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- Recorders, Printers & Plotters

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- Cartridge & Strip Heaters
- Immersion & Band Heaters
- Flexible Heaters
- Laboratory Heaters

ENVIRONMENTAL MONITORING AND CONTROL
- Metering & Control Instrumentation
- Refractometers
- Pumps & Tubing
- Air, Soil & Water Monitors
- Industrial Water & Wastewater Treatment
- pH, Conductivity & Dissolved Oxygen Instruments
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FIVE : USING THE RS-232-C SERIAL INTERFACE
Operating personnel must not remove instrument covers. Component replacement and internal adjustments must be made by qualified service personnel. Do not replace components with power cable connected.

Under certain conditions, dangerous voltages may exist even with power cable removed. To avoid injuries, always disconnect power, discharge circuits and remove external voltage sources before touching components.

DO NOT SERVICE OR ADJUST ALONE
Do not attempt internal service or adjustment unless another person, capable of rendering first aid and resuscitation, is present.

DO NOT EXCEED INPUT RATINGS
This instrument must be connected to a properly grounded receptacle to minimize electric shock hazard. Operate at line voltages or frequencies in excess of those stated on the data plate may cause leakage currents in excess of 5.0mA peak.

SAFETY SYMBOLS

WARNING
The WARNING sign denotes a hazard. It calls attention to a procedure, practice, or the like, which, if not correctly performed or adhered to, could result in personal injury. Do not proceed beyond a WARNING sign until the indicated conditions are fully understood and met.

CAUTION
The CAUTION sign denotes a hazard. It calls attention to a procedure, practice, or the like, which, if not correctly performed or adhered to, could result in damage to or destruction of part or all of the product. Do not proceed beyond a CAUTION sign until the indicated conditions are fully understood and met.

Chassis ground symbol.

Protective Conductor terminal.

DO NOT SUBSTITUTE PARTS OR MODIFY INSTRUMENT
Because of the danger of introducing additional hazards, do not install substitute parts or perform any unauthorized modification to the instrument. Return the instrument to a qualified dealers for service and repair to ensure that safety features are maintained.

INSTRUMENTS WHICH APPEAR DAMAGED OR DEFECTIVE SHOULD BE MADE INOPERATIVE AND SECURED AGAINST UNINTENDED OPERATION UNTIL THEY CAN BE REPAIRED BY QUALIFIED SERVICE PERSONNEL.

1.3 Accessories
- Power cable
- Operation manual
- Fuse

1.4 Output Isolation

The output of the power supply is isolated from earth ground. Either output terminal may be grounded or the output may floated up to +/- 240 Vdc (including output voltage) from chassis ground.
1. GENERAL INFORMATION

1.1 Introduction

This section contains a general description of your power supply as well as its performance specifications. Information about options and accessories are also provided.
The PSU300 series have been designed and tested according to EN-61010-1, Safety requirement for Electronic Measuring Apparatus.

1.2 Safety Considerations

SAFETY NOTES
The following general safety precautions must be observed during all phases of operation, service, and repair of this instrument. Failure to comply with these precautions or with specific warnings elsewhere in this manual violates safety standards of design, manufacture, and intended use of the instrument. The manufacturer assumes no liability for the customer's failure to comply with these requirements.

BEFORE APPLYING POWER

Verify that the power supply is set to match the available line voltage and the correct fuse is installed.

GROUND THE INSTRUMENT

This product is provided with a protective earth terminal. To minimize shock hazard, the instrument chassis and cabinet must be connected to an electrical ground. The instrument must be connected to the AC power supply mains through a three-conductor power cable, with the third wire firmly connected to an electrical ground (safety ground) at the power outlet. For instruments designed to be hard-wired to the AC power lines (supply mains), connect the protective earth terminal to a protective conductor before any other connection is made. Any interruption of the protective (grounding) conductor or disconnection of the protective earth terminal will cause a potential shock hazard that could result in personal injury. If the instrument is to be energized via an external autotransformer for voltage reduction, be certain that the autotransformer common terminal is connected to the neutral (earthed pole) of the AC power lines (supply mains).
The RS232 Ground is connected with chassis ground, and therefore the operator must take care if the computer is also connected with other measuring devices prevent a short cut.

CURRENT & FUSE RATING

<table>
<thead>
<tr>
<th></th>
<th>PSU301</th>
<th>PSU302</th>
<th>PSU304</th>
</tr>
</thead>
<tbody>
<tr>
<td>Current Consumption</td>
<td>0.75A / AC 115V</td>
<td>1.42A / AC 115V</td>
<td>1.30A / AC 115V</td>
</tr>
<tr>
<td></td>
<td>0.37A / AC 230V</td>
<td>0.75A / AC 230V</td>
<td>AC 230V / 80 Hz</td>
</tr>
<tr>
<td>Power Source</td>
<td>AC 115V / 60 Hz</td>
<td>AC 230V / 80 Hz</td>
<td></td>
</tr>
<tr>
<td>PSU301</td>
<td>2 Amp T type, 250V</td>
<td>1 Amp T type, 250V</td>
<td></td>
</tr>
<tr>
<td>PSU302</td>
<td>2.5Amp T type, 250V</td>
<td>1.25 Amp T type, 250V</td>
<td></td>
</tr>
<tr>
<td>PSU304</td>
<td>2.5Amp T type, 250V</td>
<td>1.25 Amp T type, 250V</td>
<td></td>
</tr>
</tbody>
</table>

Only fuses with the required rated current, voltage, and specified type (normal blow, time delay, etc.) should be used. Do not use repaired fuses or short circuited fuseholders. To do so could cause a shock or fire hazard.

DO NOT OPERATE IN AN EXPLOSIVE ATMOSPHERE

Do not operate the instrument in the presence of flammable gases or fumes.

KEEP AWAY FROM LIVE CIRCUITS
### 1.5 Specifications

<table>
<thead>
<tr>
<th>Model</th>
<th>PSU301</th>
<th>PSU302</th>
<th>PSU-304</th>
</tr>
</thead>
<tbody>
<tr>
<td>MAX. OUTPUT POWER</td>
<td>30W</td>
<td>60W</td>
<td>70W</td>
</tr>
<tr>
<td>OUTPUTS</td>
<td>Single</td>
<td>Triple</td>
<td></td>
</tr>
<tr>
<td>OUTPUT VOLTAGE</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Output Voltage</td>
<td>30V/15V</td>
<td>30V/15V</td>
<td>±30V</td>
</tr>
<tr>
<td>Peak Output Voltage</td>
<td>32V/16V</td>
<td>32V/16V</td>
<td>±32V</td>
</tr>
<tr>
<td>Setting Resolution</td>
<td>10mV</td>
<td>10mV</td>
<td></td>
</tr>
<tr>
<td>OUTPUT CURRENT</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Output Current</td>
<td>1A/2A</td>
<td>2A/4A</td>
<td>1A</td>
</tr>
<tr>
<td>Peak Output Current</td>
<td>1.2A/2.4A</td>
<td>2.2A/4.4A</td>
<td>1.2A</td>
</tr>
<tr>
<td>Setting Resolution</td>
<td>1mA</td>
<td>2mA</td>
<td>1mA</td>
</tr>
</tbody>
</table>

**CONSTANT VOLTAGE CHARACTERISTICS (at rated output)**

<table>
<thead>
<tr>
<th></th>
<th>PSU301</th>
<th>PSU302</th>
<th>PSU-304</th>
</tr>
</thead>
<tbody>
<tr>
<td>Line Regulation (10% AC)</td>
<td>1mV</td>
<td>1mV</td>
<td>5mV</td>
</tr>
<tr>
<td>Load Regulation (100% load change)</td>
<td>2mV</td>
<td>2mV</td>
<td>10mV</td>
</tr>
<tr>
<td>Ripple/Noise rms (10Hz to 20MHz)</td>
<td>1mV rms</td>
<td>1.5mV rms</td>
<td>2mV rms</td>
</tr>
<tr>
<td>Ripple/Noise peak (10Hz to 20MHz)</td>
<td>10mV p-p</td>
<td>10mV p-p</td>
<td>20mV p-p</td>
</tr>
<tr>
<td>Transient Response</td>
<td></td>
<td></td>
<td>200 μs Typical</td>
</tr>
<tr>
<td>Temperature Coefficient</td>
<td></td>
<td></td>
<td>100ppm/°C Typical</td>
</tr>
</tbody>
</table>

**CONSTANT CURRENT CHARACTERISTICS (at rated output)**

<table>
<thead>
<tr>
<th></th>
<th>PSU301</th>
<th>PSU302</th>
<th>PSU-304</th>
</tr>
</thead>
<tbody>
<tr>
<td>Line Regulation (10% AC)</td>
<td>5mA</td>
<td>5mA</td>
<td></td>
</tr>
<tr>
<td>Load Regulation (100% load change)</td>
<td>2mA</td>
<td>2mA</td>
<td></td>
</tr>
<tr>
<td>Ripple/Noise rms (10Hz to 20MHz)</td>
<td>1mA rms</td>
<td>1mA rms</td>
<td></td>
</tr>
<tr>
<td>Ripple/Noise peak (10Hz to 20MHz)</td>
<td>5mA p-p</td>
<td>5mA p-p</td>
<td></td>
</tr>
<tr>
<td>Temperature Coefficient</td>
<td></td>
<td></td>
<td>200ppm/°C Typical</td>
</tr>
</tbody>
</table>

**OTHER**

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Display</td>
<td>16 character × 2 line backlit LCD</td>
</tr>
<tr>
<td>Voltage Accuracy</td>
<td>±0.2% of rdg + 2 digits</td>
</tr>
<tr>
<td>Current Accuracy</td>
<td>±0.5% of rdg + 5 digits</td>
</tr>
<tr>
<td>Common Mode Voltage</td>
<td>±240Vdc</td>
</tr>
<tr>
<td>Temperature Range</td>
<td>Operating: 0°C to 40°C, less than 80% RH; Storage: -45°C to 75°C, less than 80% RH</td>
</tr>
<tr>
<td>Dimensions (W × H × L)</td>
<td>8.7&quot; × 3.4&quot; × 11.8&quot;</td>
</tr>
<tr>
<td>Weight</td>
<td>10 lbs</td>
</tr>
<tr>
<td>Cooling</td>
<td>Forced Air</td>
</tr>
</tbody>
</table>

*For output less than 5% of rated output, add 5 digits to the accuracy specification

**RS232 Interface: (standard)**

1. RS232C DCE interface: 9 pin D-SUB connector.
2. Port configuration: asynchronous 2400 baud, 8 data bits, 1 stop bits, no parity.
2. GETTING STARTED

2.1 Front Panel Controls and Output Terminals

A-1. The LCD Status Annuciators (PSU301/302):

Display all functions and operating characteristics of the PSU301/302

![LCD Status Annuciator](image)

(1) HI RNG : The power supply is operating in high range.
(2) LO RNG : The power supply is operating in low range.
(3) OUT ON : The power supply is in output mode.
(4) OUT OFF : The power supply is in output-off mode.

A-2. The LCD Status Annuciators (PSU304):

Display all functions and operating characteristics of the LPS-304

![LCD Status Annuciator](image)

(1) CV : The positive channel is operating under constant voltage mode.
(2) CC : The positive channel is operating under constant current mode.
(3) CV : The negative channel is operating under constant voltage mode.
(4) CC : The negative channel is operating under constant current mode.
(5) INDEP : The output of negative channel is independent from the positive channel.
(6) TRACK : The output of negative channel is in sync. with the positive channel.

(7) 5V ON : The constant 5V output terminal is in output mode.
(8) 5V OFF : The constant 5V output terminal is in stand-by mode.

NOTE:
If the square dot annuciator indicating CV or CC mode is flashing, then the channel is in output setting mode.
If the square dot annuciator is solid then the channel is not in the output setting mode.

(Press +/− key to select the channel.)
B-1. **Key Pad Controls (PSU301/302):**

For data input and mode selection

1. **V/I**
   
   Press this key to toggle between the voltage setting mode and the current setting mode.

2. **▼**
   
   Press this key in the output setting mode to move the cursor one digit left until it comes to the desired digit to be varied.

3. **►**
   
   Press this key in the output setting mode to move the cursor one digit right until it comes to the desired digit to be varied. When the cursor is at the rightmost digit, press this key again will lock the new output value into the memory.

4. **ON/OFF**
   
   Press this key to enable or disable the power supply output.

5. **▲**
   
   Press this key to increase the value of the digit to be varied when the power supply is in the output setting mode.

6. **▼**
   
   Press this key to decrease the value of the digit to be varied when the power supply is in the output setting mode.
B-2. **Key Pad Controls (PSU304):**
For data input and mode selection.

![Key Pad Controls Diagram]

1. **+/=**
   Press this key to toggle between the positive and the negative channel.

2. **V/I**
   Press this key to toggle between the voltage setting mode and the current setting mode.

3. **◄**
   Press this key in the output setting mode to move the cursor one digit left until it comes to the desired digit to be varied.

4. **►**
   Press this key in the output setting mode to move the cursor one digit right until it comes to the desired digit to be varied. When the cursor is at the rightmost digit, press this key again will lock the new output value into the memory.

5. **ON/OFF**
   Press this key to toggle the tracking mode on and off. When the tracking mode is on, the output of the negative channel is in sync. with the positive channel.

6. **ON/OFF**
   Press this key to enable or disable the channel output.

7. **▲**
   Press this key to increase the value of the digit to be varied when the channel is in the output setting mode.

8. **▼**
   Press this key to decrease the value of the digit to be varied when the channel is in the output setting mode.

**NOTE:**
Simultaneously pressing **◄** and **►** these two keys will enable or disable the constant 5V output terminal.
C-1. Output Terminals (PSU301/302):

1. + (RED) : Positive output terminal.
2. COM (BLACK) : Common output terminal.
3. GND (GREEN) : Ground (earth) output terminal connected to the main chassis.
4. ON OFF : Powers on/off the unit.

C-2. Output Terminals (PSU304):

1. + (RED) : Positive channel output terminal.
2. COM1 (BLACK) : Common terminal for both positive and negative channels.
3. --- (WHITE) : Negative channel output terminal.
4. GND (GREEN) : Ground (earth) terminal connected to the main chassis.
5. 5V (RED) : Constant 5V output terminal with respect to COM2 terminal.
6. COM2 (BLUE) : Common terminal for the constant 5V output terminal.
7. ON OFF : Powers on/off the unit.

2.2 LCD Display
A-1. When the power supply is in output mode (PSU301/302):

1. Indicates the power supply is outputting 16.00 V.
2. Indicates the power supply is outputting 2.000A.
3. Indicates the power supply is in constant voltage mode.
4. Indicates the power supply is in high range operating mode.
5. Indicates the power supply is in output mode.

B-1. When the positive and the negative channels are in stand by mode (PSU304):

1. Indicates both the positive and the negative channels are in stand by mode, no output.
2. Indicates the positive channel output voltage is set at 26.93V DC.
3. Indicates the negative channel output voltage is set at -27.76V DC.
4. Indicates the positive channel is in constant voltage mode. When the square dot annunciator flashes, the channel is in the output setting mode.
5. Indicates the negative channel is in constant voltage mode.
6. Indicates the negative channel is independent from positive channel.
7. Indicates the constant 5V channel is in output mode.

