

MODEL 7416
REGULATED DC POWER SUPPLY
OPERATION 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

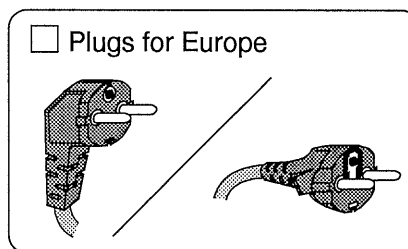
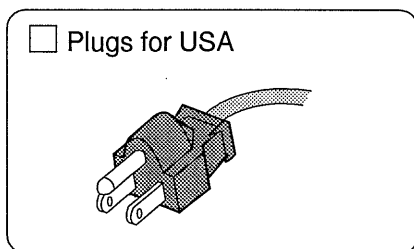
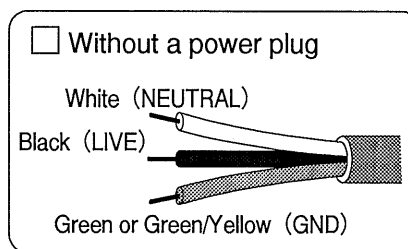
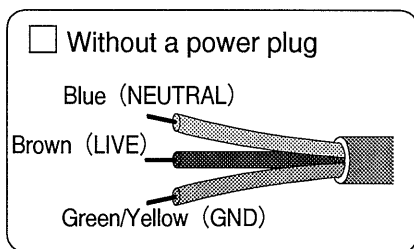
- To avoid electrical shock, always disconnect the AC power cable or turn off the switch on the switchboard before attempting to check or replace the fuse.
- Use a fuse element having a shape, rating, and characteristics suitable for this product. The use of a fuse with a different rating or one that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



Provided by Kikusui agents
Kikusui agents can provide you with suitable AC power cable.
For further information, contact your Kikusui agent.

Another Cable _____

CONTENTS

	Page
1. INTRODUCTION	3
2. SPECIFICATIONS	4
3. OPERATION	5
3.1 Front Panel Description	5
3.2 Use of Remote Switch	8
5. OVERLOAD PROTECTION CIRCUIT	9
6. MAINTENANCE	10
7. PRINCIPLE OF OPERATION	11

Circuit Diagrams

1. INTRODUCTION

Model 7416 is a regulated DC power supply for adjusting and testing equipment operating in a range of 10 to 16V with 12V as the standard. Output voltage can optionally be set to three voltage levels in a range between 10 and 16V, each being selected simply by changeover of a switch. A connector for an external changeover switch is provided to enable an operator who is away from the power supply to effect the changeover.

The output current of 3A assures a wide range of applications for the model. A fold back type current limiting circuit is used. This circuit cuts down overvoltage or overcurrent, if it occurs, to protect equipment from damage due to overload or shorted output. It operates on 1A/3A, interlocked with the changeover of the meter range.

All the transistors used in the circuit are of a silicon type.

The selector switch, which is very frequently operated, is equipped with transistors of a highly reliable and durable type usually used in communication equipment.

2. SPECIFICATIONS

Power requirements	-----V, AC \pm 10%	50/60Hz
	Full load	Approx. 140VA
Dimensions	106W x 145H x 301D mm	
(Maximum)	111W x 158H x 378D mm**	
Weight		Approx. 6 kg
Accessories	Short bar	1
	Remote control plug	1
	Operation Manual	1
Output		
Terminals	Red, white and black in color, in horizontal alignment and spaced 19mm	
Polarity		Positive or negative
Floating voltage		Max. \pm 100V
Voltage		10 ~ 16V
Current		Max. 3A
Ripple		1m Vrms
Regulation	Line voltage	Within 10mV at -----V \pm 10%
	Load regulation	Within 10mV for 0 to 100%

Voltage setting	Three-point setting. A point is selected by the switch. Changeover from the outside possible.
Overload protection circuit	Fold back type voltage current limiting circuit. Operates on 1A/3A, interlocked with the meter range.
Voltmeter	16V Accuracy 2.5% of full scale
Ammeter	1.1A/3.3A Accuracy 2.5% of full scale

