

MODEL PAF 500-1
REGULATED DC POWER SUPPLY

INSTRUCTION MANUAL

KIKUSUI ELECTRONICS CORP.

Power Requirements of this Product

Power requirements of this product have been changed and the relevant sections of the Operation Manual should be revised accordingly.

(Revision should be applied to items indicated by a check mark)

Input voltage

The input voltage of this product is _____ VAC,
and the voltage range is _____ to _____ VAC. Use the product within this range only.

Input fuse

The rating of this product's input fuse is _____ A, _____ VAC, and _____.

WARNING

- To avoid electrical shock, always disconnect the AC power cable or turn off the switch on the switchboard before attempting to check or replace the fuse.
- Use a fuse element having a shape, rating, and characteristics suitable for this product. The use of a fuse with a different rating or one that short circuits the fuse holder may result in fire, electric shock, or irreparable damage.

AC power cable

The product is provided with AC power cables described below. If the cable has no power plug, attach a power plug or crimp-style terminals to the cable in accordance with the wire colors specified in the drawing.

WARNING

- The attachment of a power plug or crimp-style terminals must be carried out by qualified personnel.

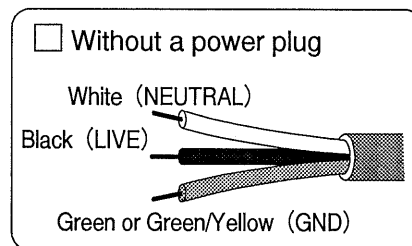
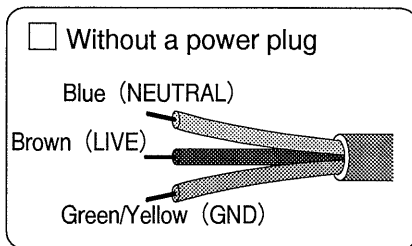


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1. GENERAL

Kikusui Model PAF 500-1 is solid-state regulated DC power supply which provides an output voltage of 0 to 500V (continuously variable) and a maximum output current of 1A. It is featured with a high operation stability. The output voltage is finely and continuously variable with a 10-turn potentiometer. It is protected from overload with a current limit circuit, circuit breaker, and fuse. It also incorporates a cutout circuit which senses overheat of the series transistors, thereby preventing damage which could otherwise be caused by hampered ventilation, etc.

2. SPECIFICATIONS

Input power: 100V AC $\pm 10\%$, 50/60Hz, approx. 1kVA at full load

Dimensions: 430(W) x 160(H) x 450(D) mm
(Maximum dimensions) 431(W) x 175(H) x 540(D) mm

Weight: Approx. 30kg

Ambient temperature: 0 to 40°C

Accessories: Fuses (1.5 A)2
Instruction manual1

Output

Terminals: Five terminals on rear panel
(-sampling, - , GND, + , +sampling)

Polarity: Positive or negative

Floating voltage to ground: $\pm 500V$ maximum

Constant-voltage characteristics

Voltage: 0 to 500V, continuously variable with
10-turn potentiometer

Current: 1A maximum

Ripple and noise (5Hz~1MHz): 5mV rms

Regulation

Line regulation: 0.01%+10mV for a $\pm 10\%$ line voltage
variation

Load regulation: 0.05%+50mV for 0~100% load variation

Overload protection: Overcurrent limit circuit (fold-back type)
and a circuit breaker (1A)