B-2. When the positive and the negative channels are in output mode (PSU304):

1. Indicates the positive channel is outputting 26.93 V 0.050A.
2. Indicates the negative channel is outputting -17.73V 0.120A.
3. Indicates the positive channel is in constant voltage mode.
4. Indicates the negative channel is in constant voltage mode.
5. Indicates the negative channel is independent from positive channel.
6. Indicates the constant 5V channel is in stand by mode.
2.3 How To Set Voltage/Current

A. When the power supply is in stand by mode.

1. Press \( \downarrow \) or \( \uparrow \) key to toggle between voltage setting and current setting mode. Next, press \( \leftarrow \) or \( \rightarrow \) key to select the digit to be varied, then press \( \uparrow \) or \( \downarrow \) key to choose the desired value. At last, press \( \rightarrow \) till the cursor disappeared to lock in the selected value.

B. When the power supply is in output mode.

1. If in CV mode, use cursor arrow keys \( \leftarrow \) or \( \rightarrow \) and then up/down keys \( \uparrow \) or \( \downarrow \) to directly set the voltage value. If in CC mode, use the cursor arrow keys and the up down keys to directly set the current value.

2. Or .Press \( \downarrow \) or \( \uparrow \) key to toggle between voltage setting and current setting mode. Next, press \( \leftarrow \) or \( \rightarrow \) key to select the digit to be varied, then press \( \uparrow \) or \( \downarrow \) key to choose the desired value. At last, press \( \rightarrow \) till the cursor disappeared to lock in the selected value.

3. OPERATING CHARACTERISTICS AND CONFIGURATIONS

3.1 INTRODUCTION

These sections contain summary information on operating characteristics and how to configure the PSU300 series. The topics included are operating ranges, load consideration, parallel/series operation and tracking operation.

3.2 OPERATING RANGES

All power supplies operate in either constant voltage (CV) or constant current (CC), over the rated output. Their respective voltage and current operating locus (figure 4.2) are found in operating quadrants for all models. The power supply acts as a constant voltage source for comparatively large values of load resistance and as a current source for comparatively small values of load resistance. The automatic crossover or transition between these two modes of operations occurs at a critical stage or "crossover" value of load resistance; \( R_c = \frac{E_s}{I_s} \), where \( E_s \) is front panel voltage setting and \( I_s \) front panel current setting.
The following are the operating quadrants (current-vs-voltage) of the power supplies.

![Diagrams showing operating quadrants](LPS-303/304 and LPS-301/302)

**Figure 3.2. Operating Quadrants**

### 3.3 LOAD CONSIDERATION AND CONNECTING MULTIPLE LOADS

When the power supply is being connected with multiple loads to the output, connect each load to the output terminal using separate load leads. This minimizes mutual coupling effects and takes full advantage of the supply's low output resistance. Each pair of wires should be as short as possible and twisted or bundled to reduce lead inductance and noise pickup.

If cabling considerations require the use of distribution terminals that are located remotely from the supply, connect the power supply output terminals to the remote distribution terminals by a pair of twisted or bundled wires. Connect each load to the distribution terminals separately.

**OUTPUT ISOLATION:** The output of the power supply is isolated from earth ground. Either output terminal may be grounded, or an external source of voltage may be connected between either output and ground. However, both output terminals must be kept within +/-240Vdc of ground. An earth ground terminal is provided on the front panel terminal block.

Each of the power supplies will operate accordingly to the various types of loads connected to the output.

**CAPACITANCE LOADING:** In normal conditions, the supply will be stable for almost any size load capacitance. However, large load capacitance may cause ringing in the supply's transient response. It is even possible that certain combinations of capacitance and ESR (equivalent series resistance) will result in instability. If this is the case, the solution is to increase or decrease total load capacitance.

### 3.4 PARALLEL CONNECTION OPERATION

**NOTE:** Power supplies equipped with SCR crowbars should not be used in series or parallel with each other unless a master-slave interconnection is employed and their crowbars interlock.

Greater current capability can be achieved by connecting outputs in parallel. **However, only power supplies which have equivalent voltage and current output ratings may be connected in parallel. Otherwise, damage to the unit may result.**
A typical connection is shown in figure 4.4 through the front of two PSU301. All leads are kept as short as possible and are bundled together. The CV and CC operations have identical setup.

![Parallel Configuration Diagram](image)

**Figure 3.4** Parallel Configuration

### 3.4.1 CV OPERATION

Although both outputs operate independently of each other in CV operation, one of the outputs must dominate (control) over the other. Additionally, the dominant output must operate in CV mode, while the other output may operate in CC mode.

As an example of this operation, let's assume in figure 4.4 that supply 2 operates in CC mode and supply 1 operates in CV mode. Perform the following steps:

1. Set supply 2 to the maximum output voltage of desired range.
2. Set supply 1 to the desired operating voltage.

The voltage of supply 1 controls the voltage across the load. The output currents are algebraic sums of the individual outputs.

### 3.4.2 CC OPERATION

The CC operation is similar in many ways to the CV operation, except that the output current must also be set. To obtain CC operation, perform the following steps:

1. Program output voltage of the two supplies to the desired operating voltage.
2. Program supply 1 to one-half the desired operating current.
3. Program supply 2 to one-half the desired operating current.

Both outputs operate in CC mode.
3.5 SERIES CONNECTION OPERATION

NOTE: Power supplies equipped with SCR crowbars should not be used in series or parallel with each other unless a master-slave interconnection is employed and their crowbars interlock.

Greater output voltage capability can be obtained by connecting outputs in series. A note of caution, since current is the same in each element of a series circuit, both outputs need identical rated currents. If this is not followed, excessive current may be forced into one of the outputs and cause a failure.

Figure 3.5 illustrates the Series configuration on a PSU304

3.5.1 CV OPERATION

In CV operation, first program the current of both outputs to the desired value. Secondly, program the desired operating voltage to equal the sum of the output voltages.

3.5.2 CC OPERATION

In CC operation, one output will operate in CV mode, the other in CC mode. To obtain this operation, perform the following:

1. Program the output current of the two channels to the desired operating current.
2. Program output positive channel to one-half the desired operating voltage.
3. Program output negative channel to one-half the desired operating voltage.

At load levels less than one half the total voltage limit, the output that was originally in CC mode, stays in CC mode.

At load voltages greater than one-half the total voltage limit, the output that was originally in CC mode, changes to CV mode. The secondary output will regulate the current in CC mode and provide the necessary voltage.
3.6 TRACKING OPERATION (PSU304)

PSU304 has extra capability of tracking since it has two output channels. When the tracking mode is enabled, voltage and current output of negative channel is in sync. with positive channel and is controlled by the positive channel. For instance, an one volt step up in positive channel would also cause a one volt step up in negative channel.

If a positive and negative supply is desired (e.g. op-amp application) use the output connector pair connected as in circuit common. Positive channel provides +V, negative channel provides -V and COM1 connects to ground.

WARNING: Under certain circumstances, potentials as low as 24 volts can cause severe injury or even death from electrocution. Please observe proper safety precautions when using such output voltages.

3.7 RANGE OPERATION (PSU301/302)

The models PSU301 and PSU302 have two (HI/LO) operating ranges. These ranges are switched automatically by the power supplies. When low range is active the square dot annunciator in the LCD will point to LO RNG. When high range is active the square dot annunciator will point to HI RNG.

4. USER MAINTENANCE / SERVICE

4.1 Fuse Replacement

If the fuse is suspected of being defective, it should be inspected and, if necessary, replaced. To inspect or replace the fuse, please perform the following steps:

1. Disconnect the AC line cord from the unit to reduce electrical shock hazard.
2. Remove the fuse by sliding out the fuse holder. The fuseholder is beneath the AC Receptacle. Test the fuse for electrical continuity with any ohmmeter.
3. If the fuse is found to be defective, replace it with a replacement fuse as specified in the label on the rear panel.
4. Replace the fuse in the fuseholder and re-install.
5. Reconnect the AC power cord.

NOTE: USE OF ANY FUSE OTHER THAN THE ONE SPECIFIED MAY CAUSE DAMAGE TO THE UNIT, POSE A SEVERE FIRE HAZARD, AND WILL VOID THE WARRANTY.

4.2 In Case Of Difficulties

This power supply has been designed to be accurate, reliable, and easy-to-use. However, it is possible that you may experience difficulties during operation. If there appears to be any kind of problem during use of the unit, please perform the following steps to help determine the cause:

1. Re-read the operating instructions. It is very easy to inadvertently make mistakes in operating procedure.
2. Remove and test the fuse. The power supply will not function with an open fuse.

If the preceding two steps fail to resolve the problem, please call your local distributors.

NOTE: ATTEMPTED REPAIR, MODIFICATIONS, OR TAMPERING BY UNAUTHORIZED PERSONNEL WILL VOID THE WARRANTY.
5. USING THE RS-232-C SERIAL INTERFACE

This section describes how to set up the RS-232-C interface for remote control. The Interface of PSU300 Series are designed in accordance with EIA (Electronic Industries Association) standard RS-232-C. Through its interface the PSU300 Series can be remotely controlled and transmit its internal data to a host computer.

<table>
<thead>
<tr>
<th>Command</th>
<th>Description</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>VSET</td>
<td>Voltage setup</td>
<td>VSET1 12.345</td>
</tr>
<tr>
<td>VOUT</td>
<td>Voltage readback</td>
<td>VOUT2</td>
</tr>
<tr>
<td>ISET</td>
<td>Current setup</td>
<td>ISET2 1.23</td>
</tr>
<tr>
<td>IOUT</td>
<td>Current readback</td>
<td>IOUT1</td>
</tr>
<tr>
<td>OUT</td>
<td>0 = +/- output off</td>
<td>OUT0</td>
</tr>
<tr>
<td></td>
<td>1 = +/- output on</td>
<td>OUT1</td>
</tr>
<tr>
<td>TRACK</td>
<td>0 = independent</td>
<td>TRACK0</td>
</tr>
<tr>
<td></td>
<td>1 = tracking from ch1</td>
<td>TRACK1</td>
</tr>
<tr>
<td></td>
<td>2 = tracking from ch2</td>
<td>TRACK2</td>
</tr>
<tr>
<td>STATUS</td>
<td>Working status (see note7)</td>
<td>STATUS</td>
</tr>
<tr>
<td>CALE</td>
<td>0 = end calibration</td>
<td>CAL0</td>
</tr>
<tr>
<td></td>
<td>1 = begin calibration</td>
<td>CAL1</td>
</tr>
<tr>
<td></td>
<td>2 = input calibration parameter</td>
<td>CAL2 9.574</td>
</tr>
<tr>
<td>MODEL</td>
<td>Display model no</td>
<td>MODEL</td>
</tr>
<tr>
<td>VERSION</td>
<td>Display version no</td>
<td>VERSION</td>
</tr>
<tr>
<td>HELP</td>
<td>Display command list</td>
<td>HELP</td>
</tr>
<tr>
<td>BEEP</td>
<td>0 = beeper function disable</td>
<td>BEEP0</td>
</tr>
<tr>
<td></td>
<td>1 = beeper function enable</td>
<td>BEEP1</td>
</tr>
<tr>
<td></td>
<td>2 = force beeper alarm</td>
<td>BEEP2</td>
</tr>
<tr>
<td></td>
<td>3 = beeper alarm off</td>
<td>BEEP3</td>
</tr>
<tr>
<td>VDD</td>
<td>0 = digital output off</td>
<td>VDD0</td>
</tr>
<tr>
<td></td>
<td>3 = digital output 3.3V</td>
<td>VDD3</td>
</tr>
<tr>
<td></td>
<td>5 = digital output 5V</td>
<td>VDD5</td>
</tr>
<tr>
<td>LOWA</td>
<td>0 = CC output compensated off</td>
<td>LOWA0</td>
</tr>
<tr>
<td></td>
<td>1 = CC output compensated on</td>
<td>LOWA1</td>
</tr>
</tbody>
</table>
NOTE:

1. All RS232 command are case-nonsensitivity ASCII codes.
2. Use async framing 8 data bits, no parity bit, 1 stop bit.
3. Bit rate = 2400bps.
4. Every command string is terminated by CR or LF or BOTH (carriage return).
5. There is one command allowable in a command string.
6. A command string enter before "OK" prompt will be reject & no function.
7. STATUS operation explanation:
   After a PSU accept a "STATUS" command, it will display a decimal number in ASCII. Convert this decimal number to binary form. Each bit indicates an action/status:

<table>
<thead>
<tr>
<th>Bit</th>
<th>0</th>
<th>Channel</th>
<th>1</th>
<th>0 = CV</th>
<th>1 = CC</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
<td>Channel</td>
<td>2</td>
<td>0 = CV</td>
<td>1 = CC</td>
</tr>
<tr>
<td>3.2</td>
<td>00</td>
<td>independent</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>10</td>
<td>tracking to channel</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>11</td>
<td>tracking to channel</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>0</td>
<td>digital output off</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>digital output on</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>0</td>
<td>digital output 5V</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>digital output 3.3V</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>0</td>
<td>output off</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>output on</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>0</td>
<td>nothing</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>digital output overload</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>0</td>
<td>fan off</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>fan on</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>0</td>
<td>beeper function disable</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>beeper function enable</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>0</td>
<td>CC output compensated off</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>CC output compensated on</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
1. GENERAL INFORMATION
   1.1 Introduction

   This section contains a general description of your power supply as well as its performance specifications. Information about options and accessories are also provided. The PSU305 series has been designed and tested according to EN-61010-1, Safety requirement for Electronic Measuring Apparatus.

   1.2 Safety Considerations

   SAFETY PRECAUTIONS

   SAFETY NOTES
   The following general safety precautions must be observed during all phases of operation, service, and repair of this instrument. Failure to comply with these precautions or with specific warnings elsewhere in this manual violates safety standards of design, manufacture, and intended use of the instrument. The manufacturer assumes no liability for the customer's failure to comply with these requirements.

   BEFORE APPLYING POWER
   Verify that the power supply is set to match the available line voltage and the correct fuse is installed.

   GROUND THE INSTRUMENT
   This product is provided with a protective earth terminal. To minimize shock hazard, the instrument chassis and cabinet must be connected to an electrical ground. The instrument must be connected to the AC power supply mains through a three-conductor power cable, with the third wire firmly connected to an electrical ground (safety ground) at the power outlet. For instruments designed to be hard-wired to the AC power lines (supply mains), connect the protective earth terminal to a protective conductor before any other connection is made. Any interruption of the protective (grounding) conductor or disconnection of the protective earth terminal will cause a potential shock hazard that could result in personal injury. If the instrument is to be energized via an external autotransformer for voltage reduction, be certain that the autotransformer common terminal is connected to the neutral (earthed pole) of the AC power lines (supply mains).
   The RS232 (option) Ground is connected with chassis ground, and therefore the operator must take care if the computer is also connected with other measuring devices prevent a short cut.

   FUSES
   Only fuses with the required rated current, voltage, and specified type (normal blow, time delay, etc.) should be used. Do not use repaired fuses or short circuited fuseholders. To do so could cause a shock or fire hazard.

   DO NOT OPERATE IN AN EXPLOSIVE ATMOSPHERE
   Do not operate the instrument in the presence of flammable gases or fumes.

   KEEP AWAY FROM LIVE CIRCUITS
   Operating personnel must not remove instrument covers. Component replacement and internal adjustments must be made by qualified service personnel. Do not replace components with power cable connected.
Under certain conditions, dangerous voltages may exist even with power cable removed. To avoid injuries, always disconnect power, discharge circuits and remove external voltage sources before touching components.

