KENWOOD

REGULATED DC POWER SUPPLY

PW18-2
PW36-1

INSTRUCTION MANUAL

KENWOOD CORPORATION

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FCC WARNING:

This equipment may generate or use radio frequency energy. Changes or modifications to this equipment may cause harmful interference unless the modifications are expressly approved in the instruction manual. The user could lose the authority to operate this equipment if an unauthorized change or modification is made.

NOTE:

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- *Reorient or relocate the receiving antenna.*
- *Increase the separation between the equipment and receiver.*
- *Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.*
- *Consult the dealer or an experienced radio/TV technician for help.*

CONTENTS

1. OUTLINE

The PW18-2 and PW36-1 are the regulated DC power supplies with, two output pins, high performance and multiple functions. They are controlled by an internal CPU and employ a dual tracking function to generate constant DC voltage and current for external electronic application circuit boards.
The negative and positive values of the output voltage and the output current can be set separately (0V to specifiable maximum output level). For this purpose, a rotary encoder is provided. With the rotary encoder, the desired output values can be specified through an "one-dial control".
In addition to the above flexible output variable entry function, the PW18-2 and PW36-1 regulated DC power supplies have the following functions:

- Dual tracking function: Allows output voltage and current values to be changed at a user-specifiable variable rate.
- Preset function: Allows output values to be preset.
- Key lock function: Places the regulated DC power supplies in a lock mode.
- Memory backup function: Keeps the previous values in the backup memory.

The PW18-2 and PW36-1 regulated DC power supplies are best suited for the use by electronic application engineers at labs and research institutes.

2. FEATURES

* Dual tracking function mode: Enables output voltage and current (negative and positive) to be changed at the same rate and same time.
* Seven-segment LED display function (red): Enables voltage and current digital values to be displayed at the same time. This function allows the user to easily view the actually output voltage and current levels and the values previously set.
* Preset function: Allows the user to preset up to three pairs of voltage and current most frequently used. This enables the quick target selection.
* Excellent man-machine interface: One-touch key switches provided for setting operational conditions. All the variables can be entered through the "one-dial control" of the rotary encoder. In addition, the desired output voltage and current values can be specified precisely in 10mV and 10mA unit.
* Key lock function: Forces all the values previously set to be fixed. This prevents the current values from being altered by someone else while the user is "out".
* Protect function: Prevents unexpected voltage and current from being output to an external application board. This function is helpful when the preset key, variable key, and tracking key are pressed in the output operation mode.
* Safety mechanism design: Well-designed heat sink provided for preventing intra-unit temperature from becoming high too much. No fan is used for cooling. As a result, the internal functional blocks are not degraded due to noises, vibration and dust.
* Backup function: Allows the values previously set to be kept in the back-up memory. That is, even if the regulated power supplies are turned off, the current values are saved to the back-up memory. There is no need for the user to enter data each time when the system is turned on.

3. SPECIFICATIONS

	PW18-2	PW36-1
OUTPUT VOLTAGE		
Output voltage	0 to +18V/−18V	0 to +36V/−36V
Setting resolution	10 mV	
Max. output voltage	+18V/−18V	+36V/−36V
Dual tracking	0 to ± 18V	0 to ± 36V
Tracking deviation	± (1% + 40 mV) of rated voltage	± (1% + 80 mV) of rated voltage
OUTPUT CURRENT		
Output current	0 to +2A / 0 to −2A	0 to +1A / 0 to −1A
Setting resolution	10 mA	
Max. output current	+2A/−2A	+1A/−1A
Dual tracking	0 to ± 2A	0 to ± 1A
Tracking deviation	(2% + 40 mA) of rated current	
CONSTANT VOLTAGE CHARACTERISTICS		
Input fluctuation (for surge of AC ± 10%)	1 mV	2 mV
Load fluctuation (for surge of 0 to 100%)	3 mV	2 mV
Ripple/noise rms (10 Hz to 1 MHz)	0.5 mV rms	

	PW18-2	PW36-1
Ripple peak (p-p)	2.8 mV p-p	
Transient response	50 μs typical	
Temperature coefficient	100 ppm/°C typical	
CONSTANT CURRENT CHARACTERISTICS		
Input fluctuation (for surge of AC ± 10%)	2 mA typical	
Load fluctuation (for surge of 0 to 100%)	10 mA typical	
Ripple/noise rms (10 Hz to 1 MHz)	2 mA rms typical	
Ripple peak (p-p)	5.6 mA p-p typical	
Temperature coefficient	300 ppm/°C typical	
VOLTMETER		
Display (3-1/2 digit LED)	max. 19.99 V, fixed range red LED	max. 19.99V/99.9V, auto range red LED
Accuracy (output "ON") (23°C ± 5°C, less than 80% RH)	± (0.5% rdg + 2 digit)	Low range: ± (0.5% rdg + 4 digit) High range: ± (0.5% rdg + 1 digit)
AMPMETER		
Display (3 digit LED)	max. 9.99 A, fixed range red LED	
± Accuracy (output "ON")	(1.0% rdg + 2 digit) 23°C ± 5°C, less than 80% RH	

	PW18-2	PW36-1
FUNCTIONS		
Output ON/OFF	ON/OFF switch. However, output cannot be ON when MEMORY ON. Red LED lights up when ON.	
Output protect ON/OFF	Disables the output of unexpected voltage and current in the output mode. This 'PROTECT' function becomes active when a different value is set by one of the PRESET, VARIABLE and TRACKING keys in the output mode. (ON → Red LED active)	
Preset (1,2,3)	3 voltages or currents can be preset as desired. Preset values can be easily checked. Green LED lights up when ON.	
Memory	Several voltage and current presets can be stored. Red LED lights when ON.	
Key Lock	Locks all functions as set. All controls except POWER are disabled. Red LED.	
V/A	Several voltages and currents can be set. Green LED.	
Tracking and V/A display selection	±18V tracking, +18V, −18V	±36V tracking, +36V, −36V
OUTPUT		
COM	±18V COM common	±36 V common
Polarity	COM, positive or negative ground possible	
Output terminals	+ (red), − (white), COM (blue), GND (black)	
Ground proof voltage	±250 V DC	
SERIAL OUTPUT	0 to 36V	0 to 72V