Voltmeter: 500V, accuracy 2.5% of full scale

Ammeter: 1.2A, accuracy 2.5% of full scale

Output accessory: Rack mount adaptor, for standard 19"
or 500 mm rack

3. OPERATING INSTRUCTIONS

3.1 Explanation of Panel (Refer to Fig. 3-1.)

- ① POWER ON-OFF switch of input power.
Upper position is ON and pilot lamp turn on.
The switch employs a circuit breaker to cut off the input power in case of overcurrent.
- ② VOLTAGE: 10-turn potentiometer for output voltage adjustment for a range of 0 to 500V, at a rate of approximately 50V per revolution.
- ③ CURRENT For setting of overcurrent limit circuit.
The set current increases as this knob is turned clockwise. The maximum set current is approximately 1.2A.
- ④ OUTPUT STANDBY switch for the output. When thrown to the upper (ON) position, the output is available at the rear panel.
The switch employs a circuit breaker (rating 1A) which protect against overcurrent.
- ⑤ VOLTMETER (right side) Indicates the output voltage.
Full scale 500V DC.
- ⑥ AMMETER (left side) Indicates the output current. Full scale 1.2A DC
- ⑦ C.V. This lamp turns on when the power supply is operating in the constant-voltage mode.

⑧ C.L. This lamp turns on when the output current has exceeded the current limit value (set with the CURRENT knob of Item ③ above, to indicate that the power supply has been driven into the current limit state.

⑨ ALARM This lamp turns on when the thermal relay has tripped and the output has become zero volts when the power supply is over-heated due to hampered ventilation, circuit failure, etc..

3.2 Explanation of Rear Panel (Refer to Fig. 3-2.)

⑩ Terminal block (lower five terminals)
The power supply output is provided through these terminals..

-S: Sampling terminal (-)
- : Output terminal (-)
GND: Ground terminal (connected to chassis)
+ : Output terminal (+)
+S: Sampling terminal (+)

⑪ Terminal block (upper ten terminals)
These terminals may be used for modifications.

⑫ Power connector
For connection of the line power cord.