**DO NOT SERVICE OR ADJUST ALONE**
Do not attempt internal service or adjustment unless another person, capable of rendering first aid and resuscitation, is present.

**DO NOT EXCEED INPUT RATINGS**
This instrument must be connected to a properly grounded receptacle to minimize electric shock hazard. Operate at line voltages or frequencies in excess of those stated on the data plate may cause leakage currents in excess of 5.0mA peak.

**SAFETY SYMBOLS**

**WARNING**
The WARNING sign denotes a hazard. It calls attention to a procedure, practice, or the like, which, if not correctly performed or adhered to, could result in personal injury. Do not proceed beyond a WARNING sign until the indicated conditions are fully understood and met.

**CAUTION**
The CAUTION sign denotes a hazard. It calls attention to a procedure, practice, or the like, which, if not correctly performed or adhered to, could result in damage to or destruction of part or all of the product. Do not proceed beyond a CAUTION sign until the indicated conditions are fully understood and met.

![Chassis ground symbol](image)

**Chassis ground symbol**

![Protective Conductor terminal](image)

**Protective Conductor terminal**

![Caution, risk of electric shock](image)

**Caution, risk of electric shock**

**DO NOT SUBSTITUTE PARTS OR MODIFY INSTRUMENT**
Because of the danger of introducing additional hazards, do not install substitute parts or perform any unauthorized modification to the instrument. Return the instrument to a qualified dealers for service and repair to ensure that safety features are maintained.

**INSTRUMENTS WHICH APPEAR DAMAGED OR DEFECTIVE SHOULD BE MADE INOPERATIVE AND SECURED AGAINST UNINTENDED OPERATION UNTIL THEY CAN BE REPAIRED BY QUALIFIED SERVICE PERSONNEL.**
1.3 Options
Options 01 determine which line voltage is set at the factory. This information is on the rear panel label.

Option 01: 230 (240) Vac AC Input
Option 02: Rack mount Shelf

1.4 Accessories

Power cable
Operation manual
Fuse

1.5 Output Isolation

The output of the power supply is isolated from earth ground. Either output terminal may be grounded or the output may floated up to +/- 240 Vdc (including output voltage) from chassis ground

1.6 Specifications

TRIPLE OUTPUT LINEAR POWER SUPPLY UP TO 165 WATTS

<table>
<thead>
<tr>
<th>Model</th>
<th>PSU305</th>
</tr>
</thead>
<tbody>
<tr>
<td>MAX. OUTPUT POWER</td>
<td>165 WATTS</td>
</tr>
<tr>
<td>OUTPUT VOLTAGE</td>
<td></td>
</tr>
<tr>
<td>Output Voltage</td>
<td>0 to +30V / 0 to -30V</td>
</tr>
<tr>
<td>Setting Resolution</td>
<td>10mV</td>
</tr>
<tr>
<td>Max. output voltage</td>
<td>+32V / -32V</td>
</tr>
<tr>
<td>Dual tracking</td>
<td>0 to ±30V</td>
</tr>
<tr>
<td>Tracking deviation</td>
<td>±20mV</td>
</tr>
<tr>
<td>OUTPUT CURRENT</td>
<td></td>
</tr>
<tr>
<td>Output Current</td>
<td>0 to +2.5A / 0 to -2.5A</td>
</tr>
<tr>
<td>Setting Resolution</td>
<td>1mA</td>
</tr>
<tr>
<td>Max. output current</td>
<td>+3A / -3A</td>
</tr>
<tr>
<td>Dual tracking</td>
<td>0 to ±2.5A</td>
</tr>
<tr>
<td>Tracking deviation</td>
<td>±5mA</td>
</tr>
<tr>
<td>CONSTANT VOLTAGE CHARACTERISTICS (at rated output)</td>
<td></td>
</tr>
<tr>
<td>Line regulation(for change of AC ±10%)</td>
<td>1mV</td>
</tr>
<tr>
<td>Load regulation(for load change 0 100%)</td>
<td>2mV</td>
</tr>
<tr>
<td>Ripple/Noise rms (10Hz to 20MHz)</td>
<td>1.5mVrms</td>
</tr>
<tr>
<td><strong>Ripple/Noise peak (10Hz to 20MHz)</strong></td>
<td>10mVp-p</td>
</tr>
<tr>
<td>---------------------------------------</td>
<td>---------</td>
</tr>
<tr>
<td><strong>Transient Response</strong></td>
<td>200μs Typical</td>
</tr>
<tr>
<td><strong>Temperature Coefficient</strong></td>
<td>100ppm / °C Typical</td>
</tr>
</tbody>
</table>

**CONSTANT CURRENT CHARACTERISTICS (at rated output: ±2.5A)**

| **Line regulation (for change of AC ±10%)** | 15mA Typical | |
| **Load regulation (for change from short to full load)** | 10mA Typical | |
| **Ripple/Noise rms (10Hz to 20MHz)** | 1mArms Typical | |
| **Ripple peak (p-p)(10Hz to 20MHz)** | 5mAp-p Typical | |
| **Temperature Coefficient** | 200 ppm / °C Typical | |
| **Display** | 2×16 LCD with backlit; Front Panel Status Announciators with beeper | |
| **Voltage Accuracy** | ±( 0.2% of rdg +2 digits ) | ± 2% |
| **Current Accuracy** | ±( 0.5% of rdg +5 digits ) | |
| **Common Mode Voltage** | ±240Vdc | |
| **Temperature ranges** | Operating: 0°C to 40°C, less than 80% RH; Storage: -40°C to 70°C, less than 80% RH | |
| **Dimensions (W × H × L)** | 8.4" × 5.2" × 15.7" | |
| **Weight** | Approx. 18 lbs | |
| **Cooling** | Fan Cooled | |
| **Power Source** | AC 115V ± 10% OR 230V ± 10%, 47 to 63Hz | |
| **Current Consumption** | 2.88A / AC 115V or 1.48A / AC 230V | |
| **Fuse Rating** | 5AT / 250V for AC 115V, 2.5AT / 250V or AC 230V | |
| **Options** | Opt 01 [ 230 ( 240 ) Vac; factory-installable only ] | |
| **Accessories** | User's manual, power cord, fuse | |

*For output less than 5% of rated output, add 5 digits to the accuracy specification*

**RS232 Interface capabilities:**

2. Port configuration: asynchronous 2400 baud, 8 data bits, 1 stop bit, no parity.
2. INSTALLATION

2.1 Introduction
This section contains instructions for checking and mounting your power supply and connection your power supply to AC power. The power supply generates operating magnetic which may affect the operation other instruments. If your instrument is susceptible to operating magnetic fields, position it more than three inches from the power supply.

2.2 Initial inspection
Your supply was thoroughly inspected and tested before shipment. As soon as you receive it, remove it from its packaging case and check to make sure it has not been damaged during shipment. Check that there are no broken connectors or keys and that the cabinet and panel surfaces are free from dents and scratches.

2.3 Location and cooling
Your power supply can operate without sacrificed performance within the temperature range of 0 to 40 °C (measured at the fan intake). The fan, located at the rear of the unit, cools the supply by drawing air in through the openings on the sides and exhausting it through the opening on the rear panel. Since the power supply is fan cooled, it must be installed in a location that allows sufficient clearance of 1 inch (25mm) is required on all sides for proper ventilation.

2.4 Input power requirements
You can operate this power supply from a nominal 115V or 230(240) Vac single phase power source at 47 to 63Hz. You can check the line voltage setting of your supply by examining the label on the rear panel.

2.5 Line fuse
You can operate this located behind the fuseholder on the QC input socket. To access the fuse, remove the power cord and pull out the fuseholder on the AC input socket. The current ration of the fuse is based on the line voltage setting of your supply.
3. GETTING STARTED

3.1 Front panel controls and output terminals

Note: most soft keys have two functions. The first function of the key is function entry (i.e. + Vset, -Iset, Tracking etc.) The second function for the soft keys is data entry (i.e. 0~9).

REFER TO THE FIGURE A.

1. LCD display : Displays alphanumeric information with status annunciators. A detailed listing of descriptions is presented in section 3.2.


3. + Vset(7) : + output control key used to display or alter the present voltage setting. Numeric entry key for number seven.

4. + Iset (8) : + output control key used to display or alter the present voltage setting. Numeric entry key for number seven.

5. + ▲ (up) (9) : + output control key used to increase the voltage settings when the supply is in the CV mode or the current settings when the supply is in the CC mode. It will change voltage or current by 10mV, or 1mA respectively. If the key is pressed and held, it will continually increase the setting until it is released. Numeric entry key for number nine.

6. + ▼ (down) : + output control key used to decrease the voltage settings when the supply is in the CV mode or the current settings when the supply is in the CC mode by 10mV or 1mA per step. If the key is pressed and held, it will continually decrease the setting until it is released.

7. - Vset (4) : - output control key used to display or alter the present voltage setting. Numeric entry key for number four.

8. - Iset (5) : - output control key used to display or alter the present voltage setting. Numeric entry key for number five.

9. + ▲ (up) (6) : - output control key. The function is as same as positive channel. Numeric entry key for number six.

10. - ▼ (down) : - output control key. The function is as same as positive channel.

11. TRACK(1) : Mode control key which toggles the tracking mode on or off.

12. "0" : Numeric entry key for zero.

13. 5V/3.3V(2) : 5V or 3.3V output selecting key. Numeric entry key for number two.

14. ":" : 5V or 3.3V output control key which toggles the output on or off. Decimal
point key.

(15) Beep (3) : Beeper control key which toggle the beeper on or off. Numeric entry key for number three.

(16) Enter : Enter the values on the display for the specified function and return the display to output-off mode or metering mode.

(17) Clear : Used in conjunction with the numeric entry keys to clear partially set commands. Also returns unit to the previous mode.

(18) ± output(on/off) : mode control key which toggles the ±output on or off simultaneously.

(19) output terminal (RED) : This terminal is used to output +30V/+2.5A with respect to the COM1 terminal

(20) COM1 Terminal(BLACK) : The common terminal which is used for +30V/+2.5A output.

(21) - output Terminal(WHITE) : This terminal is used to output +30V/+2.5A with respect to the COM1 terminal.

(22) GDN Terminal (GREEN) : This ground(earth) terminal is connected to the main chassis.

(23) COM2 Terminal(BLUE) : The common terminal which is used for 5V/3A or 3.3V/3A output.

(24) 5V/3.3V Terminal )RED) : This terminal is used to output 5V/3A or 3.3V/3A with respect to the COM2 terminal.

3.2 LCD display message
STATUS ANNUNCIATORS

Position 1: Indicator of CV mode or CC mode of + output (positive). It will flash when the output is enabled.
Position 2: Indicator of CV mode or CC mode of - output (negative). It will flash when the output is enabled.
Position 3: Indicator of the independent mode or tracking mode. Flashing cursor implies the unit is working normally.
Position 4: Indicator of the selected output 5V or 3.3V. It will flash when the output is on.

ALPHANUMERIC LCD DISPLAY
Normally LCD panel displays the preset or measured output voltage and current for both channels. When operating at the front panel, the programmed functions (e.g. + Vset, - Iset...etc), and The preset values (e.g. + Vset = 10.00V) will be displayed. Error conditions are also displayed on the LCD panel.

3.3 Rear panel

REFER TO FIGURE C.

(1) Input AC socket: AC receptacle for power cord
(2) Fuseholder: Fuseholder for line fuse
(3) RS-232C interface: 9-pin female DCE interface
(4) Label: Indicator of input power requirements and fuse rating.
4. **OPERATION**

4.1 **Initial conditions**

When AC voltage is applied, the power supply undergoes a self-test and disables all outputs by default. The display will show an "ALL OUTPUT OFF" message along with the + Vset and – Vset values as shown in Figure 4.1.

![Figure 4.1: Multiple options with voltage settings](image)

4.2 **Control of output functions**

The power supply will accept programming values directly in volts or amps. All input values will be rounded-off to the nearest multiple of the resolution (typically 10mV or 1mA) for that particular output. If the programming value is outside the valid range, an "INPUT REEOE" message will be displayed on the LCD for one second and the power supply will return to the previous set value.

When you press the +Vset, +Iset, -Vset, -Iset, the output selected (+output or –output) and the present setting for that function will be displayed. You can change setting using the numeric entry keys. Pressing the number keys will cause the present numeric setting to become blank and be replaced with the new numbers on the display. You can use the CLEAR key to erase previous keystrokes if you make a mistake. Pressing the ENTER key will enter the values displayed for the function indicated, initiate that function, initiate that function, and return the display to the output off mode or to the metering mode (output on) in which the measured numbers will result in retention of the previous values and return to the previous mode. You can also return to the previous mode at anytime by pressing the CLEAR key.

The up/down arrow keys for each output are used to change voltage and current and current setting when the power supply is in the CV mode and in the CC mode respectively.

**NOTE**

The up/down keys change the LSB of the voltage or current (typically 10mV or 1mA) each time they are pressed. If the key is held down for more than 1 second, the power supply will automatically step up/down until the key is released. The up/down step rate will increase if the key is held down for more than 2 seconds.

The up/down step function can only be used when the power supply is in the metering mode. The function is disabled when the power supply is in the programming mode (i.e. when + Vset, +Iset, - Vset, -Iset or -Iset, is pressed).

The power supply can be programmed by the numeric entry keys or the up/down step function even when the selected output is disabled.
4.3 Enabling/Disabling the output

The selected output channel can be turned on and off from the front panel. The output on/off key toggles both the +output and –output on and off simultaneously. The “.” key toggles the 5V or 3.3V output on and off. An output disabled by the output on/off key will be have as if it were programmed to zero volts.

4.4 Overload protection of 5V or 3.3V output

When the 5V or 3.3V output current is approximately 20 percent above the current output rating or if the output is shorted, the overload protection circuit will be activated and the output will be disabled. To reset the output, first clear the condition that caused the overload then press the “.” (on/off ) key to enable the output to its previous state.
5. OUTPUT CONNECTIONS (APPLICATIONS)

5.1 Serial output

If the load is connected between the positive and negative output terminals, the unit becomes a power source which can supply twice as much voltage as the rated output voltage.

PLEASE REFER TO FIGURE D.
6. CALIBRATION

Calibration steps:

Equipment needed for calibration: DMM, such as HHM290.