	PW18-2	PW36-1
OPERATION CONDITIONS		
Rated temperature/humidity range	0 to 40°C, 10~85% RH	
Operation temperature/humidity range	0 to 40°C, 10~85% RH	
Storage temperature/humidity range	−20 to 65°C, 10~85% RH	
Cooling mechanism	Natural convection	
POWER CONSUMPTION		
VA/W (at AC 100 V)	approx. 210 VA / 165 W	approx. 190 VA / 145 W
INPUT VOLTAGE		
Voltage, Frequency	AC 100 V ± 10% 120V / 220V / 240V ± 10% (max. 250 V) 50/60 Hz Internal switching possible.	
DIMENSIONS AND WEIGHT		
Dimensions	width: 104 mm height: 147 mm depth: 330 mm	
Max. dimensions	width: 109 mm height: 167 mm depth: 350 mm	
Weight	approx. 6.4 kg	
Accessory items	1 instruction manual 1 power supply cord 2 fuses	

■ Circuit and ratings are subject to change without notice due to developments in technology.

4. PRECAUTIONS FOR USE

Keep in mind the following when reading this manual:
The manual covers both the PW18-2 and PW36-1 models.
However, from Chapter 5, "Explanation of Panelfront" onwards, the manual is written only in terms of the PW18-2.
When checking regarding the PW36-1, "18 V" should be changed to "36 V" wherever it appears after Chapter 5.

1) confirming the supply voltage

* Use the unit within the specified range.
  The unit's rated voltage is single-phase, 100/120/220/240 V AC ±10% (max. 250 V) at 50/60 Hz.
* The rated voltage is written on the name plate located under the AC input terminal on the rear panel.
* See the Maintenance and Adjustment section for information on how to change the supply voltage.

2) connection of power cord

Be user to plug the provided power cord deeply and firmly into the AC input terminal.

3) Precautions for connection of output terminals

* Because this is a dual output machine that puts out positive/negative voltages and currents, do not use the provided shoring bar or other device to short the CM terminal with the positive and negative terminals, or the positive and negative terminals with each other. If a short is made, use the machine after setting the output voltage to rather a low level. If it is high, the internal circuits may be damaged. Keep it in mind.
* This is a floating type power supply. For normal use, the provided shorting bar to connect the GND and COM terminals. In addition, when connecting the short bar between the COM and GND terminals, or when removing it, be sure to put the OUTPUT switch to "OFF".

4) Set-up Environment

* Be sure to use the machine within the specified ambient temperature range of 0 to 40 deg C.
* Because the unit is cooled by natural convection, do not place objects on top, place the unit under any heat-emitting device, or use multiple units in stacked configuration. Addition, place the unit in as well ventilated a place as possible.
* During use, the heat sink in the rear panel may get hot. Ensure good ventilation and do not place heat-susceptible objects nearby.

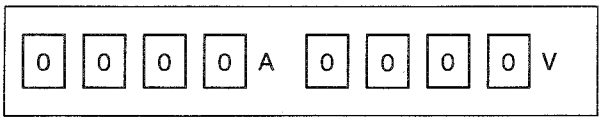
5) Remarks regarding turning on the power supply

* No data is displayed on the display panel and the LED display remains inactive for about three seconds after this system is turned on. Note that the system is not operating abnormally. Wait until some data is displayed on the display panel.

* In the case of normal switch-on when the backup condenser is charging, no displays will appear for about 3 seconds. The voltage and currents displayed after 3 seconds will all be "0" (See Figure 1-a). Then, after 5 seconds, normal operation will begin.
* Because the unit uses a condenser as the memory set back-up power supply, when first turning the power supply on, or when turning it on for the first time in a long time (more than 1 week), all of the voltage display will read "0" (See Figure 1-a). This is not a malfunction, pleased wait. While the machine is in this state, all control switches will be non-functional.
* If the system is turned off while the data '0000' is displayed on the display panel, the content of the backup memory may be destroyed. It may cause an error. Keep it in mind. If the system is turned off due to operational errors or some other unavoidable errors (for example, power failure), perform the operations discussed in Note 2 on page 18. The system will be initialized.

* No data is displayed on the display panel for about three seconds after the system is turned on.

(About three seconds later after power is supplied)



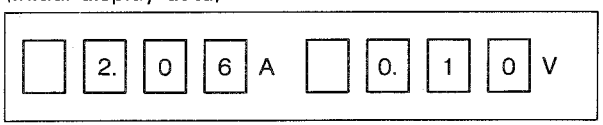
a

↓

five to ten seconds

↓

(Initial display data)



b

* The display panel of the PW36-1 indicates the two values: 1.04 A and 0.10 V.

Fig. 1

5. PANEL EXPLANATION

5-1 Front Panel

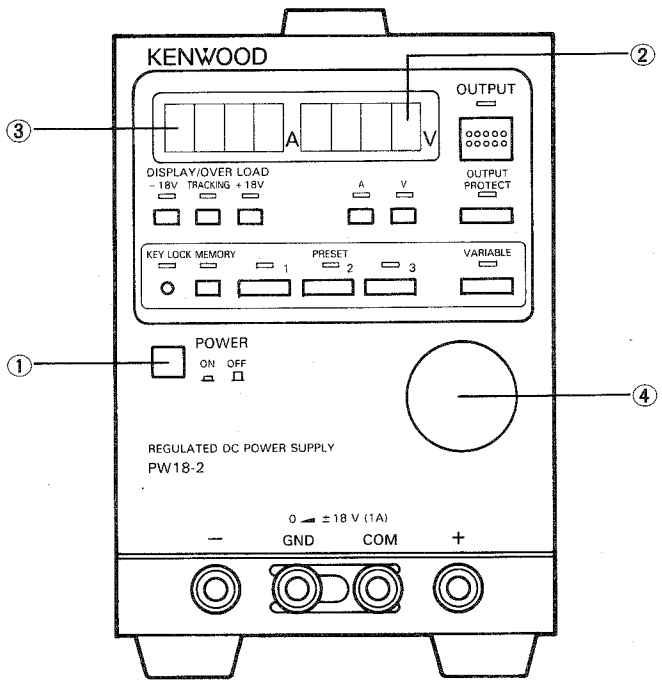


Fig. 2

① **POWER ON ▬ / OFF ■**
This is the power switch. The power is turned on when this switch is pressed. The power is turned off when this switch is pressed again.
Nothing is displayed on the panel for approximately three seconds after the power is turned on.

