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INSTRUCTION MANUAL

DUAL TRACKING DC POWER SUPPLY

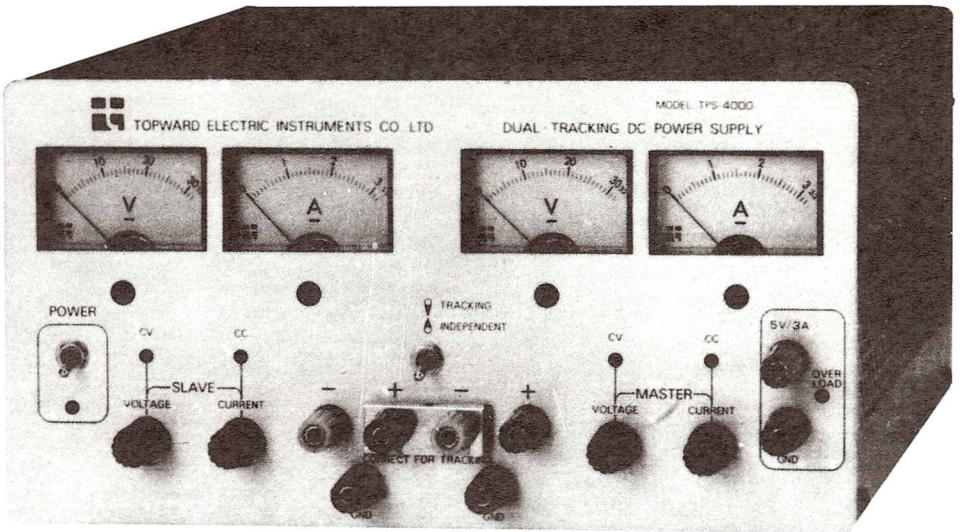
MODEL: TPS-4000

TOPWARD

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Picture of Model TPS-4000



Introduction

The Topward Model TPS-4000 is a bench top triple-output power supply. Voltage outputs may be electrically connected for tracking. The two main power supplies in the TPS-4000 have four meters for monitoring output voltage and current. Each of the power supplies is also equipped with independent controls for use when the unit is not being operated in the tracking mode. The remaining power supply has a fixed 5 volt 3 amp. output.

The TPS-4000 will find wide application in schools, laboratories, and commercial engineering and testing departments, as well as with the advanced hobbiest.

Before We Begin

The Topward Model TPS-4000 is packed in styrofoam to protect it during shipment from the factory. You should keep this material, as well as the shipping box, in case your unit must be moved or shipped again.