Step 1: Simultaneously press the "8" and the " - ▼ " keys on the Keypad and the following message will appear on the LCD:

```
+V Lo=09.487
ADC GET=01036
```

Step 2: Measure the DC voltage from the +output terminals (+ and COM1) with the DMM and key in the measured value (i.e. if the DMM shows 9.487V then key in 9.487) followed by the "ENTER" key. The following message will then appear on the LCD:

```
+V Hi=29.798
ADC GET=03104
```

Step 3: Repeat step 2. Key in the measured value (i.e. if the DMM shows 29.798V then key in 29.798) followed by the " ENTER " key. The following message will then appear on the LCD:

```
+I Lo=0.728
ADC GET=00903
```
Step 4: Measure the DC current from +out terminals (+ and COM1) with the DMM and keyin the value (i.e. if the DMM shows 0.728A, then keyin 0.728) followed by the "ENTER" key. The following message will then appear on the LCD:

![Image of LCD display showing +I Hi=2.491 and ADC GET=02579]

Step 5: Repeat step 4. Keyin the measured value (i.e. if the DMM shows 2.491A then keyin 2.491) followed by the "ENTER" key. The following message will then appear on the LCD:

![Image of LCD display showing ADC GET=01039 and -V Lo=09.624]

Step 6: Measure the DC voltage from -output terminals (- and COM1) with the DMM and keyin the measured value (i.e. if the DMM shows 9.624V then keyin 9.624) followed by the "ENTER" key. The following message will then appear on the LCD:

![Image of LCD display showing ADC GET=03099 and -V Hi=30.036]

Step 7: Repeat step 6. Keyin the measured value (i.e. if the DMM shows 30.036V, then keyin 30.036) followed by the "ENTER" key. The following message will then appear on the LCD:
Step 8: Measure the DC current from -output terminals ( - and COM) with the DMM and keyin the measured value (i.e. if the DMM shows 0.642A then keyin 0.642) followed by the “ENTER” key.
The following message will then appear on the LCD:

Step 9: Repeat step 8. Keyin the measured value (i.e. if the DMM shows 2.418A, then keyin 2.418) followed by the “ENTER” key. The following message will then appear on the LCD:
7. USER MAINTENANCE/SERVICE

7.1 Fuse Replacement

If the fuse is suspected of being defective, it should be inspected and, if necessary, replaced. To inspect or replace the fuse, please perform the following steps:

1. Disconnect the AC line cord from the unit to reduce electrical shock hazard.
2. Remove the fuse by sliding out the fuse holder. The fuseholder is beneath the AC Receptacle. Test the fuse for electrical continuity with an ohmmeter.
3. If the fuse is found to be defective, replace it with a replacement fuse as specified in the label on the rear panel.
4. Replace the fuse in the fuseholder and re-install.
5. Reconnect the AC power cord.

NOTE: USE OF ANY FUSE OTHER THAN THE ONE SPECIFIED MAY CAUSE DAMAGE TO THE UNIT, POSE A SEVERE FIRE HAZARD, AND WILL VOID THE WARRANTY.

7.2 In Case of Difficulties

This programmable power supply has been designed to be accurate, reliable, and easy-to-use. If you experience any difficulties during the use of the unit, please perform the following steps:

1. Re-read the operation instructions, it is very easy to inadvertently make mistakes in operation procedures.
2. Remove and test the fuse. The power supply will not function with an open fuse.

If the preceding two steps fail to resolve the problem.

NOTE: ATTEMPTED REPAIR, MODIFICATIONS, OR TAMPERING BY UNAUTHORIZED PERSONNEL WILL VOID THE WARRANTY.

7.3 Using the RS-232-C Serial Interface

This section describes how to set up the RS-232-C interface for remote control. The interface of PSU305 are designed in accordance with EIA (Electronic Industries Association) standard RS-232-C. Through its interface be TPT-3025 be remotely controlled and transmit its internal data to a hose computer.

<table>
<thead>
<tr>
<th>Command</th>
<th>Description</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>VSET</td>
<td>Voltage setup</td>
<td>VSET1 12.345</td>
</tr>
<tr>
<td>VOUT</td>
<td>Voltage readback</td>
<td>VOUT2 1.23</td>
</tr>
<tr>
<td>ISET</td>
<td>Current setup</td>
<td>ISET2 1.23</td>
</tr>
<tr>
<td>IOUT</td>
<td>Current readback</td>
<td>IOUT1</td>
</tr>
<tr>
<td>OUT1</td>
<td>0=+/+- output off</td>
<td>OUT0</td>
</tr>
<tr>
<td></td>
<td>1=+/+- output on</td>
<td>OUT1</td>
</tr>
<tr>
<td>TRACK</td>
<td>0=independent</td>
<td>TRACK0</td>
</tr>
<tr>
<td></td>
<td>1=tracking from ch1</td>
<td>TRACK1</td>
</tr>
<tr>
<td></td>
<td>2=tracking from ch2</td>
<td>TRACK1</td>
</tr>
<tr>
<td>STATUS</td>
<td>Working status(see note7)</td>
<td>STATUS</td>
</tr>
<tr>
<td>CALI</td>
<td>0=end calibration</td>
<td>CALI0</td>
</tr>
<tr>
<td></td>
<td>1=end calibration</td>
<td>CALI1</td>
</tr>
<tr>
<td></td>
<td>2=end calibration</td>
<td>CALI2 9.574</td>
</tr>
<tr>
<td>MODEL</td>
<td>Display model no.</td>
<td>MODEL</td>
</tr>
<tr>
<td>VERSION</td>
<td>Display version no.</td>
<td>VERSION</td>
</tr>
<tr>
<td>HELP</td>
<td>Display command list</td>
<td>HELPP</td>
</tr>
<tr>
<td>141,145</td>
<td>0=beeper function disable</td>
<td>BEEP0</td>
</tr>
<tr>
<td>1=beeper function disable</td>
<td>BEEP1</td>
<td></td>
</tr>
<tr>
<td>2=force beeper alarm</td>
<td>BEEP2</td>
<td></td>
</tr>
<tr>
<td>3=beeper alarm off</td>
<td>BEEP3</td>
<td></td>
</tr>
<tr>
<td>VDD</td>
<td>0=digital output off</td>
<td>VDD0</td>
</tr>
<tr>
<td>3=digital output 3.3V</td>
<td>VDD3</td>
<td></td>
</tr>
<tr>
<td>5=digital output 5v</td>
<td>VDD5</td>
<td></td>
</tr>
<tr>
<td>LOWA</td>
<td>0=CC output compensated off</td>
<td>LOWA0</td>
</tr>
<tr>
<td>1=CC output compensated on</td>
<td>LOWA1</td>
<td></td>
</tr>
</tbody>
</table>

**NOTE:**

1. All RS232 commands are case-nonsensitivity ASCII codes.
2. Use async framing 8 data bits, no parity bit, 1 stop bit.
3. Bit rate=2400bps.
4. Every command string is terminated by CR or LF or BOTH (carriage return).
5. There is one command allowable in a command string.
6. A command string enters before "OK" prompt will be reject & no function.
7. STATUS operation explanation:
   After a PSU305 accept A "STATUS" command, it will display a decimal number in ASCLL Convert
   this decimal number to binary form each bit indicate a action/status:

| Bit 0: | channel 1 | 0=CV 1=CC |
| Bit 1: | channel 2 | 0=CV 1=CC |
| Bit 3,2: | 00:independent |
| 10:tracking to channel 1 |
| 11:tracking to channel 2 |
| Bit 4: | 0:digital output off |
| Bit 5: | 0:digital output 5V |
| 1:digital output 3.3V |
| Bit 6: | 0:output off |
| 1:output on |
| Bit 7: | 0:nothing |
| 1:digital output overload |
| Bit 8: | 0:fan off |
| 1:fan on |
| Bit 9: | 0=beeper function disable |
| 1=beeper function enable |
| Bit 10: | 0=CC output compensated off |
| 1=CC output compensated on |
PSU505
Programmable DC Power Supply
Storage
When don’t use the device, please pack it properly and store under a good environment.
(The packing is no needed when the device under appropriate environment.)

Freight
Please use the original packing material when move the device. If the packing material is missing, please use the equivalent buffer material to pack and mark it fragile and waterproof to avoid the device damage during movement. The device is precision equipment, please use qualified transportation as possible. And, please avoid heavy hitting to damage the device.

Maintenance
There is no maintenance operation for the general user (except for the note in the manual). Please contact our company or agent when the device occurred the user judgment abnormal. Don’t maintain by yourself to avoid occurred unnecessary danger and serious damage to the device.

Disposal
When the device in badly condition and can’t be used or repaired, please discard it according to your company disposal procedures or local legal procedures. Don’t discard arbitrary to avoid polluting environment.
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1. Introduction

1.1 An Overview of Product

Motech PSU505 is a triple outputs and programming DC power supply. PSU505 comes with 12 bits resolution. Total 210W power output is provided by triple independent outputs. Double output provide 0~32V/3A, the other one provides 0~15V/5A 30W. For the 0~15V/5A output, users can use auto-ranging while constant 30W power output. This is the unique feature and it differs from other traditional power supplies. Those two 0~30V/3A outputs are required to output in serial or parallel mode. Tracking function is convenient and changeable for users in circuit application. PSU505 has rotary and number key for user to easily operation. The configuration can be stored in memory (Max.100). Timer (1 sec~100 hrs) control when output can be switched off. It can provide the safety for burning room and electroplating application. OVP, OCP can be controlled and monitored by front panel. Users will not change the original setting because of the key lock function. When source and load change, PSU505 has stable output due to 0.01% load and line regulation and max. 50 us respond time. Average measurement time is 50 ms to increase the production quantity.

1.2 Features

1. Triple output:
   - Voltage Ranges : 0 ~ 32V (CH1&CH2) / 0 ~ 15V (CH3)
   - Current Ranges : 0 ~ 3A (CH1&CH2) / 0 ~ 5A (CH3)
   - Power Ranges : 0 ~ 96W (CH1&CH2) / 0 ~ 30W (CH3)

   The third output is an auto-ranging output. Users can change voltage and current as they want based on maximum 30W output. For example, output 15V/2A or 6V/5A voltage and current should be within the output range.

2. Digital rotary, number key, function key setting:
   Digital rotary can change voltage rapidly. Simulate the surge of the voltage output. It provides the solution for the trigger circuit testing. User can set up voltage by number key quickly. It differs from original VR adjusting. Function key provide users operation more friendly and easily.

3. Precious measurement on Voltage & current:
   Besides precise output, PSU505 provides voltage and current measurement. Users can reduce the measurement equipment budget and space.
4. **Memory and timer function:**
   PSU505 has large memory to memorize 100 settings. Operators are unnecessary to remember the settings. It can be easily to recall the settings. For safety issue, timer function will automatically switch off the machine when they are burning in burning room. PSU505 can also provides time control good current resolution for electroplate application as customers’ need.

5. **OVP, OCP & lock protection function:**
   OVP, OCP provide the safety for the laboratory. The setting will not be changed due to the key lock function.

6. **Series, parallel mode:**
   In serial mode, CH1/CH2 can output maximum 60V with positive/negative output. It can be used for OP circuit design. In parallel mode, CH1/CH2 can output 6A maximum.

7. **Dual tracking:**
   Users only needs to setup CH1 output voltage and current, PSU505 will output the same voltage/current at CH2. This is convenient to test two samples at the same time.
### 2. Specification

<table>
<thead>
<tr>
<th>Model</th>
<th>PSU505</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Channel NO.</strong></td>
<td>CH1 &amp; CH2</td>
</tr>
<tr>
<td>Output Voltage</td>
<td>0~32V</td>
</tr>
<tr>
<td>Output Current</td>
<td>0~3A</td>
</tr>
<tr>
<td>Output Power</td>
<td>96W</td>
</tr>
<tr>
<td>(CH3 Auto Ranging)</td>
<td></td>
</tr>
</tbody>
</table>

**Line Regulation ±(% of output + offset)**

| Voltage                | 0.01% + 2mV     |
| Current                | 0.01% + 300uA   |

**Load Regulation ±(% of output + offset)**

| Voltage                | ≤3mV            | ≤5mV            |
| Current                |                | 0.01% + 300uA   |

**Ripple and Noise (20Hz ~ 20MHz)**

| Normal Mode Voltage    | 700uVrms / 7mVpp | 1mVrms / 20mVpp |
| Normal Mode Current    | <1mA             | <5mA            |

**Resolution**

| Programming            | 10mV / 1mA       | 10mV / 2mA       |
| Readback               | 10mV / 1mA       | 3mV / 2mA        |

**Programming Accuracy ±(% output + offset)**

| Voltage                | 0.05% + 20mV     | 0.05% + 6mV      |
| Current                | 0.05% + 3mA      | 0.05% + 4mA      |

**Readback Accuracy ±(% output + offset)**

| Voltage                | 0.05% + 20mV     | 0.05% + 6mV      |
| Current                | 0.05% + 3mA      | 0.05% + 4mA      |

**Temperature Coefficient per°C ±(% output + offset)**

| Voltage                | ≤0.1% + 3mV      |
| Current                | ≤0.2% + 2mA      |

**Tracking Accuracy ±(% of output + offset)**

| Voltage                | 0.1% + 40mV      |
| Transient Response Time| <50μS            |

**Stability, constant output & temperature ±(% of output + offset), 8hrs**

| Voltage                | <0.2% + 2mV      |
| Current                | <0.1% + 1mA      |
## Specification

<table>
<thead>
<tr>
<th>Voltage Programming Speed</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Rising Time at Full Load</td>
<td>3mSec</td>
</tr>
<tr>
<td>Rising Time at No Load</td>
<td>3mSec</td>
</tr>
<tr>
<td>Falling Time at Full Load</td>
<td>8mSec</td>
</tr>
<tr>
<td>Falling Time at No Load</td>
<td>250mSec</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>General</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>AC Line Input Voltage Ranges</td>
<td>115/220 VAC ± 10% (47Hz ~ 63Hz)</td>
</tr>
<tr>
<td>Temperature Ratings</td>
<td>Operating (0°C ~ 40°C), Storage (-10°C ~ 70°C)</td>
</tr>
<tr>
<td>Common-Mode Voltage</td>
<td>±240Vdc</td>
</tr>
<tr>
<td>Dimensions (W×H×D)mm</td>
<td>(216×135×432)</td>
</tr>
<tr>
<td>Weight</td>
<td>6.5 kg</td>
</tr>
</tbody>
</table>

PSU505 Features:

- LCD display, triple independent output and display on LCD
- CH3 auto-ranging output
- Low Ripple, Low Noise
- Number and function key
- Store and recall settings (100)
- Timer (1 sec ~ 100 hours)
- Precise voltage and current measurement
- OVP, OCP and key lock
- Serial and parallel mode
- Dual Tracking Mode
- Average measurement time 50msec
- Standard RS232, USB interface
3. Notices before Using

3.1 Confirm Attachment before Using

Please follows the below items to protect your rights as you receive this instrument.
1. If there is ruin or scratch bad condition on product overlook.
2. The standard attachment as table 7-1, please confirm if there is any missing.
※ If above conditions, please inform us for prompt service.

3.2 The Description of Using

The tester is an accurate instrument. Please read through this manual to prevent improper operation and arbitrary using from causing this instrument damaged. Please calibrate once a year for keeping accuracy.

3.3 Ambient Environment

1. Do not use the tester in a dusty, vibrating, sunlight and corrosive gas. Please use this instrument under the ambient temperature is 0~40°C and the relative humidity is 20%~80%. If the temperature is over 40°C, please don’t use temporary until the temperature is down to normal. Please check to avoid the unit damage which result from over temperature.
2. The tester is equipped with a cooling fan on the rear panel to keep the internal temperature down, so adequate ventilation should be ensured. The tester should be located at least 10cm from any object or wall behind it. Do not block the ventilation holes to keep the tester in good precision.
3. The tester has been carefully designed to prevent the noise from the AC power source. However, it should be used in the noise-free environment as low as possible. If noise is inevitable, please install a power filter.

3.4 Storage

The tester should be stored within the temperature range -20°C ~ 70°C, the relative humidity 80% RH. If the unit is not to be in use for a long time, please store it in the original or similar package and keep it from direct sunlight and humidity.
3.5 Power-Line Voltage

The tester is an instrument which uses AC power 115V/220V 50Hz/60Hz. Before plugging in the power cord, make sure the power switch is in the off position and the voltage of the rear panel is the same as the required voltage.