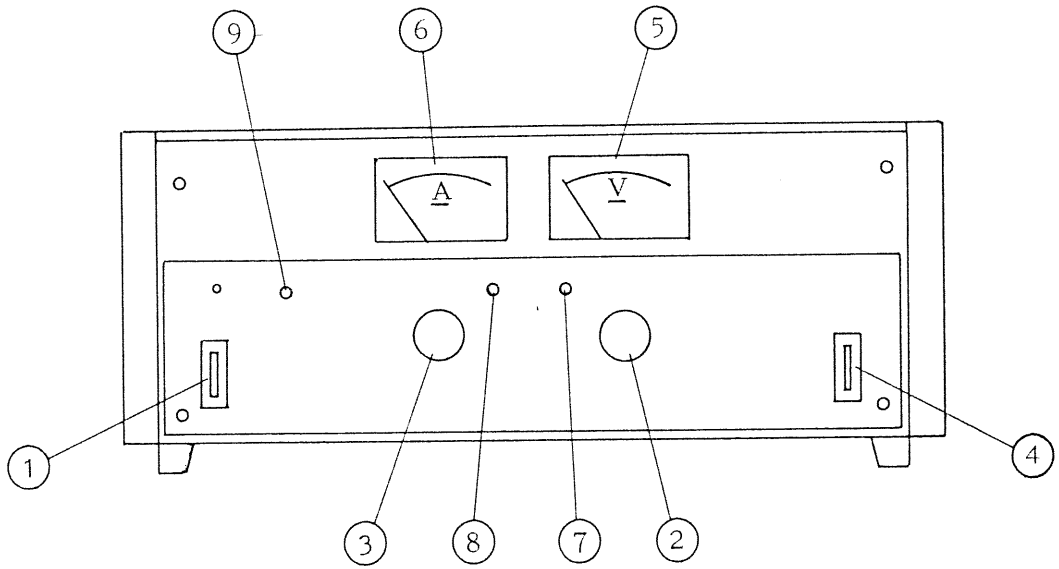


Fig. 3-1 Front Panel

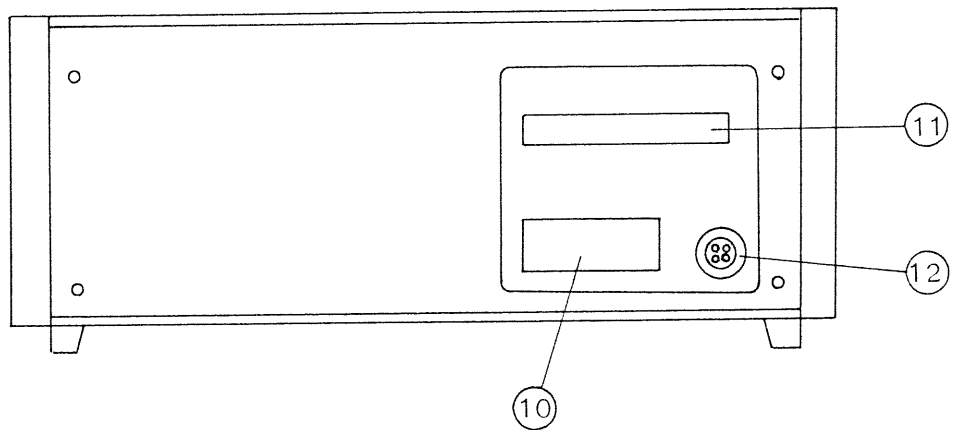


Fig. 3-2 Rear Panel

3.3 Precaution in Use

When using the PAF 500-1 , pay attention to the precautions below.

(1) Input voltage

The input voltage must be $100V \pm 10\%$, 48~62Hz AC.

(2) Enviroments

Do not use the power supply in the below-mentioned enviroments.

- o Directly exposed to a heat source.
- o Ambient temperature is other than 0 to 40°C.
- o Highly humid and dusty atomosphere.
- o The base is not level.

Note that troubles may be caused as heat radiation is hampered if the power supply is laid on its side or an object is placed on the power supply. When two or more power supplies are used being stacked or mounted on a rack, provide agap of more than 50mm between two adjoining power supplies.

NOTE: The PAF 500-1 incorporates an automatic output voltage cut off circuit which automatically cut off the output voltage when the power supply is overheated due to hampered ventilation or any other reason. The circuit automatically reset when power supply is cooled off. When the ALARM lamp has turned on, turn off the POWER switch to cool off the power supply.

3.4 Operation Method

- (1) After ensuring that the POWER and OUTPUT switches are set in the OFF position (thrown to the lower position), connect the power cord. Next, turn on the POWER switch (throw to the upper position). The power pilot lamp turns on to indicate that the input power is being applied to the power supply.
- (2) Turn the CURRENT knob to the extremely clockwise position and the VOLTAGE knob to the required voltage position.
- (3) Connect the load to the terminals. Turn on (throw to the upper position) the OUTPUT switch.
- (4) If the output current is required to be limited, turn counterclockwise the CURRENT knob to the required current position.
(In the case of a capacitor load for example, the output current may not be supplied as the OUTPUT switch is tripped off due to the initial rush current. In such a case, limit the output current to less than 1A.)
- (5) The output is cut off as the OUTPUT switch becomes OFF. This switch, however, cuts the "+" line only. Therefore, in order to prevent electric shock hazards, the switches should be operated in the following order:
 - (1) OUTPUT switch OFF, POWER switch OFF, and connect the load.
 - (2) POWER switch ON, and set the voltage.
 - (3) OUTPUT switch ON.

3.5 Output terminals (lower section of rear panel)

Since the power supply deals with a high voltage, the output terminals are located on the rear panel in order to prevent electric shock hazards. Five terminals provided on the rear panel from left to right are -S, - , GND, + , and +S. The output is available at the + and - terminals.

When the power supply is shipped from the factory, terminals between -S and -, between - and GND, and between + and +S are shorted with short bars (- side grounded). When the power supply is required to be operated in the + side grounded mode, disconnect the short bar from between - and GND terminals and connect it between GND and + terminals.

3.6 Sampling Terminals (-S and +S)

When the load is located apart from the power supply and the lead wires are long, a substantial voltage drop will be produced in the lead wires and the voltage at the load may vary. The sampling terminals are provided to compensate for this voltage variation. To utilize this feature, disconnect the short bars from between -S and - terminals and between + and +S terminals, and connect lead wires from the -S and +S terminals to points closest to the load. (Refer to Fig.3-3.)