** With the plug for the remote switch inserted.

** Four units can be mounted in a row in a 19" or 500mm standard rack.

3. OPERATION

3.1 Front panel description (See Fig. 3-1.)

- ① POWER switch: Turns on and off the power for Model 7416.
This switch upward to turn on the power.
- ② PILOT lamp: Indicates whether the power is on or off.
It lights up when the power is on.
- ③ Current meter range switch: Changes over the current meter range and the setting of the current limiting circuit.
- ④ Voltage setting switch: Selects output voltage setting I, II or III.
Voltage setting I is selected by tilting this switch leftward, II by setting it to the center and III by tilting it rightward.

- ⑤ Output voltage setting knob: Sets the output voltage at any level between 10 and 16V. Turn it clockwise to raise the output voltage.
- ⑥ Output terminals: Positive, ground and positive terminals, from left to right. The positive or negative terminals is generally connected to the GND terminal (which is electrically connected to the chassis panel) with the attached short bar. A maximum DC bias of $\pm 100V$ can be applied.
- ⑦ Output current meter: Measures the current flowing through the load. Changed over to 1A or 3A. Accuracy is 2.5% of full scale. (See "zero point on ammeter".)
- ⑧ Output voltmeter: Indicates the voltage at the output terminal. Full scale is 16V. Accuracy is 2.5% of full scale.
- ⑨ Voltage (interior/remote) selector switch Changes over the voltage setting switch to the interior or remote position.