3.6 Fuse

There is one fuse installed in the rear panel. When replacing the fuse, please notice the following:

1. Please turn off the power and disconnect the AC power cord and all the other connections to the power supply.
2. The checking of fuse can't sure with the eyes, the testing value under 15Ω is normal.
3. When replacing the fuse, the cap jut out the rear panel on fuse stand using flat type screwdriver or pressing softly by hand.

<table>
<thead>
<tr>
<th>Mark</th>
<th>Center Voltage</th>
<th>Range</th>
<th>Fuse</th>
</tr>
</thead>
<tbody>
<tr>
<td>115</td>
<td>115V</td>
<td>100V~125V</td>
<td>Slow</td>
</tr>
<tr>
<td>220</td>
<td>220V</td>
<td>200V~250V</td>
<td>Slow</td>
</tr>
</tbody>
</table>

**Warning**:
For continues protection against fire hazard, replace only with the same type and rating of fuse as specified.

3.7 Warming Up

This tester activates at power on. However, in order to meet the accuracy in the specification, please warm it up for 30 minutes or longer.

3.8 End Test

When tests are done and the tester is not in use or need to leave for a while during usage, make sure to turn off the power switch.
4. Panel Description

4.1 PSU505 Panel Description

4.1.1 Front Panel Description

(1) Display:
Display is a 20x4 yellow green backlight LCD

(2) Rotary(ENTER):
Rotary can adjust voltage and current. Users can press it as ENTER function.

(3) M:
Press M key to memory configuration display. Users can select which setting to store and recall by pressing STORE and RECALL key.

(4) CH:
Selecting CH1/CH2/CH3
(5) **ON/OFF:**
Switching power output on or off of the instrument

(6) **Number Key:**
Input number by number key. To set the voltage or current, press the "V" or "A" key after the number input.

(7) **► (STORE):**
When the output is on, press the key to move the cursor to select digit for adjustment. Users can adjust the digit by rotary. In memory function, store into memory by pressing this key.

(8) **◄ (RECALL):**
When the output is on, press the key to move the cursor to select digit for adjustment. Users can adjust the digit by rotary. In memory function, recall from the memory by pressing this key.

(9) **DISP:**
Press this key to select the display to show the voltage/current or power/resistance readout.

(10) **V (Voltage):**
Press this key to set voltage after number input.

(11) **A (Current):**
Press this key to set current after number input.

(12) **Config:**
Press this key to enter the configuration setting. There are 16 items to be set in this mode.

1. **Timer:** The initial value is OFF. Press the rotary to enter timer configuration.

![Configuration Table]

- **Configuration:** 1
- **Timer:** OFF
- **Tracking:** OFF
- **OVP setting**
Panel Description

A. Using rotary or ▲▼ to move the cursor onto the digit and input the number. Timer: 00:00:00 (HH:MM:SS)

B. Switching CH1/CH2/CH3 by press CH key. Then press rotary to switch ON/OFF

C. Start Timer when press ON/OFF key

D. Press rotary + CLEAR to pause the timer. Restart by repeating the same step

2. TRACKING: The initial value is OFF, switch to ON by pressing the rotary. The CH2 will have the same voltage and current setting as the CH1.

3. OVP setting: Over voltage protection. Press the rotary to enter OVP Configuration. Press "CH" to select CH1/CH2/CH3. Users can press ON/OFF to enable or disable OVP and input the voltage value via the number keys. Please remember to press rotary to save the settings.
4. OCP setting: Over current protection. Press rotary to enter OCP Configuration. Press "CH" to select CH1/CH2/CH3. Users can press ON/OFF to enable or disable OCP and input current value via the number keys. Please remember to press rotary to save the settings.

5. Baud rate: Transmission speed. Users can select baud rate for 1200, 2400, 4800, 9600, 19200, 38400 by rotary.

6. Interface: Transmission interface. Users can select RS232, USB, GPIB (only PPS 3210 Optional), LAN Port (only PPS 3210
Optional) by using rotary.

7. DHCP: This parameter is for LAN port setting. The default value is Off mode. You may change the mode by press the rotary. At DHCP "On" mode, a dynamic IP address can be obtained from the server.

8. IP***.***.***.***: Setting of IP address. You may key-in the right IP address for PPS 3210.

9. BEEP: Buzzer. Press rotary to switch the buzzer on or off.
10. Key lock: Key lock function. The initial value is OFF. Press rotary to turn on key lock function. All keys are disabled except Rotary + CLEAR can disable the key lock.

<table>
<thead>
<tr>
<th>Configuration: 10</th>
<th>TRK LOCK RMT P/S</th>
</tr>
</thead>
<tbody>
<tr>
<td>CH1</td>
<td>10.Key lock:OFF</td>
</tr>
<tr>
<td>CH2</td>
<td>11.Parallel out:OFF</td>
</tr>
<tr>
<td>CH3</td>
<td>12.Serial out:OFF</td>
</tr>
</tbody>
</table>

11. Parallel out: Parallel output. The initial value is OFF. Press rotary to turn on parallel output. The total output current is 6A because the CH1 and CH2 are connected parallelized.

12. Serial out: Serial output. The initial value is OFF. Press rotary to turn on serial output. The total output voltage is 60V because the CH1 and CH2 are connected serialized.

13. Address: GPIB address setting. Acceptable range is 00~31. Users can input the number and press rotary to save the settings.
14. Hot Key: Express function key. The initial value is OFF. Press rotary to turn on hot key. The users can recall the correspondent settings from the memory via input 0~9.

15. Initial Mode: Memorize the settings before the instrument shutdown. The initial value is OFF. Press rotary to turn on the function. When the function is enable, all setting will be saved before the instrument shutdown and recalled after the instrument power on.

16. Out Mode: Output mode. The initial value is single. Press rotary to switch to multi mode. In the multi mode, CH1/CH2/CH3 output on or off will synchronize by press the ON/OFF key.
**Panel Description**

<table>
<thead>
<tr>
<th>TIMER</th>
<th>TRK</th>
<th>LOCK</th>
<th>RMT</th>
<th>P/S</th>
</tr>
</thead>
<tbody>
<tr>
<td>CH1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CH2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CH3</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Configuration: 16**

- 16. Out Mode: Multi
- 17. Factory Preset
- 18. Back Main Menu

17. Factory Preset: Reset to default settings

<table>
<thead>
<tr>
<th>TIMER</th>
<th>TRK</th>
<th>LOCK</th>
<th>RMT</th>
<th>P/S</th>
</tr>
</thead>
<tbody>
<tr>
<td>CH1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CH2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CH3</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Configuration: 17**

- 16. Out Mode: Multi
- 17. Factory Preset
- 18. Back Main Menu

18. Back Main Menu: Quit configuration and save the settings

<table>
<thead>
<tr>
<th>TIMER</th>
<th>TRK</th>
<th>LOCK</th>
<th>RMT</th>
<th>P/S</th>
</tr>
</thead>
<tbody>
<tr>
<td>CH1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CH2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CH3</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Configuration: 18**

- 16. Out Mode: Multi
- 17. Factory Preset
- 18. Back Main Menu

PS: Setting will be saved, after the last item (16. Back Main Menu) is entered.

(13) . (LCL):
Use as a decimal point. Or, users can press the key to reset to LOCAL mode when in REMOTE connection.

(14) CLEAR(ESC):
Clear the number input. Or, back to the previous display.

(15) Power Switch(POWER ON/OFF)
Power switch. ■ is OFF, □ is ON. Please read Notices before Using before power on.

(16) CH1/CH2/CH3 Power Output:
Please recognize the mark on front panel and notice the positive and
negative pole.

(17) GND:
Connected to the ground. Please note that the power core has the third pin, or it will not work.

4.1.2 Rear Panel Description

(18) AC Power Input:
The plug connected to the AC source. It uses for 115V/220V.

(19) Fuse:
The fuse used for power source. When the switch set to 115V, using 5A slow fuse; set to 220V, using 2.5A slow fuse.

(20) Remote Sense/Local Sense dip switch: (only PPS 3210)
Panel Description

When the switch set to ON, it becomes to local sense mode, which means positive pole connect to +Sense, negative pole connect to -Sense. When the switch set to OFF, it becomes to remote sense mode. It has voltage compensation when it collaborate with ±Sense.

(21) CH1 ±S / CH2 ± S: (only PPS 3210)
When the switch set to OFF, it becomes to local sense mode. It has voltage compensation when it collaborates with ±Sense. CH1 +Sense and positive pole connect to DUT positive pole. CH1 -Sense and negative pole connect to DUT negative pole.

(22) RS232 Interface
(23) USB Interface
(24) 115V/220V Power switch (At the bottom of the instrument near the front panel)
(25) Cooling Fan:
Depends on the current of the load, it will adjust the rotation speed of the fan. It is a fuzzy fan.

(26) Optional Interface: (only PPS 3210)
There are GPIB, LAN, I/O port.
5. Operation Setting

5.1 Voltage Setting

Press "CH" to select channel, there are CH1/CH2/CH3 to choose. (Please follow the * sign in the left side of the LCD) Use the number key to input the voltage. And, press "V" to finish the setting. The voltage will be set immediately.

<table>
<thead>
<tr>
<th>TIMER</th>
<th>TRK</th>
<th>LOCK</th>
<th>RMT</th>
<th>P/S</th>
</tr>
</thead>
<tbody>
<tr>
<td>CH1</td>
<td>OFF</td>
<td>*30.00V</td>
<td>3.000A</td>
<td></td>
</tr>
<tr>
<td>CH2</td>
<td>OFF</td>
<td>10.01V</td>
<td>3.000A</td>
<td></td>
</tr>
<tr>
<td>CH3</td>
<td>OFF</td>
<td>5.00V</td>
<td>3.000A</td>
<td></td>
</tr>
</tbody>
</table>

5.2 Current Setting

Press "CH" to select Channel, there are CH1/CH2/CH3 to choose. (Please follow the * sign in the left side of the LCD) Use the number key to input the current. And, press "A" to finish the setting. The current will be set immediately.

<table>
<thead>
<tr>
<th>TIMER</th>
<th>TRK</th>
<th>LOCK</th>
<th>RMT</th>
<th>P/S</th>
</tr>
</thead>
<tbody>
<tr>
<td>CH1</td>
<td>OFF</td>
<td>*30.00V</td>
<td>3.000A</td>
<td></td>
</tr>
<tr>
<td>CH2</td>
<td>OFF</td>
<td>10.01V</td>
<td>3.000A</td>
<td></td>
</tr>
<tr>
<td>CH3</td>
<td>OFF</td>
<td>5.00V</td>
<td>3.000A</td>
<td></td>
</tr>
</tbody>
</table>

5.3 OVP

Press "Config" to enter Configuration display, adjust rotary or ▼ to move the cursor to OVP setting. Press rotary to enter OVP setting display. Users can press "CH" to select channel of setting. (Please follow the * sign in the left side of the LCD) Press the ON/OFF key to choose enable or disable. Use the number key to input the voltage. Please remember to press rotary to finish the setting.
5.4 OCP

Press "Config" to enter Configuration display, adjust rotary or ◀▶ to move the cursor to OCP setting. Press rotary to enter OCP setting display. Users can press "CH" to select channel of setting. (Please follow the ➔ sign in the left side of the LCD) Press the ON/OFF key to choose enable or disable. Use the number key to input the current. Please remember to press rotary to finish the setting.

5.5 Rotary Controller (output on)

When output is on, users can adjust the voltage by rotary. Press ◀ or ▶ key to adjust the cursor position. Adjust the voltage by rotary. If users want to change channel, just press "CH". This provides a convenient testing tool when users are observing the variation of the voltage.
6. RS-232/USB Package Mode

Communication protocol includes OMEGA and SCPI instructions Protocol.

6.1 Preface

SCPI interface provides users to operate the power supply by connecting to PC via IEEE-488.2 or RS-232 interface. It also allows users to control and monitor the instrument remotely. SCPI IEEE-488 supports multiple power supply to control. (Max. 32 set)

6.2 Definition of Parameters

<table>
<thead>
<tr>
<th>Type</th>
<th>Valid arguments</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;boolean&gt;</td>
<td>&quot;ON&quot; or 1, &quot;OFF&quot; or 0</td>
</tr>
<tr>
<td>&lt;NR1&gt;</td>
<td>The data format &lt;NR1&gt; is defined in IEEE-488.2 for integers. Zero, positive and negative integer numeric values are valid data.</td>
</tr>
<tr>
<td>&lt;NRf&gt;</td>
<td>The data format &lt;NRf&gt; is defined in IEEE-488.2 for flexible Numeric Representation. Zero, positive and negative floating point numeric values are some examples of valid data.</td>
</tr>
<tr>
<td>&lt;string&gt;</td>
<td>Characters enclosed by single or double quotes</td>
</tr>
<tr>
<td>&lt;NL&gt;</td>
<td>New line, Hex code is 0x0Ah</td>
</tr>
<tr>
<td>&lt;Rtn&gt;</td>
<td>Return, Hex code is 0x0Dh</td>
</tr>
<tr>
<td>&lt;END&gt;</td>
<td>End or identify</td>
</tr>
</tbody>
</table>