② **Voltmeter**
This indicates the positive (+) and negative (−) setting values for the voltage and the output voltage.

[*The last-digital data may not be stable due to display resolution. However, the output, does not fluctuate.*]

* If a reverse voltage is generated 0.00 V is displayed and the display flashes.

③ **Ammeter**
This indicates the output current value and the setting value of the positive (+) and negative (−) output current.

④ **Rotary Encoder Knob (for setting voltage and current values)**
A rotary encoder knob is used to specify the output voltages and the output current limit values (negative and positive).
If the V LED ⑤ is turned on the voltage value displayed by the voltmeter ② can be changed by using this rotary encoder.
If the A LED ⑥ is turned on, the current limit value dislayed by the Ammeter ③ can be changed with this rotary encoder.
The values displayed on the voltmeter and the ammeter will be incremented it the knob is rotated clockwise.

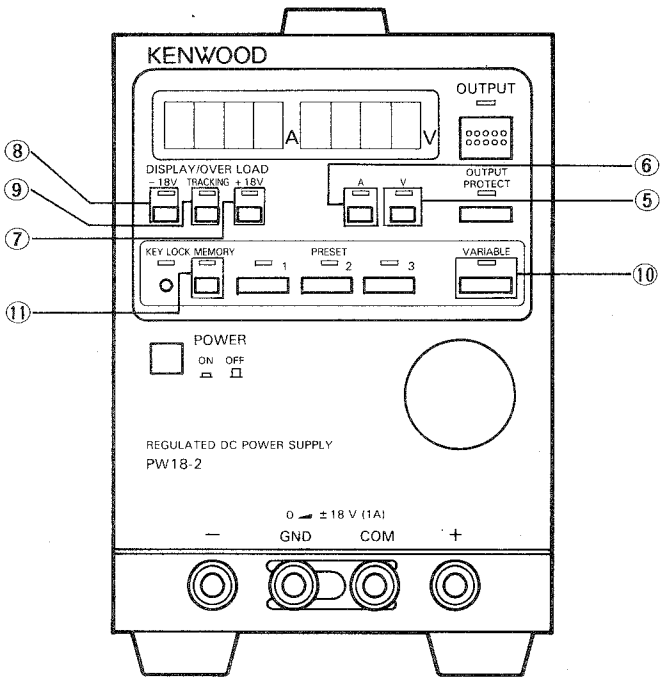


Fig. 3

⑤ **V-KEY / V-LED (Green)**

This key sets the output voltage value and the LED lights to indicate when the output voltage value can be set.

Press this key to set the output voltage value. The V-LED lights when this key is pressed and the output voltage that is indicated on the voltmeter ② can be varied or set by the rotary encoder ④. When this key is pressed again, the V-LED goes off and the output voltage value cannot be varied by the rotary encoder ④.

⑥ **A-KEY / A-LED (Green)**

This key sets the current limit value and the LED indicates when the current limit value is set. The A-LED lights when this key is pressed and the current limit value that is indicated on the voltmeter ② can be varied of set by the rotary encoder ④.

When this key is pressed again, the A-LED goes off and the current limit value cannot be varied by the rotary encoder ④.

⑦ **+18 key / OVERLOAD LED (Green)**

This key sets the output voltage or the positive (+) current limit value and the LED indicates when this setting is possible.

The positive (+) output voltage and current value or the setting value are displayed and the + 18V LED lights when this key is pressed.

Press this key and set the value with the rotary encoder ④ to set the output voltage or the positive (+) current limit value.

If the output is overloaded (Constant current operation), the OVERLOAD (+ 18V) LED flashes to indicate a malfunction

warning.
The LED goes off when the +18V key is pressed again.

⑧ **−18V key / OVERLOAD LED (Green)**
This key sets the output voltage or the negative (−) current limit value and the LED indicates when this setting is possible.
The negative output voltage and current value or the setting value are displayed and the −18V LED lights when this key is pressed.
Press this key and set the value with the V-A value setting knob ④ to set output voltage or the negative (−) current limit value.
If the output is overloaded (Constant current operation), the OVERLOAD (−18V) LED flashes to indicate a malfunction warning.
The LED goes off when the −18V key is pressed again.

⑨ **TRACKING Key / TRACKING LED (Red)**
This key sets the output (the positive and negative voltage and current values to the same value) in the tracking mode.
The LED lights to indicate that this mode is set.
When this key is pressed, the setting values of the positive (+) and negative (−) output voltage and current limit are set to the same absolute value and the TRACKING LED lights.
The currently indicated value (selected by either the +18V key ⑦ or the −18V key ⑧) has priority for the tracking value and the output value that is not displayed is set to correspond to this value.
When this key is pressed again, the LED goes off and the tracking status is canceled. The setting value remains at the same value as when the tracking is performed and is not reset to the original value.

⑩ **VARIABLE KEY / VARIABLE LED (Green)**
This key varies the output setting value and the LED lights when this operation is possible.
Press this key to change the output setting value. The LED lights to indicate that the output setting value can be changed.
Press the OUTPUT key ⑬ and turn the rotary encoder (4) to change the output setting.
Since the signal from this key is internally and logically linked with those from the PRESET and MEMORY keys, the VARIABLE LED goes off and the output setting value cannot be changed if either one of the preset keys is selected or the MEMORY key ⑪ is pressed.