Front Panel

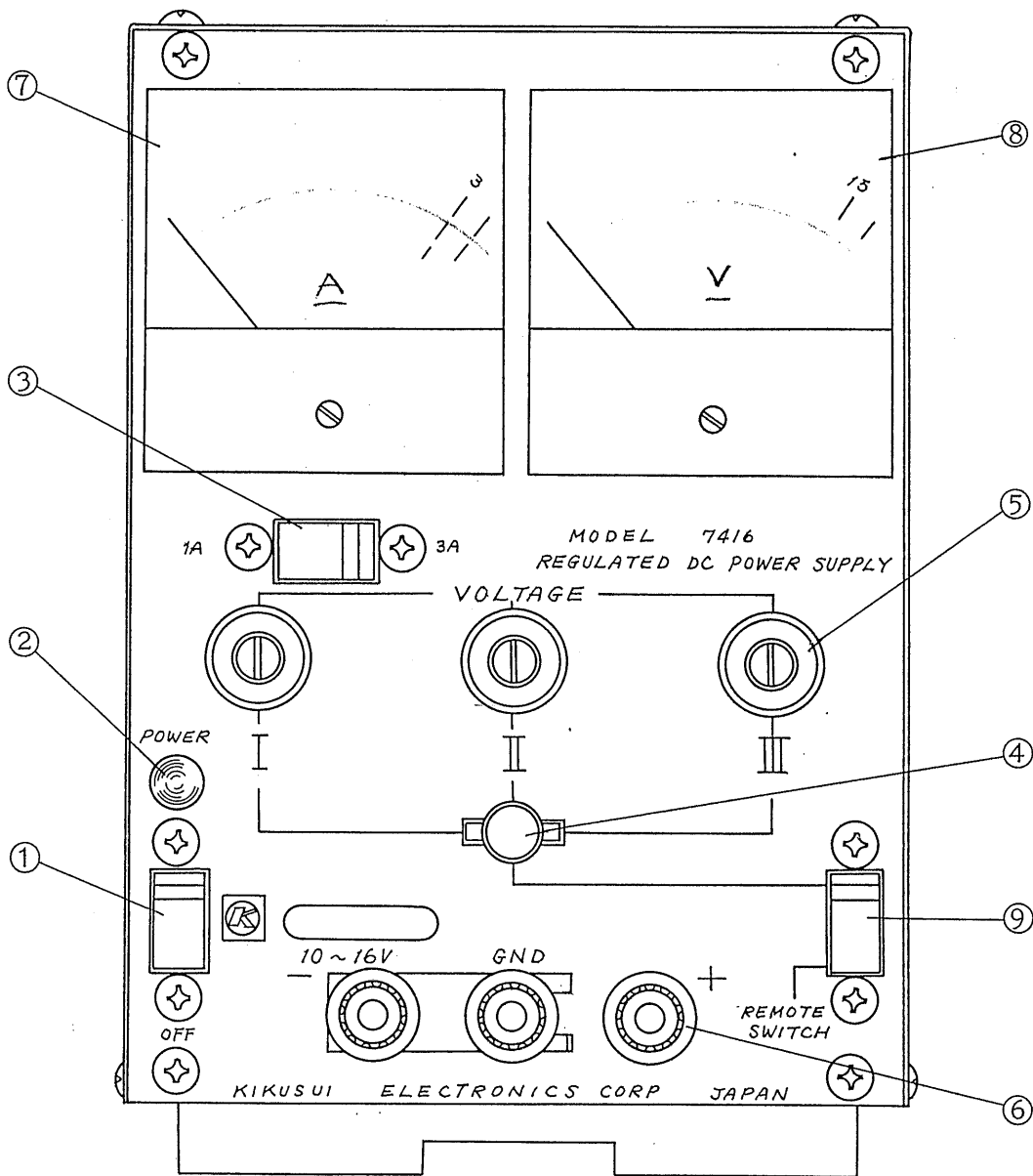


Fig. 1

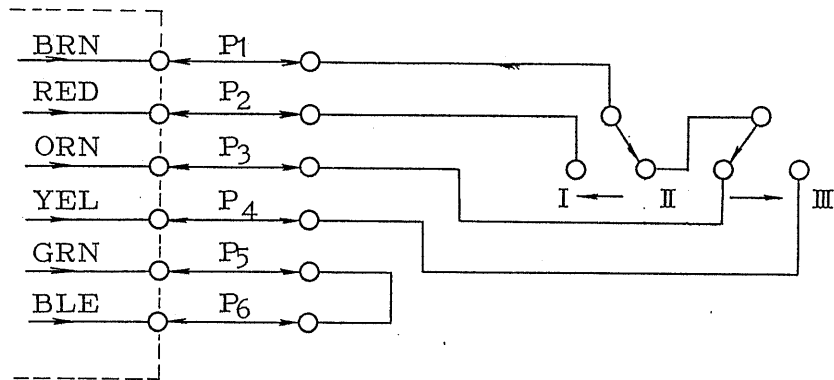
3.2 Use of remote switch

The 7416 has a connector for remote-controlling output voltage.

This should be of a 2-circuit, 2-contact continuous type

If a selector switch of another type is used, be careful since voltage approximating to unregulated input voltage is detected at the time of switchover.

Connect it to the attached plug as indicated in Fig. 2.



Main body of the 7416

Fig. 2

Insert the plug in the connector at the rear, and tilt the voltage setting switch to "remote" (downward).

Now the switch, like the attached switch, is ready to change over the output voltage setting.

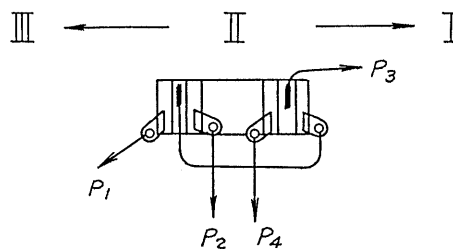


Fig. 3

If a switch of the same type as the attached selector switch is used, wire as indicated in Fig. 3.

5. OVERLOAD PROTECTION CIRCUIT

The 7416 uses a fold back type current limiting circuit for protection against overload. (Refer to Fig. 6.)

If the output current increases beyond the set value, that is, voltage drop V_s at both ends of R_s nearly exceeds the voltage of V_{cr} , QCR_1 is energized, and the current from the constant current circuit is bypassed so that the control unit controls the current flowing to the load.