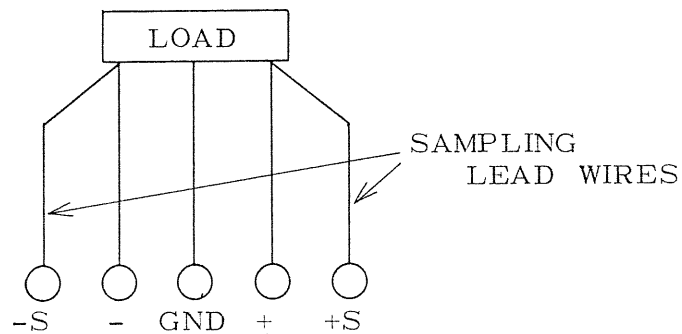
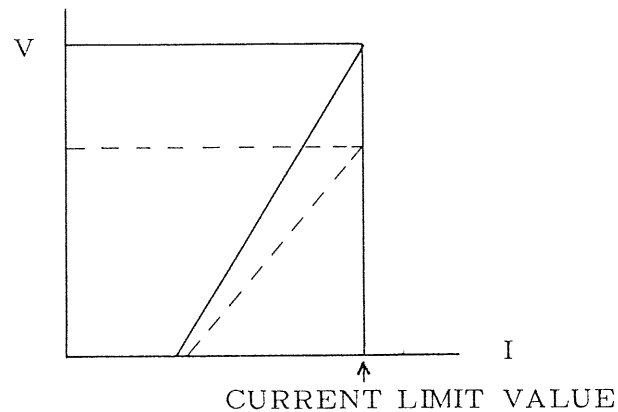


Fig. 3-3

3.7 Current Limit Circuit

The power supply has a figure-7 current limit characteristics as illustrated below. When the load current has exceeded the value preset by the CURRENT knob, both voltage and current decrease and the CL lamp (current limit lamp) turns on to indicate that the power supply is driven into the current limit operation domain.

The output in this domain includes large ripples and is unstable, and generally unusable.



3.8 Series/Parallel Operation

Do not connect two power supplies in series to obtain a higher output voltage because such method is dangerous from the viewpoint of the withstanding voltage of the internal parts.

Two power supplies may be operated in parallel to increase the current capacity, with their output voltage set as close as possible. Note that, when the load current increases, the one which output voltage is set higher by any slight amount is driven first into the current limit operation domain and, as result, the ripple and load regulation characteristics are degraded.

3.9 Warning

Note that the power supply may be damaged if its output is set at a low voltage and an external voltage higher by far (10 times or more) than the set output voltage is applied to the power supply.

The same will result when a large capacitor load is connected and the voltage is rapidly lowered by turning the VOLTAGE knob.

(A protective fuse is internally provided. Refer to SECTION 4 "MAINTENANCE" .)

4. MAINTENANCE

4.1 Internal Inspection

Before opening the case of the instrument for inspection and service, disconnect the power cord in order to prevent electric shock hazard.

The top panel can be removed by loosening (turning counterclockwise) the two screws located near the rear corner on it. Pull backwards the panel keeping the rear part raised by inserting your finger in the finger hole. The bottom panel is fixed with eight screws.

If required for parts replacement, the front and rear panels also can be removed together with their handles. To remove the panel, remove the two screws each on the right and left panels using a hex rod wrench and pull outwards the panel. When removing and replacing the panel, pay attention not to damage wiring and components.

4.2 Adjustments of Potentiometers

To adjust potentiometers in order to compensate for aging or component replacement variation, proceed as below. (Refer to Fig. 4-1.)

<u>PC board</u>	<u>R No.</u>	
A008	R27	For adjustment of the maximum output voltage. Adjust this potentiometer so that the output voltage is made approximately 510V when the VOLTAGE knob on the front panel is turned to the extremely clockwise position.