⑪ **MEMORY key / MEMORY LED (Red)**
The MEMORY function is used to store the previous setting values for output voltage and current that are stored in the PRESET function of the main unit.
This key and LED are used to set and indicate the preparation standby mode when the setting values in the PRESET key ⑫ are recorded.
If this key is pressed when the OUTPUT key ⑬ is set OFF, the MEMORY LED lights to indicate that the preset operation can be performed.
The setting value is stored for the selected key number by setting the voltage and current setting value by the V-key ⑤, A-key ⑥ or rotary encoder ④ and then selecting any

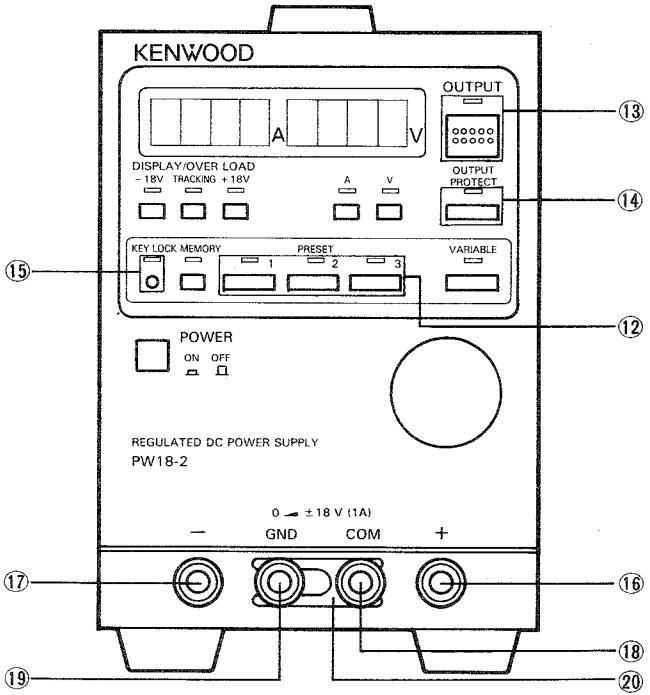


Fig. 4

one of the PRESET keys (1, 2, and 3). If this key is pressed again the MEMORY LED goes off to indicate that the preset status is canceled.
The condition that was determined by the previous value setting is restored if this key is pressed when the MEMORY LED lights (before the PRESET key is selected).
Refer to the section "Operating Procedures" for a detailed explanation of the setting procedures.

⑫ **PRESET (1, 2, 3) key / PRESET LED (1, 2, 3) (Green)**
The output condition settings are stored in a key before operation and the LED lights in the corresponding keys when the settings are read.
Three types of output conditions within the standard range can be set and stored as desired.
These keys have two operations method. If the PRESET 1 key is pressed, the PRESET 1 LED lights. The following operations can be performed.

(1) The setting conditions can be stored (only when MEMORY LED ⑪ lights).
(2) The output is performed according to the stored settings conditions. (with the OUTPUT LED ⑬ on)

The operation and LED function are the same for PRESET 2 and PRESET 3.

⑬ **OUTPUT key / OUTPUT LED (Red)**
The OUTPUT LED lights when the OUTPUT key is pressed and the positive and negative voltage and current are output simultaneously. The voltmeter and ammeter indicate the output values at this time. If the output key is pressed when the OUTPUT LED lights, the OUTPUT LED goes off and the

positive and negative output stops simultaneously.
When the system is powered on, the OUTPUT LED does not light. That is, the system is initialized to the output OFF mode.

⑭ **OUTPUT PROTECT Key / OUTPUT PROTECT LED (Red)**
This key sets the OUTPUT PROTECT function ON and OFF and the LED indicates the function status.
The OUTPUT PROTECT status is set as the initial setting for the pulse surface and the LED lights when the power is first applied.
If this key is pressed when the OUTPUT PROTECT function is set, the OUTPUT PROTECT function is canceled and the OUTPUT PROTECT LED also goes off.
The OUTPUT PROTECT function should be set and the LED should light during normal operation.
Refer to the section "Operating Procedure" for a detailed explanation of the setting procedures.

⑮ **Key Lock Switch / KEY LOCK LED (Red)**
This key turns the KEY LOCK setting ON and OFF and the LED lights to indicate the function status.
The KEY LOCK LED is OFF as the initial default setting after the power is first applied. The LED lights when the KEY LOCK switch is turned ON.
When the KEY LOCK switch is pressed again, the LED goes off to indicate that the KEY LOCK status is set OFF.
When the KEY LOCK function is set ON, all other key switch operations, except for power switch, cannot be performed.
The ON and OFF setting for this switch is performed by pressing and insulated round shaft 2 to 3 mm in diameter in the round hole in the front panel.

⑯ **Output Terminal (+)**
This terminal is used to output positive voltage and current for the COM terminal.

⑰ **Output Terminal (−)**
This terminal is used to output negative voltage and current for the COM terminal.

⑱ **COM Terminal**
This is a common terminal which is used for both positive and negative voltage and current output.

⑲ **GND Terminal**
The GND terminal is connected to the main unit. It is normally connected with the COM terminal and the short bar.

⑳ **Short Bar**
This bar connects the COM GND terminals.

5-2 Rear panel

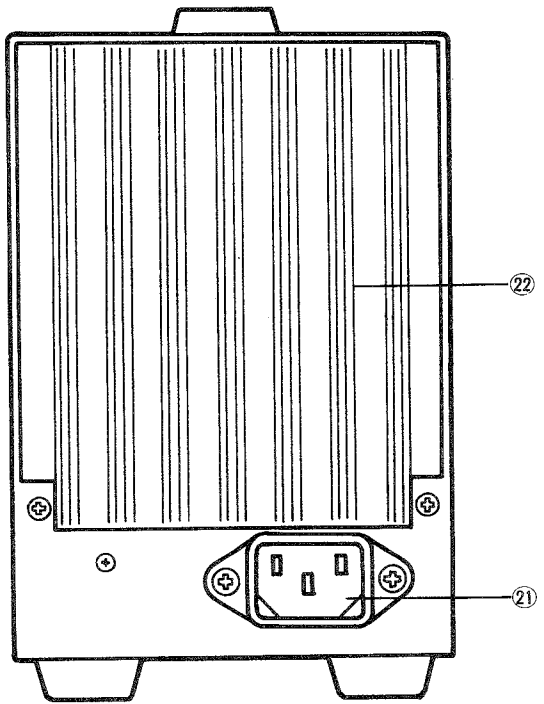


Fig. 5

㉑ **Power Input Connector**
The AC current is input by this connector. Always use the accessory power cord for connection to this terminal.

㉒ **Heat Sink**
This is a radiator for the transistors. Be careful not to touch it as it can be extremely hot from dissipating the heat from the components.

6. OPERATION PROCEDURE

Make sure that the power source provides the rated voltage, before connecting the power cord (attached to the unit) to the power input connecter which is installed on the back of the unit.

When connecting a load to the output terminal, make sure in advance that the OUTPUT KEY ⑬ is set OFF (the OUTPUT LED is not lit).