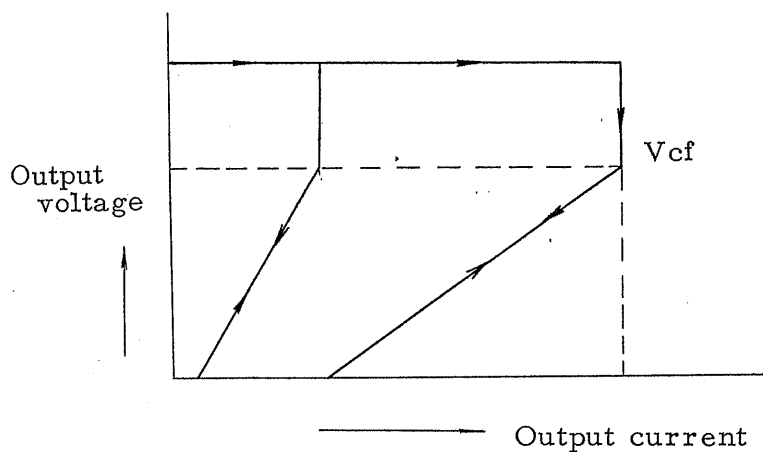


Fig. 4

When the load further decreases, the voltage at the output terminals drops also. When it drops below $V_{cf} + V_d$, the diode is energized, and V_{cf} drops with the decrease of the output voltage. This decreases constant current Q_2 , V_{ct} , working voltage V_s of the constant current and output current in this sequence.

Zero point on ammeter

The ammeter attached to the 7416 is adjusted to zero in the 1A range. Be careful since the zero point may somewhat deviate in the 3A range. This corresponds to approximately 10mA with reference to the mechanical zero point.

6. MAINTENANCE

If the output voltage range is a little shifted when parts are replaced after long use or due to a malfunction or for other reasons, adjust as directed below.

Tools to be used. DC voltmeter: 1K ohm/V or more with an accuracy of 0.5 class

Small conventional screwdriver

Remove the truss head screws from the sides and top of the equipment to detach the case.

Turn the output voltage variable semi-fixed resistor fully clockwise and set the output voltage setting switch to the minimum position.

Adjust R_{24} if the meter pointer overshoots the full scale.

Then proceed as follows.

Set the DC voltmeter to the 10 or 15V range and connect the negative lead to the negative output terminal and the positive lead to Com (center terminal) of S_{3-b} .

See 9 in Fig. 1.

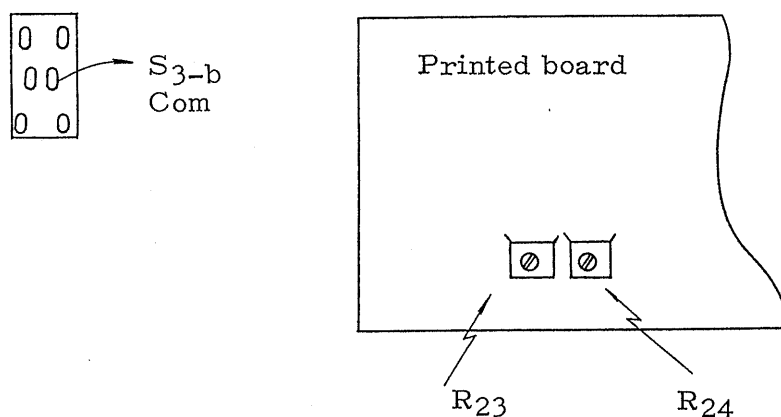


Fig. 5

Turn R_{24} until the voltmeter indicates 8.5V.

Connect the DC voltmeter (or the attached voltmeter) to the output terminals, and adjust R_{23} with the output voltage variable semi-fixed resistor turned fully counterclockwise until the output voltage becomes 9V.

7. PRINCIPLE OF OPERATION

Constant voltage operation is performed essentially with the amplifier (Q_4), constant current circuit (Q_3), which serves as the load for Q_4 , and series control unit ($Q_{5\sim 8}$) which controls the output voltage.