6.3 Error/Event Queue

The SCPI maintains an Error/Event Queue as defined by SCPI. The queue holds up to 10 errors and events. It is queried by using the system : error ? command which reads in a First In/First Out (FIFO) manner. The read operation removes the entry from the queue. The *CLS command will clear all entries from the queue.
<table>
<thead>
<tr>
<th>Error</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>-000</td>
<td>No error</td>
</tr>
<tr>
<td>-002</td>
<td>GET not allowed</td>
</tr>
<tr>
<td>-003</td>
<td>Parameter not allowed</td>
</tr>
<tr>
<td>-004</td>
<td>Missing parameter</td>
</tr>
<tr>
<td>-005</td>
<td>Command Header Error</td>
</tr>
<tr>
<td>-006</td>
<td>Header Separator Error</td>
</tr>
<tr>
<td>-007</td>
<td>Program mnemonic too long</td>
</tr>
<tr>
<td>-008</td>
<td>Undefined header</td>
</tr>
<tr>
<td>-009</td>
<td>Header suffix out of range</td>
</tr>
<tr>
<td>-010</td>
<td>Numeric data error</td>
</tr>
<tr>
<td>-011</td>
<td>Invalid character in number</td>
</tr>
<tr>
<td>-012</td>
<td>Exponent too large</td>
</tr>
<tr>
<td>-013</td>
<td>Too many digits</td>
</tr>
<tr>
<td>-014</td>
<td>Numeric data not allowed</td>
</tr>
<tr>
<td>-015</td>
<td>Suffix error</td>
</tr>
<tr>
<td>-016</td>
<td>Invalid suffix</td>
</tr>
<tr>
<td>-017</td>
<td>Suffix too long</td>
</tr>
<tr>
<td>-018</td>
<td>Suffix not allowed</td>
</tr>
<tr>
<td>-019</td>
<td>Character data error</td>
</tr>
<tr>
<td>-020</td>
<td>Invalid character data</td>
</tr>
<tr>
<td>-021</td>
<td>Character data too long</td>
</tr>
<tr>
<td>-022</td>
<td>Character data not allowed</td>
</tr>
<tr>
<td>-023</td>
<td>String data error</td>
</tr>
<tr>
<td>-024</td>
<td>Invalid string data</td>
</tr>
<tr>
<td>-025</td>
<td>String data not allowed</td>
</tr>
<tr>
<td>-026</td>
<td>Block data error</td>
</tr>
<tr>
<td>-027</td>
<td>Invalid block data</td>
</tr>
<tr>
<td>-028</td>
<td>Block data not allowed</td>
</tr>
<tr>
<td>-029</td>
<td>Expression error</td>
</tr>
<tr>
<td>-030</td>
<td>Invalid expression</td>
</tr>
<tr>
<td>-031</td>
<td>Expression data not allowed</td>
</tr>
<tr>
<td>-032</td>
<td>Macro error</td>
</tr>
<tr>
<td>-033</td>
<td>Invalid outside macro definition</td>
</tr>
<tr>
<td>-034</td>
<td>Invalid inside macro definition</td>
</tr>
<tr>
<td>-035</td>
<td>Macro parameter error</td>
</tr>
<tr>
<td>-036</td>
<td>Execution error</td>
</tr>
<tr>
<td>Code</td>
<td>Description</td>
</tr>
<tr>
<td>------</td>
<td>----------------------------------</td>
</tr>
<tr>
<td>-037</td>
<td>Invalid while in local</td>
</tr>
<tr>
<td>-038</td>
<td>Settings lost due to rtl</td>
</tr>
<tr>
<td>-039</td>
<td>Trigger error</td>
</tr>
<tr>
<td>-040</td>
<td>Trigger ignored</td>
</tr>
<tr>
<td>-041</td>
<td>Arm ignored</td>
</tr>
<tr>
<td>-042</td>
<td>Init ignored</td>
</tr>
<tr>
<td>-043</td>
<td>Trigger deadlock</td>
</tr>
<tr>
<td>-044</td>
<td>Arm deadlock</td>
</tr>
<tr>
<td>-045</td>
<td>Parameter error</td>
</tr>
<tr>
<td>-046</td>
<td>Settings conflict</td>
</tr>
<tr>
<td>-047</td>
<td>Data out of range</td>
</tr>
<tr>
<td>-048</td>
<td>Too much data</td>
</tr>
<tr>
<td>-049</td>
<td>Illegal parameter value</td>
</tr>
<tr>
<td>-050</td>
<td>Data corrupt or stale</td>
</tr>
<tr>
<td>-051</td>
<td>Data questionable</td>
</tr>
<tr>
<td>-052</td>
<td>Hardware error</td>
</tr>
<tr>
<td>-053</td>
<td>Hardware missing</td>
</tr>
<tr>
<td>-054</td>
<td>Mass storage error</td>
</tr>
<tr>
<td>-055</td>
<td>Missing mass storage</td>
</tr>
<tr>
<td>-056</td>
<td>Timer currently running</td>
</tr>
<tr>
<td>-057</td>
<td>Timer error</td>
</tr>
<tr>
<td>-058</td>
<td>Timer syntax error</td>
</tr>
<tr>
<td>-059</td>
<td>Cannot create timer</td>
</tr>
<tr>
<td>-060</td>
<td>Password error</td>
</tr>
<tr>
<td>-082</td>
<td>Missing media</td>
</tr>
<tr>
<td>-083</td>
<td>Corrupt media</td>
</tr>
<tr>
<td>-084</td>
<td>Media full</td>
</tr>
<tr>
<td>-085</td>
<td>Directory full</td>
</tr>
<tr>
<td>-086</td>
<td>File name not found</td>
</tr>
<tr>
<td>-087</td>
<td>File name error</td>
</tr>
<tr>
<td>-088</td>
<td>Media protected</td>
</tr>
<tr>
<td>-089</td>
<td>Expression Error</td>
</tr>
<tr>
<td>-090</td>
<td>Math error in expression</td>
</tr>
<tr>
<td>-091</td>
<td>Macro error</td>
</tr>
<tr>
<td>-092</td>
<td>Macro syntax error</td>
</tr>
<tr>
<td>-093</td>
<td>Macro execution error</td>
</tr>
<tr>
<td>-094</td>
<td>Illegal macro label</td>
</tr>
<tr>
<td>-095</td>
<td>Macro parameter error</td>
</tr>
</tbody>
</table>
-096 Macro definition too long
-097 Macro recursion error
-098 Macro redefinition not allowed
-099 Macro header not found
-100 Program error
-101 Cannot create program
-102 Illegal program name
-103 Illegal variable name
-104 Program currently running
-105 Program syntax error
-106 Program runtime error
-107 Device-specific error
-108 Syntax error
-109 Data type error
-110 Input voltage overwrite error
-111 Input current overwrite error

6.4 Compatible OMEGA PSU505 Protocol

<table>
<thead>
<tr>
<th>Command</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ADDRess</td>
<td>set the address of the machine</td>
</tr>
<tr>
<td>BEEP</td>
<td>set beep on(1) or off(0)</td>
</tr>
<tr>
<td>CALi</td>
<td>calibration procedure</td>
</tr>
<tr>
<td>CURR[1]</td>
<td>channel 1 current setting</td>
</tr>
<tr>
<td>CURR[1]?</td>
<td>return channel 1 current setting</td>
</tr>
<tr>
<td>CURR2</td>
<td>channel 2 current setting</td>
</tr>
<tr>
<td>CURR2?</td>
<td>return channel 2 current setting</td>
</tr>
<tr>
<td>CURR3</td>
<td>channel 3 current setting</td>
</tr>
<tr>
<td>CURR3?</td>
<td>return channel 3 current setting</td>
</tr>
<tr>
<td>CURRENT[1]</td>
<td>channel 1 current setting</td>
</tr>
<tr>
<td>CURRENT[1]</td>
<td>return channel 1 current setting</td>
</tr>
<tr>
<td>CURRENT2</td>
<td>channel 2 current setting</td>
</tr>
<tr>
<td>CURRENT2?</td>
<td>return channel 2 current setting</td>
</tr>
<tr>
<td>CURRENT3</td>
<td>channel 3 current setting</td>
</tr>
<tr>
<td>CURRENT3?</td>
<td>return channel 3 current setting</td>
</tr>
<tr>
<td>HOTKey</td>
<td>set hot key function, on(1) or off(0)</td>
</tr>
<tr>
<td>IOUT[1][?]</td>
<td>channel 1 current readback</td>
</tr>
</tbody>
</table>
IOUT2[?]
channel 2 current readback
IOUT3[?]
channel 3 current readback
ISET[1]
channel 1 current setting
ISET[1][?]
return channel 1 current setting
ISET2
channel 2 current setting
ISET2?
return channel 2 current setting
ISET3
channel 3 current setting
ISET3?
return channel 3 current setting
LOCK
set rotary and keypad lock on(1) or off(0)
MODEL
display model NO.
OCP[1]
set channel 1 current protect to off(0) or on(1)
OCP2
set channel 2 current protect to off(0) or on(1)
OCP3
set channel 3 current protect to off(0) or on(1)
OISET[1]
set channel 1 overcurrent protect
OISET[1][?]
return channel 1 overcurrent value
OISET2
set channel 2 overcurrent protect
OISET2?
return channel 2 overcurrent value
OISET3
set channel 3 overcurrent protect
OISET3?
return channel 3 overcurrent value
OUT[1]
set channel 1 output on(1) or off(0)
OUT2
set channel 2 output on(1) or off(0)
OUT3
set channel 3 output on(1) or off(0)
OVP[1]
set channel 1 voltage protect to off(0) or on(1)
OVP2
set channel 2 voltage protect to off(0) or on(1)
OVP3
set channel 3 voltage protect to off(0) or on(1)
OVSET[1]
set channel 1 overvoltage protect
OVSET[1][?]
return channel 1 overvoltage value
OVSET2
set channel 2 overvoltage protect
OVSET2?
return channel 2 overvoltage value
OVSET3
set channel 3 overvoltage protect
OVSET3?
return channel 3 overvoltage value
PARA llel
set parallel output on(1) or off(0)
SERRal
set serial output on(1) or off(0)
STATUS?
current NLPS working status
TRACK
set CH2=CH1
VERSION?
display version NO.
VOLT[1]
channel 1 voltage setting
VOLT[1][?]
return channel 1 voltage setting
VOLT2    channel 2 voltage setting
VOLT2?   return channel 2 voltage setting
VOLT3    channel 3 voltage setting
VOLT3?   return channel 3 voltage setting
VOLTAGE[1] channel 1 voltage setting
VOLTAGE[1]? return channel 1 voltage setting
VOLTAGE2 channel 2 voltage setting
VOLTAGE2? return channel 2 voltage setting
VOLTAGE3 channel 3 voltage setting
VOLTAGE3? return channel 3 voltage setting
VOUT[1][?] channel 1 voltage readback
VOUT2[?] channel 2 voltage readback
VOUT3[?] channel 3 voltage readback
VSET[1] channel 1 voltage setting
VSET[1]? return channel 1 voltage setting
VSET2    channel 2 voltage setting
VSET2?   return channel 2 voltage setting
VSET3    channel 3 voltage setting
VSET3?   return channel 3 voltage setting

**example:**

**Q1. How to set machine address (same GPIB ID)?**

ADDR 10 <NL>        ==>  address is 10
ADDRESS 5 <NL>      ==>  address is 5
ADDR 70 <NL>         ==>  address is out of maximum value, refer to error code

**Q2. How to set beep?**

BEEP 1 <NL>         ==>  triger beep to on
BEEP off <NL>       ==>  triger beep to off

**Q3. How to enter calibration procedure?**

Step 1: CONT:PWD:13579 <NL>    ==>  enable password to verify
Step 2: CALI 1 <NL>            ==>  entry to calibration procedure for channel 1
Step 3: CALI 7.5010203 <NL>    ==>  input low scale voltage parameter
Step 4: CALI 23.123456 <NL>    ==>  input high scale voltage parameter
Step 5: CALI 0.7510203 <NL>  ===> input low scale current parameter
Step 6: CALI 2.2567890 <NL>  ===> input high scale current parameter

Q4. How to exit calibration procedure?
CALI OFF <NL>

Q5. How to set voltage?
VSET 10 <NL>  ===> set channel 1 voltage to 10V
VSET2 5.123 <NL>  ===> set channel 2 voltage to 5.123V
VOLT3 3.3V <NL>  ===> set channel 3 voltage to 3.3V
VOLTAGE1 35 <NL>  ===> set channel 1 voltage to 35V is fail, because out of range

Q6. How to read the voltage setting value?
VSET? <NL>  ===> return channel 1 voltage setting
VSET2? <NL>  ===> return channel 2 voltage setting

Q7. How to set current?
ISET : 1.1 <NL>  ===> set channel 1 current to 1.1A
ISET2 : 2.1A <NL>  ===> set channel 2 current to 2.1A
CURR3 4.3022 <NL>  ===> set channel 3 current to 4.3022A
CURRENT1 0.250 <NL>  ===> set channel 1 current to 250mA

Q8. How to read the current setting value?
ISET? <NL>  ===> return channel 1 current setting
ISET2? <NL>  ===> return channel 2 current setting

Q9. How to read the voltage output value?
VOLT3? <NL>  ===> return channel 3 voltage output
VOLTAGE1? <NL>  ===> return channel 1 voltage output
VOUT2? ;  ===> return channel 2 voltage output
VOUT ;

Q10. How to read the current output value?
CURR3? <NL>  ===> return channel 3 current output
CURRENT1? <NL>  ===> return channel 1 current output
IOUT2? ;  ===> return channel 2 current output
Q11. How to set the tracking mode?

TRACK 1 <NL>  ==>  CH2 = CH1
TRACK : ON;  ==>  CH2 = CH1
TRACK 0 <NL>  ==>  tracking off
TRACK OFF <NL>  ==>  tracking off

Q12. How to set the parallel output mode?

PARA 1;  ==>  parallel on
PARALLEL ON <NL>  ==>  parallel on
PARA 0 <NL>  ==>  parallel on
PARALLEL OFF <NL>  ==>  parallel off

Q13. How to set the serial output mode?

SER : 1 <NL>  ==>  serial on
SERIAL : ON <NL>  ==>  serial on
SER 0 <NL>  ==>  serial off
SERIAL OFF;  ==>  serial off

Q14. How to read back calibration parameter?

CAL? ;  ==>  return the calibration data
CALI? <NL>  ==>  return the calibration data

Q15. How to lock keypad and knob?

LOCK : 1;  ==>  lock the keypad and knob
LOCK ON <NL>  ==>  lock the keypad and knob

Q16. How to read back address number?

ADDR ? <NL>
ADDRESS ? ;
6.5 SCPI Compatible Information

The SCPI conforms to all specifications for devices as defined in IEEE-488.2 and complies with SCPI command syntax version 1995.0. Confirmed Commands are those commands which are approved commands in the SCPI 1995 Specification, Volume 2: Command Reference.

6.5.1 SCPI Frequent Command

<table>
<thead>
<tr>
<th>Command</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>*CLS</td>
<td>Clear status (include error code)</td>
</tr>
<tr>
<td>*CAL?</td>
<td>As same as CALi? command, return calibration parameter</td>
</tr>
<tr>
<td>*IDN?</td>
<td>Response:&lt;Manufacturer&gt;, &lt;model&gt;, &lt;serial number&gt;, &lt;firmware type, &amp; version&gt;</td>
</tr>
<tr>
<td>*RCL</td>
<td>Recalls settings from memory. Memory numbers from 0 to 99 are valid.</td>
</tr>
<tr>
<td>*RST</td>
<td>Resets the power supply to its power on state.</td>
</tr>
<tr>
<td>*SAV</td>
<td>1. Saves defined parameters</td>
</tr>
<tr>
<td></td>
<td>2. Saves current settings to memory. Memory numbers from 0 to 99 are valid.</td>
</tr>
<tr>
<td>*WAI</td>
<td>Sets the device to wait until all previous commands and queries are complete before executing commands following the *WAI command.</td>
</tr>
</tbody>
</table>

example:

Q17. How to save VI to memory?

*SAV : 15;  
SAV 0 <NL>  

>>> Saves current settings to memory number 15

>>> Saves current settings to memory number 0

Q18. How to recall memory VI variable to output?

*RCL : 3 <NL>  
RCL 120;

>>> recall setting from memory location 3

>>> the data value is invalid

Q19. How to save parameter?
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SAV;
*SAV <NL>

Q20. How to do the software reset procedure?

*RST;
RST <NL>

Q21. How to return the device identification?