Initial parameters upon the start-up of the unit

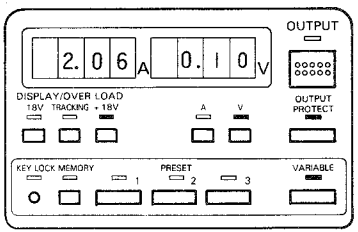


Fig. 6

The following are the initial settings when the unit is powered for the first time after purchase (or after it has not been used for a long period of time.)

1. + 18V LED ⑦ Lights up
2. V LED ⑤ Lights up
3. OUTPUT LED ⑬ Turn off
4. VARIABLE LED ⑩ Lights up
5. OUTPUT PROTECT LED Lights up
6. The initial settings of the voltmeter ②, the ammeter ③, and the PRESET KEYs (1,2,3) are:

Display settings for the positive (+) output

PW 18-2 2.06 A 0.10 V

PW 36-1 1.04 A 0.10 V

Display settings for the negative (−) output

PW 18-2 −2.06 A −0.10 V

PW 36-1 −1.04 A −0.10 V

Note 1

After the first use of the unit, the settings from the previous operation (just before the power shut off) are displayed. Note that the OUTPUT mode is set to OFF and the OUTPUT PROTECT mode is set to ON.

Note 2

Upon turning on the power switch, if the VARIABLE KEY ⑩ is kept pressed until the displayed value of each of the voltmeter and ammeter becomes "0000", the settings of the panel will return to the said initial settings, and the data stored in the PRESET KEYs be cleared.

[Caution] : If the system is turned off while the data '0000' is displayed on the display pannel. The content of the backup memory may be destroyed. It may cause an error. Keep it in mind. If the system is turned off due to operational errors or some other unavoidable errors (for example, power failure), perform the operations discussed in Note 2 on. The system will be initialized.

Setting by the Rotary Encoder

* Every set value can be varied by using the V/A value setting knob of the rotary encoding system. The set value increases if the knob is turned clockwise. The set value decreases if the knob is turned counterclockwise.
* The increasing or decreasing rate is controllable by changing the turning speed of the Knob. If the Knob is turned slowly, a set value increases or decreases by 10mV and 10MA for each click of the Rotary Encoder. If it is turned fast, a set value increases or decreases by 2V and 2A (PW36-1: approximately 2 V and 1A) for each click of the Rotary Encoder. No greater increase or decrease can be obtained if the knob is turned faster.
* If the positive or negative output voltage level is set to + or − 50 mV, this new value will be stabilized in a few seconds. The same temporary value is set when a new value is set using the PRESET feature.
* One click on the rotary encoder may force 2-digit voltage and current display data to change at the same time or to remain uncharged.
* If 'automatic range up' mode is activated on the PW36-1 product, the display data will be changed in 100 mV unit each 10 clicks on the rotary encoder. Note that the data exceeding 20 V is not displayed in 10 mV unit. The output level can change in 10 mV unit.
  If 'automatic range down' mode is activated, the data exceeding 19.9 V is displayed in 100 mV unit (10 clicks). The data below 19.9 mV is displayed in 10 mV unit (one click) such as 19.9 V→19.89 V→19.88 V.

When turning the Rotary Encoder, do not apply an excessive force to its shaft, as this may cause damage. The Rotary encoder is equipped with a mechanical contact and extended use requires the current rotary encoder to be replaced with a new one.
Call the local service representative if this occurs.

6-1 Using as a positive (+) stabilized power supply

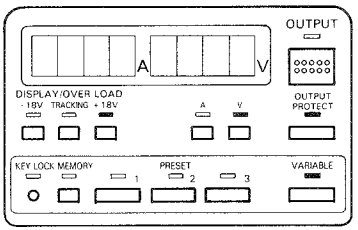


Fig. 7

1) Set the LEDs as shown in the Figure 7. (Make sure that the OUTPUT LED is not lit.)
2) Turn the Rotary Encoder to set an arbitrary voltage value.
3) Press the A KEY ⑥ and make sure that the A LED lights up.
4) Turn the Rotary Encoder to set an arbitrary current limit value.
5) Press the OUTPUT KEY ⑬ to obtain the output value entered from the positive (+) output terminal.

6-2 Using as a negative (−) output as the stabilized power supply

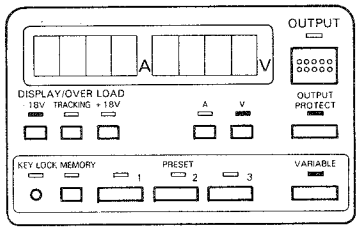


Fig. 8

1) Set the LEDs as shown in the Figure 8. (Make sure that the OUTPUT LED is not lit.)
2) Turn the Rotary Encoder to set an arbitrary voltage value.
3) Press the A KEY (6) and make sure that the A LED lights up.
4) Turn the Rotary Encoder to set an arbitrary current limit value.
5) Press the OUTPUT KEY ⑬ to obtain the output value entered from the negative (+) output terminal.

If the OUTPUT KEY ⑬ is pressed (ON), both positive and negative output terminals supply a voltage and a current.

If the load short-circuits, or if the set current limit value is reached, the circuit becomes overloaded and the output voltage drops. The unit may be used a constanct-current power source in this overloaded condition.

Note that the current limiter may sometimes deviate several digits from the specified current limit value. If the current limiter is used within the smaller range of error, connect each output pin to the ground level and place the system in the overload status, and then use this products after setting a desired current limiter value.

If rather a large-capacitance load is connected to this product, it will take some seconds until the stable voltage level is reached. Keep it in mind.

The positive, negative pins and the COM pin of this product have a capacitor of 100 micro farad. This product has an internal circuit for the discharge. This internal circuit becomes active when the output mode is set to OFF. This means that the diodes in serial with a load are required to prevent the discharge if the products is used as a battery charger or a memory backup battery.