Output voltage V_0 is divided by a divider consisting mainly of R_{19} and R_{25} and is balanced with V_{ref} and then amplified.

Constant current circuit Q_3 is provided to serve the current limiting circuit to increase the effective load resistance of Q_4 and thereby increase the gain.

When the output voltage exceeds the set value, Q_4 is turned on, and the corrector potential drops. As the corrector potential is connected to the control unit (emitter follower) consisting of Q_5 to Q_8 , the output voltage drops with the decrease of the corrector potential.

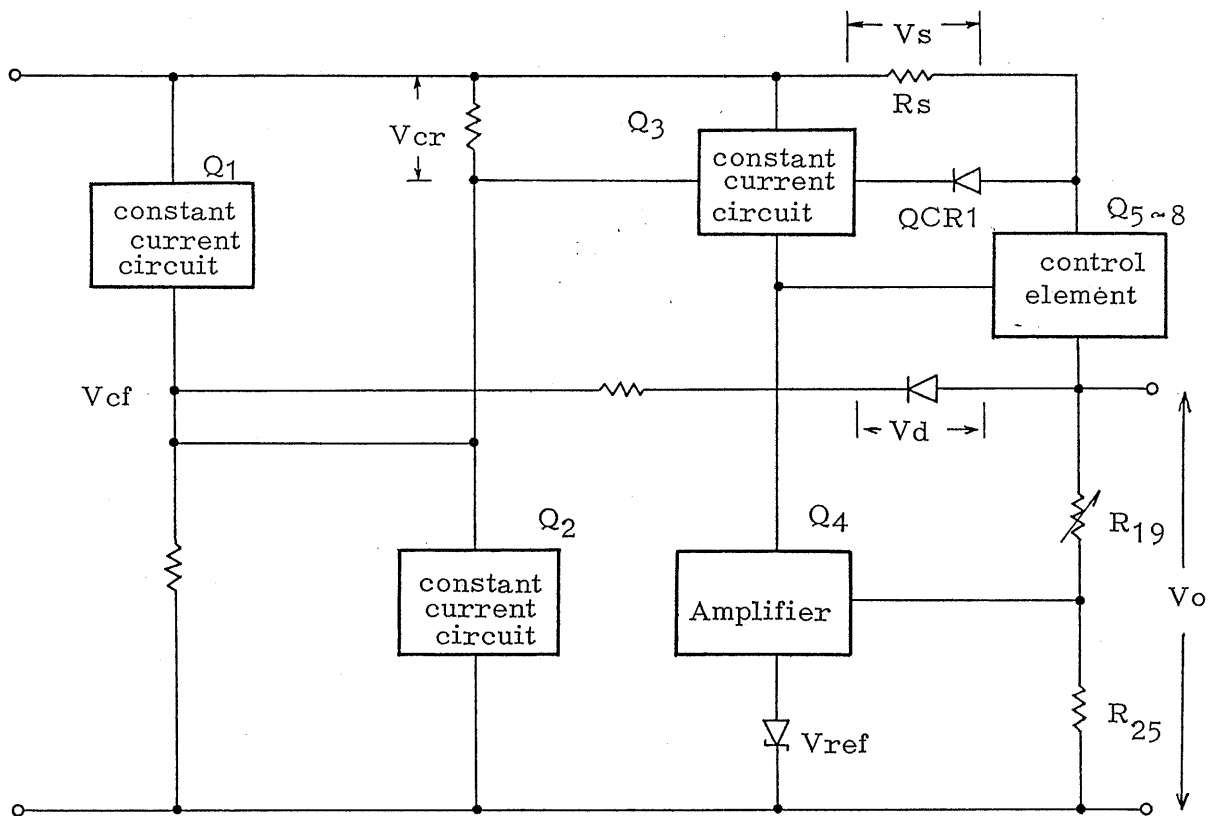


Fig. 6