*IDN?;
IDN? <NL>

6.5.2 SCPI Command for Subsystem

OUT[n]
  [:STATE] <bool> <NL>
  ALL
  TRACK <NL>
  PARallel <NL>
  SERial <NL>
  NORMAL <NL>

ON/OFF subsystem
enable/disable output action
multi-channel to select instruct
enable track mode
enable parallel mode
enable serial mode
resume normal mode

STATus
  [?]<NL>
  ERROR[?]? <NL>
  CCP[?]? <NL>
  CV[?]? <NL>
  MONV[?]? <NL>
  MONI[?]? <NL>

status subsystem.
read back machine status
read back machine error code
read back iset DAC value
read back Vset DAC value
read back Vout DAC value
read back Iout DAC value

DISPlay
  [:KEYpad]
  :DOT
  0
  1
  2
  3
  4
  5
  6

display subsystem
simulate keypad action
simulate key '9' ASCII code is 0x2e
simulate key '0' ASCII code is 0x30
simulate key '1' ASCII code is 0x31
simulate key '2' ASCII code is 0x32
simulate key '3' ASCII code is 0x33
simulate key '4' ASCII code is 0x34
simulate key '5' ASCII code is 0x35
simulate key '6' ASCII code is 0x36
::7 simulate key '2' ASCII code is 0x37
::8 simulate key '2' ASCII code is 0x38
::9 simulate key '2' ASCII code is 0x39
::VOLT simulate key 'V'
::V simulate key 'V'
::AMP simulate key 'A'
::A simulate key 'A'
::OUTput simulate ON/OFF key action
::Channel simulate CH select
::LEFT cursor shift left
::RIGHT cursor shift right
::MEMory into memory item
::CLEAR simulate CLEAR key
::ESC simulate CLEAR key
::CLR simulate CLEAR key
::ENTer simulate enter key
::MULTI simulate double key
::1 into calibration mode for channel 1
::2 into calibration mode for channel 2
::3 into calibration mode for channel 3
::CLEAR unlock key or pause timer action
::ESC unlock key or pause timer action
::CLR unlock key or pause timer action
::DISPLAY switch V, A, W, OHM select
::CONFIG into config item
::KNOB simulate knob action
::LEFT simulate knob turns left
::RIGHT simulate knob turns right
::PROGProgram
::ON/OFF
::: [n] <NL>
::: <NL>
:::VSET[n]
::: [level] <NL>
:::ISET[n]
::: [level] <NL>
:::TIMER program subsystem
::enables/disables program action
::select [n] page program number, n range from 0 ~ 99
::volt setting for channel n
::voltage level
::current setting for channel n
::current level
::setting timer for standard
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:hh:mm:ss<NL>
:FASTimer
[:level]<NL>

:NEXT
:END<NL>
:NEXT<NL>
:JUMP:PAGE<NL>
:? <NL>
:TIMER? <NL>
:SAVE<NL>

TIMER
:ON/OFF<NL>
:hh:mm:ss <NL>
:TIMER? <NL>
:PAUSE <NL>
:? <NL>

MEMORY
[:n]<NL>

:VSET[n]
[:level]<NL>
:SET[n]
[:level]<NL>
:READ
:ROM<NL>
[:n]<NL>
:? 
:CALibration
:? <NL>
:SAVE
:V1
[:level]<NL>
:V2
[:level]<NL>
:I1

unit is second
setting timer for fast action
unit is mini second, range from 4~65535ms
next step
end program to running.
next page
jump to page n; n from 0 ~ 99
Respone program n parameter
Respone current timer parameter
save programmable 0 ~ programmable 99 value
timer subsystem
enables/disables timer action
setting timer
Respone current timer parameter
Respone timer parameter
memory subsystem
select [n] page memory number, n range from 0 ~ 99
evoltage setting for channel n
evoltage level
current setting for channel n
current level
read eprom data
read ROM data
read eprom page number, from 0 ~ 15
read back memory parameter
read back calibration parameter
save calibration parameter
voltage low level parameter
voltage high level parameter
current low level parameter
current high level parameter

read back voltage low level DAC parameter

read back voltage high level DAC parameter

read back current low level DAC parameter

read back current high level DAC parameter

read back serial number

the string must less 15 charster

return password number

return the can programmable CHIP type

restore special parameter

control subsystem

enables/disables OEM type

enables/disables ISP flag

enables/disables fast output mode

enables/disables hotkey mode

enables/disables keypad and rotary lock

enables/disables monitore to send "status" & VI message
RS-232/USB Package Mode

.:BAUD
   [:level] <NL>
.:COMMunicaton
   [:MODE] <NL>
   .? <NL>
.:DHCP
   [:state] <bool> <NL>
   :xx.xx.xx.xx <NL>
   .? <NL>

.:IP
   :xx.xx.xx.xx <NL>
   .? <NL>

.:MAC
   :xxxxxx <NL>
   .? <NL>

.:Channel
   [:level] <NL>
   .MINUSREQ
   [:state] <bool> <NL>

.:ADDRESS
   [:level] <NL>
   .? <NL>

.:DEFault <NL>

.:DAC
   :VSET[n]
   [:level] <NL>
   :ISET[n]
   [:level] <NL>

.:PWD

.:PASSword

select baud rate:
38400,19200,9600,4800,2400,1200
communication kind to select
[MODE] is
"USB","RS232","ETHNET","GPIB"
respone MODE data
select DHCP command
enables/disables DHCP mode
setting DHCP address (the value is hexadecimal)
respone DHCP data address (the value is hexadecimal)
select IP command
setting IP address (the value is hexadecimal)
respone IP data address (the value is hexadecimal)

setting MAC address (the value is hexadecimal)
respone MAC data address (the value is hexadecimal)
select channel
channel number
enables/disables minus sign to display, default is disable

setting address
address number
return address number
resume factory preset
direct DAC to output for channel n
voltage DAC count
direct DAC to output for channel n
current DAC count
password to test and verify
MEASure
[:n]
:CURRent[n]? <NL>
:VOLTage[n]? <NL>
:POWer[n]? <NL>
:RESistance[n]? <NL>
[SOURce]
[:n]
:CURRent[n]

[:level] <NL>
:PROTection
[:level] <NL>

:TRIGger
[:state] <bool> <NL>

:VOLTage[n]

[:level] <NL>
:PROTection
[:level] <NL>

:TRIGger
[:state] <bool> <NL>

example:

Q22. How to set tracking mode?

OUT : TRACK <NL>

Q23. How to set serial output mode?

OUT : SER <NL>
OUT SERIAL ;
Q24. How to set parallel output mode?

OUT : PARA <NL>
OUT PARALLEL ;

Q25. How to resume normal output mode?

OUT : NORM :
OUT NORMAL <NL>

Q26. How to read back machine status?

STATUS? <NL>

Q27. How to read back machine error code?

STAT ERR ;
STATUS ERR? <NL>
STATUS : ERROR <NL>
STAT? : ERROR? ;

Q28. How to simulate keypad?

*RCL : 3 <NL>  => recall setting from memory location 3
RCL 120;   => the data value is invalid
DISPLAY 0 <NL>  => simulate keypad '0'
DISP 5 <NL>  => simulate keypad '5'
DISPLAY VOLT <NL>  => simulate keypad "VOLT"
DISPLAY : V <NL>  => simulate keypad "VOLT"
DISP A <NL>  => simulate keypad "AMP"
DISPLAY OUTPUT <NL>  => simulate keypad "ON/OFF"
DISP CHANNEL <NL>  => simulate keypad "CH"
DISPLAY : LEFT <NL>  => simulate keypad "<|
DISP RIGHT <NL>  => simulate keypad "|>
DISPLAY : MEMORY <NL>  => simulate keypad 'M'
DISPLAY MEM <NL>  => simulate keypad 'M'
DISP CLEAR <NL>  => simulate keypad "CLEAR"

Q29. How to simulate double key?

DISPLAY MULTI 1 <NL>  => simulate keypad "ENTER" & "1"
DISPLAY : MULTI : 2 <NL>  => simulate keypad "ENTER" & "2"
DISP : MULTI ESC  ;  => simulate keypad "ENTER" &
"CLEAR"

Q30. How to simulate rotary?

DISPLAY : KNOB LEFT <NL>  ==>  simulate rotary left scroll
DISP    : KNOB : RIGHT <NL>  ==>  simulate rotary right scroll

Q31. How to read voltage setting DAC value?

STATUS : CVP <NL>  ==>  read CVP DAC value
STATUS  CVP? ;  ==>  read CVP DAC value

Q32. How to read current setting DAC value?

STATUS  CCP ;  ==>  read CCP DAC value
STATUS : CCP? <NL>  ==>  read CCP DAC value

Q33. How to read voltage DAC value?

STATUS : MONV ;  ==>  read MONV DAC value
STATUS : MONV? <NL>  ==>  read MONV DAC value

Q34. How to read current DAC value?

STATUS  MONI <NL>  ==>  read MONI DAC value
STATUS : MONI? ;  ==>  read MONI DAC value

Q35. How to setting tri-channel to synchronous output?

OUT ALL 1 <NL>  ==>  tri-channel output is ON
OUT:ALL:OFF ;  ==>  tri-channel output is OFF

Q36. How to setting timer?

TIMER  00:10:00 <NL>  ==>  setting timer 10 minute to stop
TIM :  99:59:59 ;  ==>  setting timer 99 hour 59 minute 59 second to stop

Q37. How to start timer?

TIMER ON ;
TIM :  ON <NL>

Q38. How to close timer?

TIMER OFF <NL>
TIM :  OFF ;
Q39. How to read timer parameter?

```plaintext
TIMER  ?  <NL>
TIM:  ?;
```

Q40. How to setting program?

```plaintext
step 1: PROG : 10 <NL>  ===> select page number is 10, page number from 0 ~ 99.
step 2: PROG:VSET1:16V <NL>  ===> sets channel 1 voltage is 16V.
step 3: PROG:VSET2:25V <NL>  ===> sets channel 2 voltage is 25V.
step 4: PROG:VSET3:3.3V <NL>  ===> sets channel 3 voltage is 3.3V.
step 5: PROG:ISET1:1A <NL>  ===> sets channel 1 current is 1A.
step 6: PROG:ISET2:2A <NL>  ===> sets channel 2 current is 2A.
step 7: PROG:ISET3:3.3A <NL>  ===> sets channel 3 current is 3.3A.
step 8: PROG:TIMER:00:05:00<NL>  ===> sets run-time is 5 minute.
step 9: PROG:NEXT:NEXT <NL>  ===> select next status is next page

... ...
```

Q41. How to save program?

```plaintext
PROGRAM : SAV <NL>
PROG SAVE ;
```

Q42. How to start program?

```plaintext
PROG : 10 ;  ===> select page number is 10, page number from 0 ~ 99.
PROGRAM : ON <NL>  ===> program is on, from page 10 to running
```

Q43. How to close program?

```plaintext
PROG OFF ;
```

Q44. How to read program parameter?

```plaintext
PROGRAM : ? <NL>  ===> Return program parameter
PROGRAM : TIMER? ;  ===> Return timer parameter
```

Q45. How to setting memory?
step 1: MEM:1 <NL>  
step 2: MEM:VSET:1.5 <NL>  
step 3: MEM:ISET:3:5 <NL>  
...  
...  

===> select memory number is 1  
===> sets channel 1 voltage is 1.5 V.  
===> sets channel 3 current is 5 A.

Q46. How to read EPROM data?
MEM : READ : 3 <NL>  
MEMORY  READ 16 <NL>  

===> read eprom page 3 data  
===> the command is valid, page less than 16

Q47. How to read memory parameter?
step 1: MEM:2 <NL>  
step 2: MEM:? <NL>  

===> select memory number is 2  
===> read back memory NO.2 parameter

Q48. How to read calibration parameter?
CONT:PWD:13579 <NL>  
MEM:CALIBRATION:? <NL>  
MEMORY:CAL: <NL>  

===> enable password to verify

Q49. How to setting calibration parameter?
step 1: CONT:PWD:13579 <NL>  
step 2: CONT:CH:1 <NL>  
step 3: MEM:CAL:V1:? ?? <NL>  
step 4: MEM:CAL:CCV1:? ?? <NL>  
step 5: MEM:CAL:V2:? ?? <NL>  
step 6: MEM:CAL:CCV2:? ?? <NL>  
step 7: MEM:CAL:I1:? ?? <NL>  
step 8: MEM:CAL:CCI1:? ?? <NL>  
step 9: MEM:CAL:I2:? ?? <NL>  
step 10: MEM:CAL:CCI2:? ?? <NL>  
step 11: CONT:CH:2 <NL>  
...  

===> enable password to verify 2  
===> select channel 1.  
===> sets voltage low level parameter  
===> sets read back voltage low level DAC parameter  
===> sets voltage high level parameter  
===> sets read back voltage high level DAC parameter  
===> sets current low level parameter  
===> sets read back current low level DAC parameter  
===> sets current high level parameter  
===> sets read back current high level DAC parameter  
===> select channel 2.
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: CONT:CH:3 <NL>          ==> select channel 3.
  :
MEM:CAL:SAVE <NL>        ==> save calibration parameter

Q50. How to read back serial number?
MEM:SERIAL:? <NL>
MEMORY SER ? <NL>

Q51. How to change baud rate?
CONT:BAUD:19200 <NL>    ==> modify baud is 19200
CONTROL BAUD 9600 <NL>  ==> modify baud is 9600
CONTROL BAUD:2400 <NL>  ==> modify baud is 2400
CONT:BAUD 4800 <NL>     ==> modify baud is 4800

Q52. How to select communication port?
CONT:COMM:RS232 <NL>    ==> modify communication port is RS-232
CONT COMMUNICATION:USB <NL> ==> modify communication port is USB
CONTROL:COMM RS232 <NL> ==> modify communication port is RS-232

Q53. How to modify machine ID(address)?
CONTROL:ADDR:23 <NL>    ==> modify id is 23
CONT:ADDRESS 09 <NL>    ==> modify id is 9
CONT ADDR:00 <NL>       ==> modify id is 0

Q54. How to check password?
CONT:PASSWORD:13579 <NL>  ==> enable password to verify
CONTROL:PWD:23 <NL>      ==> check the password

Q55. How to entry or leave monitor mode?
CONT:MONITOR:ON <NL>    ==> entry monitor mode
CONTROL MONI ON <NL>    ==> exit monitor mode

Q56. How to change channel?
CONT:CHANNEL:1 <NL>     ==> change channel number is 1
CONT CH 0 <NL>          ==> change channel number is 1
CONTROL CH:2 <NL>       ==> change channel number is 2
Q57. How to entry or leave lock status?
CONT:LOCK:ON <NL>  ==>  entry lock mode
CONTROL:LOCK OFF <NL>  ==>  exit lock mode

Q58. How to entry or leave lock status?
CONT:HOTK:ON <NL>  ==>  entry hotkey mode
CONTROL HOTKEY OFF <NL>  ==>  exit hotkey mode

Q59. How to display minus symbol?
CONT:MINUSREQ:ON <NL>  ==>  enable minus flag is on
CONTROL MINUSREQ OFF <NL>  ==>  normal LCD display

Q60. How to change DAC to direct output?
CONTROL DAC:VSET1:1000 <NL>  ==>  define vset1 DAC count is 1000
CONT:DAC:VSET3:60000 <NL>  ==>  define vset3 DAC count is 60000
CONT DAC ISET2 5000 <NL>  ==>  define iset2 DAC count is 5000

Q61. How to measure current?
MEASURE CURR1? <NL>  ==>  read back current 1 result
MEAS:CURRENT3? <NL>  ==>  read back current 3 result
MEAS:2:CURRENT? <NL>  ==>  read back current 2 result
MEAS 3 CURR? <NL>  ==>  read back current 3 result
MEAS:CURR3? <NL>  ==>  read back current 3 result
CURR1? <NL>  ==>  read back current 1 result
CURRENT2? <NL>  ==>  read back current 2 result
IOUT1? <NL>  ==>  read back current 1 result
IOUT2 <NL>  ==>  read back current 2 result

Q62. How to measure voltage?
MEASURE VOLT1? <NL>  ==>  read back voltage 1 result
MEAS:VOLTAGE3? <NL>  ==>  read back voltage 3 result
MEAS:2:VOLTAGE? <NL>  ==>  read back voltage 2 result
MEAS 3 VOLT? <NL>  ==>  read back voltage 3 result
MEAS:VOLT3? <NL>  ==>  read back voltage 3 result
VOLT1? <NL>  ==>  read back voltage 1 result
VOLTAGE2? <NL>  ==>  read back voltage 2 result
VOUT1? <NL>  ==>  read back voltage 1 result
VOUT2 <NL> => read back voltage 2 result

Q63. How to measure power?