6-3 Tracking Power Supply Procedure

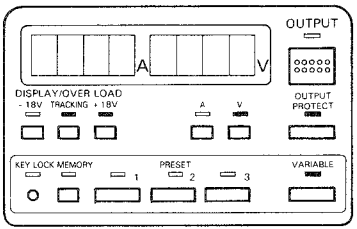


Fig. 9

1) Set the LEDs as shown is Figure 9.
   (Be sure that the OUTPUT LED ⑬ is not lit.)
   Figure 9 indicates the case where positive voltage level is used.
2) Turn the Rotary Encoder to set an arbitrary positive voltage value.
3) Press the A KEY ⑥ and make sure that the A LED lights up.
4) Turn the Rotary Encoder to set an arbitrary positive current value.
5) If the − 18V KEY is pressed, the display of each of the voltmeter and the ammeter allows the user to confirm that the negative value is the same as the positive.
6) Press the OUTPUT KEY ⑬ to obtain the output value entered from the positive (+), or negative (−), output terminal.
7) If the Rotary Encoder is turned in the state of (6) above, the negative values change. Press the + 18V KEY to make sure that the positive values are changing alike.

The unit is tracking while the TRACKING LED ⑨ is lit. The absolute value of both set voltage value and set current limit value are identical, for both positive and negative outputs.

The unit does not track when the Tracking LED ⑨ is not lit. If the TRACKING KEY ⑨ is pressed, the TRACKING LED lights up and tracking starts, and the set voltage and current limit values attain the same values as indicated by the voltmeter and the ammeter, respectively. If the settings of voltage and current need to be changed, press the TRACKING KEY again to cancel the tracking and enter a new positive or negative value for each of the voltage and current.
for new voltage and current values.

6-4 PRESET feature

(1) The PRESET feature is used to store the actually value setting (displayed value) in one of the PRESET (1, 2, 3) KEYs ⑫.

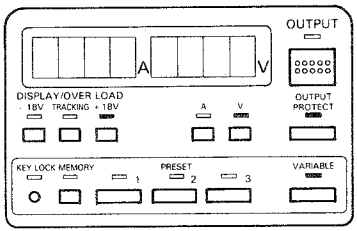


Fig. 10

1) Set the LEDs as indicated in Figure 10. Always make sure that the OUTPUT LED ⑬ is not lit.
2) Set a positive voltage value by the Rotary Encoder.
3) Press the A KEY ⑥ and turn the Rotary Encoder to set a positive current limit value.
4) Press −18V KEY ⑧ and turn the Rotary Encoder to set a negative current limit value.
5) Press the V KEY ⑤ and turn the Rotary encoder to set a negative voltage value.
6) Press the MEMORY KEY ⑪ and confirm that the VARIABLE LED ⑩ goes off.
7) If one of the PRESET KEYS (1,2,3) ⑫ is pressed, the MEMORY LED ⑪ goes off and the LED of the selected PRESET KEY lights up. An arbitrarily entered value is stored in the selected PRESET key at this time.
8) Perform the same procedure to store an arbitrary setting value in each of the other PRESET KEYs.

> Any setting value stored in one of the PRESET KEYs ⑫ cannot be altered while the OUTPUT LED ⑬ is lit (during the output operation). The setting value can be changed during the output operation if the VARIABLE LED ⑩ is lit.

(2) To change the set value stored in the PRESET KEY:
1) Press any one of the PRESET key (1, 2 and 3) to store a new value for it when the system is placed in the state described in 1) of the previous section.
2) Press the MEMORY key.
3) Set a new voltage/current value according to the procedures described in 2) to 5) of the previous section.
4) Press another PRESET key store a new value for it again.
5) To stop setting a new value halfway, press the MEMORY key again before pressing the PRESET key as described in 4). In this case, the MEMORY LED is turned off and the previous status (postive, negative output, values and each LED status) before the MEMORY key is pressed as described in 2) will be restored.

6-5 OUTPUT PROTECT Feature

The unit is equipped with the VARIABLE KEY and PRESET KEYs (1,2,3) to change and set an output value. Each of these 4 keys can change a setting value (output value) when it is pressed. If a different key is pressed by mistake while the Unit is in operation, it is likely to erase or change loaded data (a sample circuit, etc.).

(e.g., If one of the PRESET KEYs is pressed by mistake while the Unit is used in the VARIABLE status, the setting value stored in the pressed PRESET KEY is output, which may erase the loaded data accidentally.)

The OUTPUT PROTECT feature is useful to prevent this type of accident. This feature protects the load by burning off the OUTPUT at the moment when any of the output setting keys is pressed (while the Unit is in the "OUTPUT ON" status).

> If the TRACKING KEY is turned ON, the output value may also fluctuate considerably. In this case, the OUTPUT PROTECT may be turned ON to shut off the output.

(1) Perform the following procedure to make sure the OUTPUT PROTECT feature operates correctly.

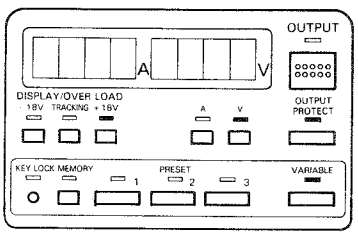


Fig. 11

1) Set the LEDs as shown in Figure 11. In the Figure, the VARIABLE KEY ⑩ is selected as an output setting key.
2) Press the OUTPUT KEY ⑬, to turn "ON" the output.
3) Nothing can be changed at this point, if the VARIABLE KEY is pressed.
4) If one of the other keys (PRESET KEY 1, 2, or 3) is pressed, the LED corresponding to the pressed key lights up, and the setting value stored in it is displayed in each of the voltmeter and the ammeter.
   At the same time, the OUTPUT LED goes off, allowing the user to confirm that the output is in the OFF state.

Make sure not to turn on the OUTPUT KEY immediately after the OUTPUT PROTECT feature is started up. Otherwise, the value of the incorrectly selected output setting key will be output.

(2) Follow the below procedure to make sure that the OUTPUT PROTECT feature is set OFF.

1) Press the OUTPUT KEY as shown in Figure 11, to turn off its LED.
2) Press the OUTPUT KEY to turn "ON" the output.
3) Nothing can be changed at this point, if the VARIABLE KEY is pressed.
4) Press one of the keys except the VARIABLE KEY and change the output value deliberately. At this time, the output will not be shut off while the OUTPUT LED is lit, and the output setting value entered in the selected key is displayed and output. The selection of another output setting key will also lead to the output of the value entered in it.

The OUTPUT PROTECT KEY can be turned ON or OFF while the output is ON.