<u>PC board</u>	<u>R No.</u>	
A008	R23	For adjustment of threshold value of the current limit circuit. Set this potentiometer in such a position that the current is set at approximately 0.6A when the CURRENT knob on the front panel is turned to the extremely clockwise position.
A012	R32	For voltmeter calibration. Calibration is made by connecting a precision voltmeter to rear output terminals.
A012A	R31	For voltmeter calibration. Calibration is by connecting a precision ammeter and a load in series to rear terminals.
A010	R3	For adjustment of the operation timing of the relay which selects the transformer secondary tap. This potentiometer must be so adjust that, as the output voltage is gradually increased from zero to approximately 220V, relay K1 is energized and the 187V tap of the transformer is connected. (The operation point can be known either by listening to the operation sound (click sound) or by monitoring the rectified output voltage.)
A010	R6	In a similar manner as above, adjust this potentiometer so that relay K2 is deenergized when the output voltage has become approximately 380V.

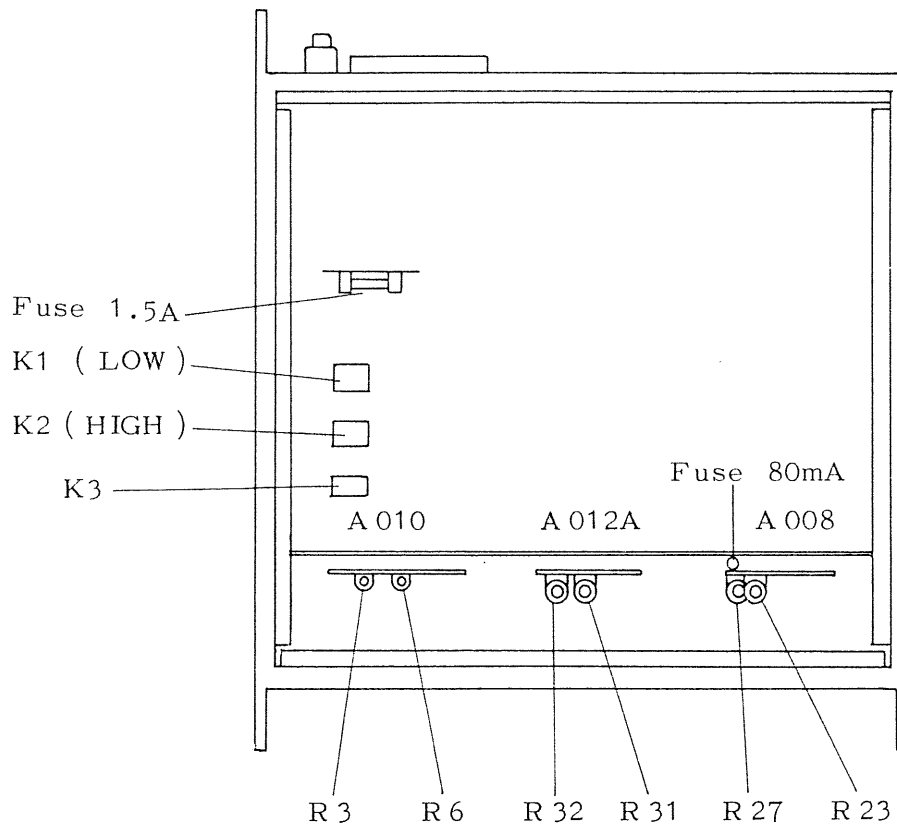


Fig. 4 -1

4.3 Fuses (Refer to Fig. 4-1)

- F (1.5A) Rectified output circuit fuse. Protects the series transistors from overcurrent when the current limit circuit breaker is not operated (when a short-circuiting occurs within the power supply ,for example).
- F (80mA) Protects primarily the 10-turn output voltage setting potentiometer when such a trouble as mentioned in Par. 3.9 is caused.