MEASURE POW1? <NL> => read back power 1 result
MEAS:POWER3? <NL> => read back power 3 result
EAS:2:POWER? <NL> => read back power 2 result
MEAS 3 POW? <NL> => read back power 3 result
MEAS:POW3? <NL> => read back power 3 result

Q64. How to measure resistance?

MEASURE RES1? <NL> => read back resistance 1 result
MEAS:RESISTANCE3? <NL> => read back resistance 3 result
MEAS:2:RESISTANCE? <NL> => read back resistance 2 result
MEAS.3:RES? <NL> => read back resistance 3 result
MEAS:RES3? <NL> => read back resistance 3 result

Q65. How to define voltage output?

SOUR:VOLTAGE2:12 <NL> => sets voltage is 12V for channel 2.
SOURCE VOLT1 30 <NL> => sets voltage is 30V for channel 1.
SOUR:1:VOLT:23 <NL> => sets voltage is 23V for channel 1.
VOLT3:10 <NL> => sets voltage is 10V for channel 3.
VOLTAGE3:5 <NL> => sets voltage is 5V for channel 3.
VSET2:15 <NL> => sets voltage is 15V for channel 2.

Q66. How to define current output?

SOUR:CURRENT2:1 <NL> => sets current is 1A for channel 2.
SOURCE CURR1 3 <NL> => sets current is 3A for channel 1.
SOUR:2:CURR:2 <NL> => sets current is 2A for channel 2.
CURR3:1.2 <NL> => sets current is 1.2A for channel 3.
CURRENT3:5 <NL> => sets current is 5A for channel 3.
ISET2 1.5 <NL> => sets current is 1.5A for channel 2.

Q67. How to define over voltage protection?

SOUR:VOLTAGE3:PROT:12 <NL> => sets over voltage is 12V for channel 3.
SOURCE VOLT1:PROT 30 <NL> => sets over voltage is 30V for channel 1.
SOUR:VOLT2 PROTECTION:10 <NL> => sets over voltage is 10V for channel
SOUR:3 VOLT PROTECTION:5 <NL>  ==>  sets over voltage is 5V for channel 3.
VOLTAGE3:PROT: 7 <NL>         ==>  sets over voltage is 7V for channel 3.
VOLT2:PROT 18 <NL>            ==>  sets over voltage is 18V for channel 2.
VOLT1 PROTECTION:27 <NL>       ==>  sets over voltage is 27V for channel 1.
VOLT PROTECTION 25 <NL>        ==>  sets over voltage is 25V for channel 1.
OVSET2:19 <NL>                ==>  sets over voltage is 19V for channel 2.

Q68. How to define over current protection?

SOUR:CURRENT3:PROT:1.2 <NL>    ==>  sets over current is 1.2A for channel 3.
SOURCE CURR1:PROT 3 <NL>       ==>  sets over current is 3A for channel 1.
SOUR:CURR2 PROTECTION:2<NL>    ==>  sets over current is 2A for channel 2.
SOUR:3 CURR PROTECTION:5<NL>   ==>  sets over current is 5A for channel 3.
CURRENT3:PROT: 2.7 <NL>       ==>  sets over current is 2.7A for channel 3.
CURR2:PROT 1.8 <NL>           ==>  sets over current is 1.8A for channel 2.
CURR1 PROTECTION:2.7 <NL>     ==>  sets over current is 2.7A for channel 1.
CURR PROTECTION 2.5 <NL>      ==>  sets over current is 2.5A for channel 1.
OISET2 1.9 <NL>               ==>  sets over current is 1.9A for channel 2.

Q69. How to read back over voltage parameter?

SOUR:VOLTAGE3:PROT:? <NL>     ==>  return over voltage for channel 3.
SOURCE VOLT1:PROT ? <NL>      ==>  return over voltage for channel 1.
SOUR:VOLT2 PROTECTION:? <NL>   ==>  return over voltage for channel 2.
SOUR:3 VOLT PROTECTION:?<NL>  ==>  return over voltage for channel 3.
VOLTAGE3:PROT:? <NL>          ==>  return over voltage for channel 3.
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VOLT2:PROT? <NL> ==> return over voltage for channel 2.
VOLT1 PROTECTION:? <NL> ==> return over voltage for channel 1.
VOLT PROTECTION? <NL> ==> return over voltage for channel 1.
OVSET2? <NL> ==> return over voltage for channel 2.

Q70. How to read back over current parameter?

SOUR:CURRENT3:PROT?: <NL> ==> return over current for channel 3.
SOURCE CURR1:PROT ? <NL> ==> return over current for channel 1.
SOURCE:CURR2 PROTECTION? <NL> ==> return over current for channel 2.
SOURCE:3 CURR PROTECTION? <NL> ==> return over current for channel 3.
CURRENT3:PROT?: <NL> ==> return over current for channel 3.
CURR2:PROT ? <NL> ==> return over current for channel 2.
CURR1 PROTECTION?: <NL> ==> return over current for channel 1.
CURR PROTECTION ? <NL> ==> return over current for channel 1.
OISSET2? <NL> ==> return over current for channel 2.

Q71. How to enable or disable over voltage?

SOUR:VOLTAGE3:PROT:TRIG:ON <NL> ==> enable over voltage for channel 3.
SOURCE VOLT1:PROT:TRIG:OFF <NL> ==> disable over voltage for channel 1.
SOUR:VOLT2 PROTECTION:TRIG:OFF <NL> ==> disable over voltage for channel 2.
SOUR:3 VOLT PROTECTION::TRIG:OFF <NL> ==> disable over voltage for channel 3.
VOLTAGE3:PROT:TRIG:ON <NL> ==> enable over voltage for channel 3.
VOLT2:PROT TRIGGER ON <NL> ==> enable over voltage for channel 2.
VOLT1 PROTECTION:TRIG:OFF <NL> ==> disable over voltage for channel 1.
VOLT PROTECTION TRIG:OFF <NL> ==> disable over voltage for channel 1.
OVP2:ON <NL> ==> enable over voltage for channel 2.
OVP3 OFF <NL> ==> disable over voltage for channel 3.
Q72. How to enable or disable over current?

SOUR:CURRENT3:PROT:TRIG:ON <NL>  ==> enable over current for channel 3.
SOURCE CURR1:PROT:TRIG:OFF <NL>  ==> disable over current for channel 1.
SOUR:CURR2 PROTECTION:TRIG:OFF <NL>  ==> disable over current for channel 2.
SOUR:3 CURR PROTECTION::TRIG:OFF <NL>  ==> disable over current for channel 3.
CURRENT3:PROT:TRIG:ON <NL>  ==> enable over current for channel 3.
CURR2:PROT TRIGGER ON <NL>  ==> enable over current for channel 2.
CURR1 PROTECTION:TRIG:OFF <NL>  ==> disable over current for channel 1.
CURR PROTECTION TRIG:OFF <NL>  ==> disable over current for channel 1.
OCP2:ON <NL>  ==> enable over current for channel 2.
OCP3 OFF <NL>  ==> disable over current for channel 3.

Q73. How to setting program?

PROG 10;
PROG ISET1 1;
PROG ISET2 1;
PROG ISET3 1;
PROG VSET1 1;
PROG VSET2 1;
PROG VSET3 1;
PROG FAST 4;
PROG NEXT NEXT;
PROG ?;
PROG 11;
PROG ISET1 1;
PROG ISET2 1;
PROG ISET3 1;
PROG VSET1 3;
PROG VSET2 3;
PROG VSET3 3;
PROG FAST  4;
PROG NEXT NEXT;
PROG ?;
PROG 12;
PROG ISET1 1;
PROG ISET2 1;
PROG ISET3 1;
PROG VSET1 5;
PROG VSET2 5;
PROG VSET3 5;
PROG FAST  5;
PROG NEXT NEXT;
PROG ?;
PROG 13;
PROG ISET1 1;
PROG ISET2 1;
PROG ISET3 1;
PROG VSET1 7;
PROG VSET2 7;
PROG VSET3 7;
PROG FAST  10;
PROG NEXT NEXT;
PROG ?;
PROG 14;
PROG ISET1 1;
PROG ISET2 1;
PROG ISET3 1;
PROG VSET1 10;
PROG VSET2 10;
PROG VSET3 10;
PROG FAST  4;
PROG NEXT NEXT;
PROG ?;
PROG 15;
PROG ISET1 1;
PROG 19;
PROG ISET1 1;
PROG ISET2 1;
PROG ISET3 1;
PROG VSET1 23;
PROG VSET2 23;
PROG VSET3 5;
PROG FAST 4;
PROG NEXT NEXT;
PROG ?;
PROG 20;
PROG ISET1 1;
PROG ISET2 1;
PROG ISET3 1;
PROG VSET1 17;
PROG VSET2 17;
PROG VSET3 4;
PROG FAST 4;
PROG NEXT NEXT;
PROG ?;
PROG 21;
PROG ISET1 1;
PROG ISET2 1;
PROG ISET3 1;
PROG VSET1 13;
PROG VSET2 13;
PROG VSET3 3;
PROG FAST 4;
PROG NEXT NEXT;
PROG ?;
PROG 22;
PROG ISET1 1;
PROG ISET2 1;
PROG ISET3 1;
PROG VSET1 8;
PROG VSET2 8;
PROG VSET3 2;
PROG FAST 4;
PROG NEXT NEXT;
PROG ?;
PROG 23;
PROG ISET1 1;
PROG ISET2 1;
PROG ISET3 1;
PROG VSET1 2;
PROG VSET2 2;
PROG VSET3 1;
PROG FAST 4;
PROG NEXT NEXT;
PROG ?;
PROG 24;
PROG ISET1 1;
PROG ISET2 1;
PROG ISET3 1;
PROG VSET1 1;
PROG VSET2 1;
PROG VSET3 12;
PROG FAST 4;
PROG NEXT NEXT;
PROG ?;
PROG 25;
PROG ISET1 1;
PROG ISET2 1;
PROG ISET3 1;
PROG VSET1 0.2;
PROG VSET2 0.51;
PROG VSET3 8.765;
PROG FAST 100;
PROG NEXT JUMP 10;
PROG ?;
PROG 30;
PROG ISET1 0.01;
PROG ISET2 0.01;
PROG ISET3 0.01;
PROG VSET1 0.2;
PROG VSET2 0.51;
RS-232/USB Package Mode

PROG VSET3 8.765;
PROG FAST 10;
PROG NEXT NEXT;
PROG ?;
PROG 31;
PROG ISET1 0.01;
PROG ISET2 0.01;
PROG ISET3 0.01;
PROG VSET1 12;
PROG VSET2 0.51;
PROG VSET3 8.765;
PROG FAST 4;
PROG NEXT JUMP 30;
PROG ?;

Q74. How to getting DHCP address?

CONT:DHCP:? <NL>         ==>  respone DHCP address
CONTROL DHCP ? <NL>      ==>  respone DHCP address

Q75. How to enable or disable DHCP status?

CONT:DHCP:ON <NL>         ==>  enable DHCP
CONTROL DHCP 1 <NL>      ==>  enable DHCP
CONT:DHCP:0 <NL>          ==>  disable DHCP
CONTROL DHCP OFF <NL>    ==>  disable DHCP

Q76. How to setting DHCP address?

CONT:DHCP:192.168.10.1 <NL>  ==>  setting DHCP address

Q77. How to getting IP address?

CONT:IP:? <NL>            ==>  respone IP address
CONTROL IP ? <NL>        ==>  respone IP address

Q78. How to setting IP address?

CONT:IP:192.168.10.1 <NL>  ==>  setting IP address
CONTROL IP 192.168.10.1 <NL>  ==>  setting IP address

Q79. How to getting MAC address?
Q80. How to set the MAC address?

CONT:MAC:xx xx xx xx xx xx <NL>  =>>  setting MAC address

6.6 Rules of Status Definition

**byte 0:**
- bit 7: channel 3 on/off status
- bit 6: channel 2 on/off status
- bit 5: channel 1 on/off status
- bit 4: channel 3 OVP setting flag
- bit 3: channel 2 OVP setting flag
- bit 2: channel 1 OVP setting flag
- bit 1: channel 3 OCP setting flag
- bit 0: channel 2 OCP setting flag

**byte 1:**
- bit 7: channel 1 OCP setting flag
- bit 6: output mode status; 0: single output 1: multi-output power on status, 0: output off, 1: remember pre-setting status
- bit 5: hot-key flag
- bit 4: serial output mode
- bit 3: parallel output mode
- bit 2: track output mode
- bit 1: beep trigger flag
- bit 0: inhibit communication flag

**byte 2:**
- bit 7: disable remote mode, inhibit communication programmable flag
- bit 6: remote flag
- bit 5: keypad between push and pop status
- bit 4: machine running at time mode
- bit 3: machine running at sub-menu mode
- bit 2: machine running at configuration sub-menu mode
- bit 1: machine running at memory item mode
- bit 0: machine running at status flag
RS-232/USB Package Mode

byte 3:  
bit 7  machine running at power on status  
bit 6  keypad & Rotary lock flag  
bit 5  machine running at EPROM write or read mode  
bit 4  machine running at synchize mode  
bit 3  display I/V or W/Ohm flag  
bit 2  machine running at LCD process mode  
bit 1  detect double- key flag  
bit 0  machine running at key-pad process mode

byte 4:  
bit 7  channel 3 CV/CC status  
bit 6  channel 2 CV/CC status  
bit 5  channel 1 CV/CC status  
bit 4  channel 3 OVP is occur flag  
bit 3  channel 2 OVP is occur flag  
bit 2  channel 1 OVP is occur flag  
bit 1  channel 3 OCP is occur flag  
bit 0  channel 2 OCP is occur flag

byte 5:  
bit 7  channel 1 OCP is occur flag  
bit 6  relay switch flag  
bit 5  in line system program flag  
bit 4  password is correct flag  
bit 3  machine running at DAC read-back mode  
bit 2  timer pasue flag  
bit 1  machine running at calibration mode  
bit 0  reserved

byte 6:  
bit 7  display lock message flag  
bit 6  continue to send "V/I,status" message flag  
bit 5  reserved  
bit 4  reserved  
bit 3  DHCP on or off flag  
bit 2  when the bit is on, LCD to display minus('-') signal  
bit 1  fast-output flag  
bit 0  when the machine is OEM version, the flag must on

byte 7:  fan PWM value.
7. Accessories

Model: PSU505

Serial number:

<table>
<thead>
<tr>
<th>No</th>
<th>Description</th>
<th>P/N</th>
<th>Q'ty</th>
<th>Selection</th>
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<tbody>
<tr>
<td>1</td>
<td>Power cord</td>
<td>ZPO-640MI</td>
<td>1</td>
<td>[ ] Yes [ ] No</td>
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<tr>
<td>2</td>
<td>Black &amp; Red Test Lead</td>
<td>ZTP-LPSMI-1</td>
<td>3</td>
<td>[ ] Yes [ ] No</td>
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<tr>
<td>3</td>
<td>User's manual</td>
<td>ZOM-505ME</td>
<td>1</td>
<td>[ ] Yes [ ] No</td>
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Version: 1.0