6-6 KEY LOCK feature

This feature is used to prevent the setting value of each function key on the panel from fluctuating, when the unit is used for an experiment for an extended period of time or for burn-in.

Use an insulated shaft of 2 to 3 in diameter to turn on or off the KEY LOCK SW.

1) If the KEY LOCK SWITCH ⑮ is pressed, the KEY LOCK LED lights up and any input from the Rotary Encoder or other KEYs will be rejected except for input from the power switch.
2) If the KEY LOCK SW is pressed again, the KEY LOCK LED goes off and the KEY LOCK status is cancelled.
3) If the product is turned off with the KEY LOCK mode "active", the KEY LOCK mode will be still effective after power is supplied to the product next time. That is, every key operation will be disabled in this case. Keep it in mind. If new key operations need to be performed, set the KEY LOCK switch to the OFF mode.

6-7 Rotary Encoder lock procedures

If the selected V KEY (or A KEY) is pressed, the corresponding LED goes off. The set value does not change even if the Rotary Encoder is turned, because the Rotary Encoder is locked. This feature allows the user to temporarily maintain the position (the output value) of the Rotary Encoder. If the V KEY or the A KEY is pressed again, the Rotary Encoder starts to operate and the set value can be varied.

7. APPLICATIONS

7-1 Serial Output

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

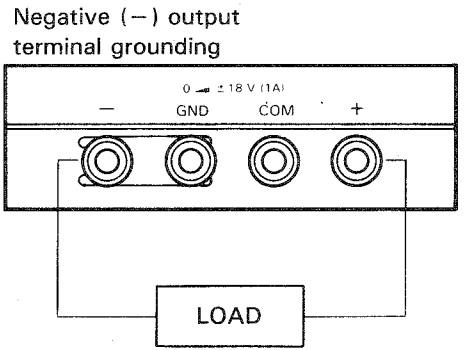
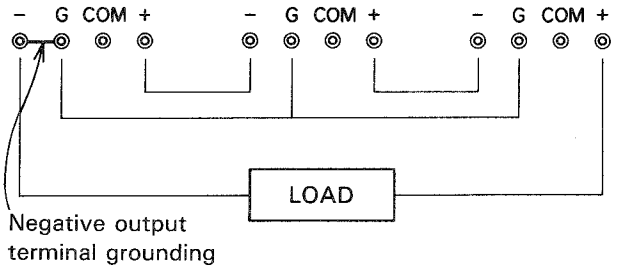


Fig. 12

Do not connect anything except the GND terminal to the COM terminal.

7-2 Series run

If more than one unit are connected as in the below figure, the total of the individual output voltages will be applied to the load.



Be sure that the total voltage should not exceed ± 250 V.

Fig. 13

8. MAINTENANCE

8-1 Removing the Case

To remove the case of the unit, remove the screws on the top and sides of the unit and lift the case upwards.

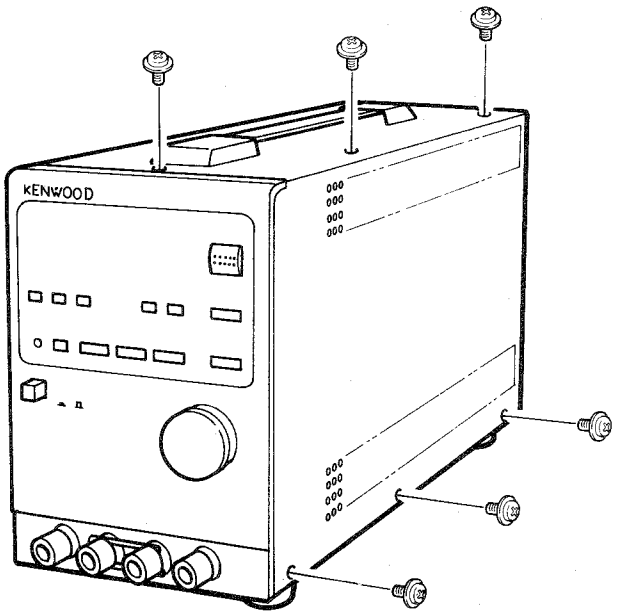


Fig. 14

8-2 Changing the Power Voltage

To change the rated input voltage, change the rated values of the power transformer and fuse inside the unit as described in the following section:

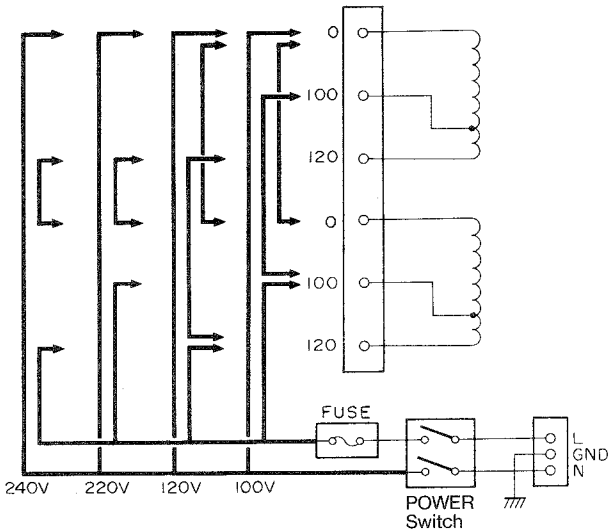


Fig. 15

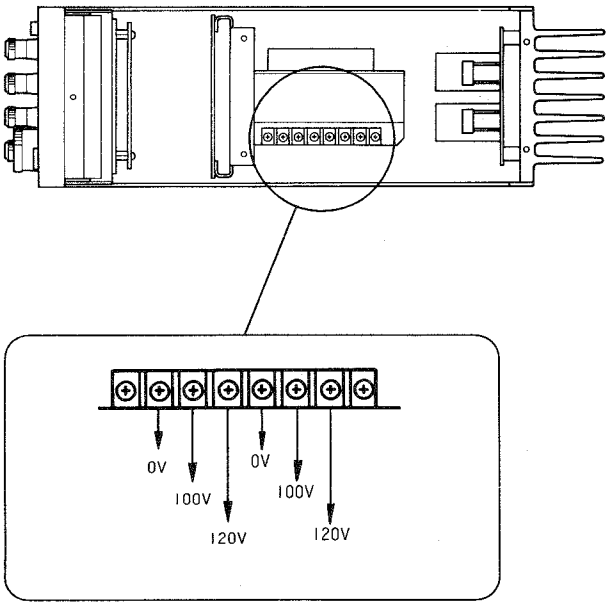


Fig. 16

8-3 Replacing the Fuse

If the fuse burns out, investigate the cause before replacing it. Replace it with a rated fuse that corresponds to the new power voltage (see the table).

> Be sure to disconnect the power cord from the AC outlet before replacing the power voltage or the fuse.

Table (Rated fuses)

Model	100V	120V	220V	240V
PW18-2	2A	2A	1A	1A
PW36-1	2A	2A	1A	1A

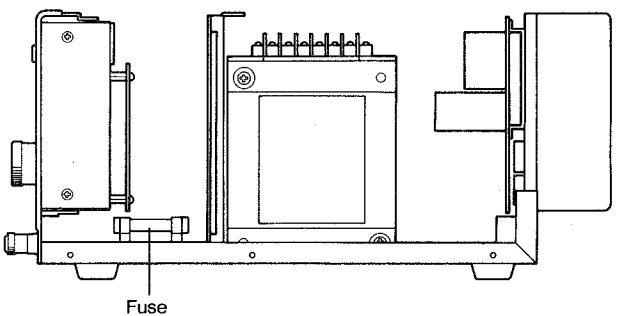


Fig. 17

9. TROUBLE SHOOTING

Trouble	Check point	Cause
The unit cannot be turned on.	None of the LEDs light up within 5 minutes after the power turned ON.	— The power cord is not connected or is broken. — The power switch is defective. — The fuse is burnt.
Excessive output	Neither the output voltage nor the output current decreases.	— The power transistor is broken or the control circuit is malfunctioning.
Unstable output	1) Is there any change in the power voltage? 2) Can any oscillation be observed? 3) Is any strong magnetic or electric field present near the unit?	1) The power voltage exceeds the limits of a rated input voltage. 2) Oscillation can be caused by special types of loads. 3) The unit should be separated from the oscillating source.

10. EXTERNAL DIMENSIONS FIGURE

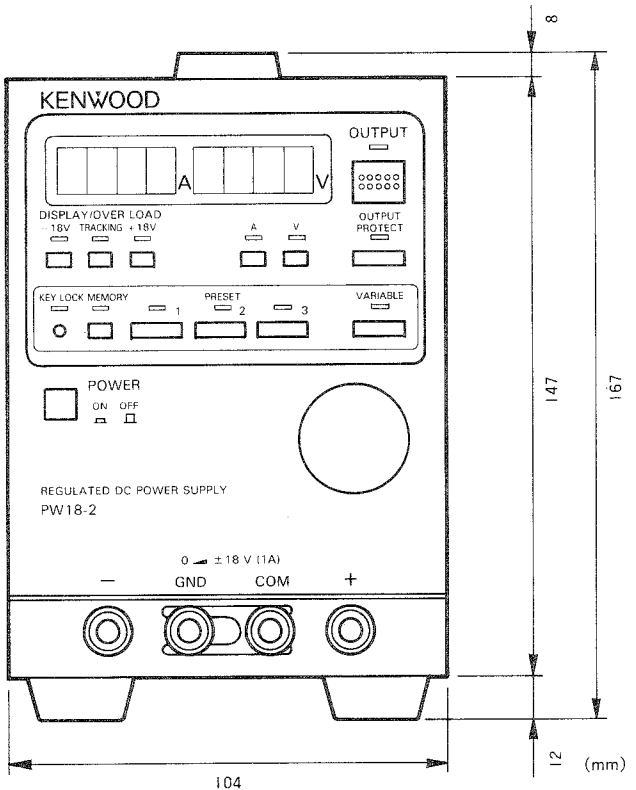


Fig. 18

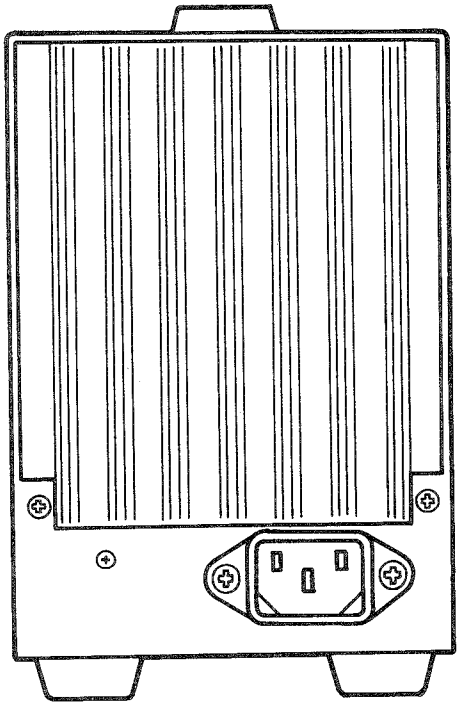


Fig. 19

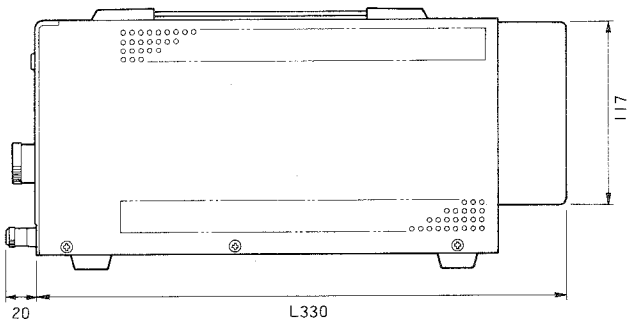


Fig. 20

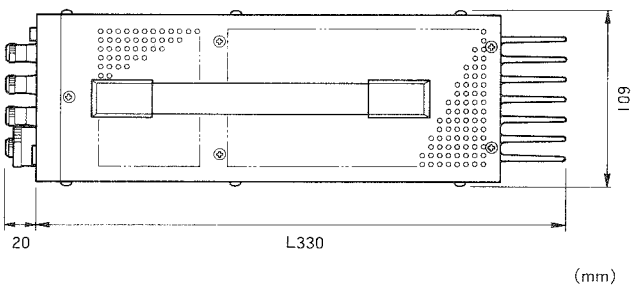


Fig. 21

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