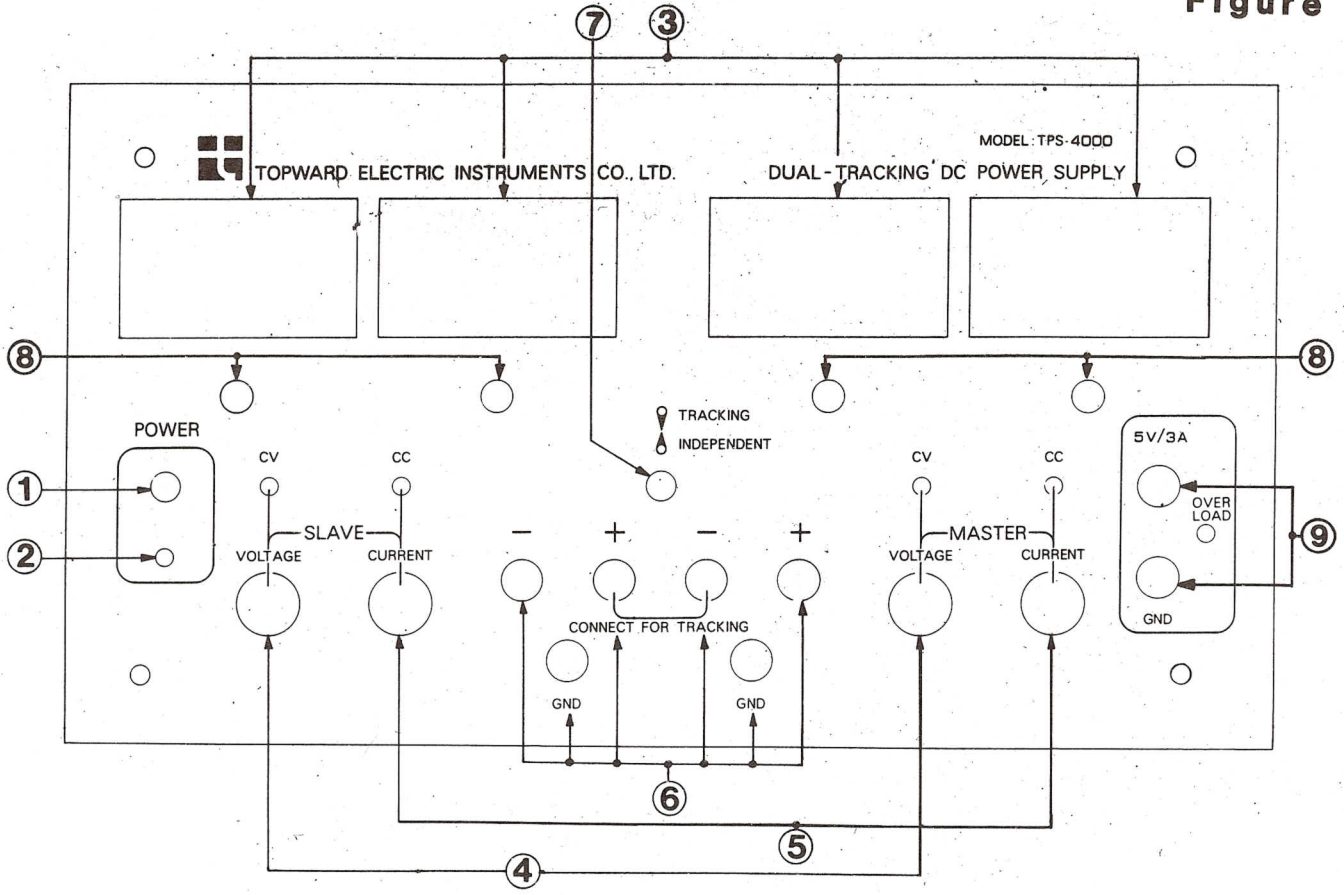
The box should include the following items:

- Model TPS-4000 Series power supply
- Removeable AC line cord
- Banana plug to Alligator clip cables
- Instruction manual

Please check to see that all of the above items are included.

Front Panel of Model TPS-4000 Series

Figure 1



Front Panel Description

The following is an explanation of the function of each of the front panel controls and connectors. You should refer to Figure 1 for the location of each control/connector.

1. POWER ON - This is the main power switch.

2. POWER ON LED - This LED indicates that the power is on.

3. VOLTAGE/CURRENT METERS - These four meters indicate the output voltage and current as measured at the output terminals.

4. VOLTAGE ADJUST - These two controls adjust the output voltage of the two supplies.

5. CURRENT ADJUST - These two controls adjust the maximum output current that the two supplies will put out.

6. OUTPUT TERMINALS - There are two sets of three terminals (one set for each supply). They represent positive, negative and ground. Note that the two inside connectors (one + the other -) should be connected together when the supply is used in tracking mode.

7. INDEPENDENT/TRACKING SWITCH - This toggle switch is used to turn the tracking function on and off.

8. METER ZERO - Each meter has a mechanical screw adjustment for setting the zero point.

9. 5V/3A OUTPUT - These two terminals have a fixed 5V/3A voltage output. The GND terminal is connected to the earth ground.

Operating Instructions

WARNING - Before applying power to your TPS-4000 Series power supply, make sure that the AC input voltage setting (SW103 and SW104 at bottom) is correctly set for your available power.

1. Connect the instrument to an AC power source using the line cord provided and turn the POWER ON switch (1) on. For maximum stability, allow the instrument to warm up for at least 20 minutes.

2. Independent Mode - Set the INDEPENDENT/TRACKING switch (7) to the independent position. The two sets of voltage and current adjustment knobs may then be used to set the outputs to the desired levels.

3. Tracking Mode - Set the INDEPENDENT/TRACKING switch (7) to the tracking position. Using the voltage adjustment knob marked "MASTER", set the desired output voltage. The slave channel will have the same output voltage (but opposite polarity) as the master. You may use the two current adjustment knobs to independently set the maximum current for each channel.

Operating Cautions

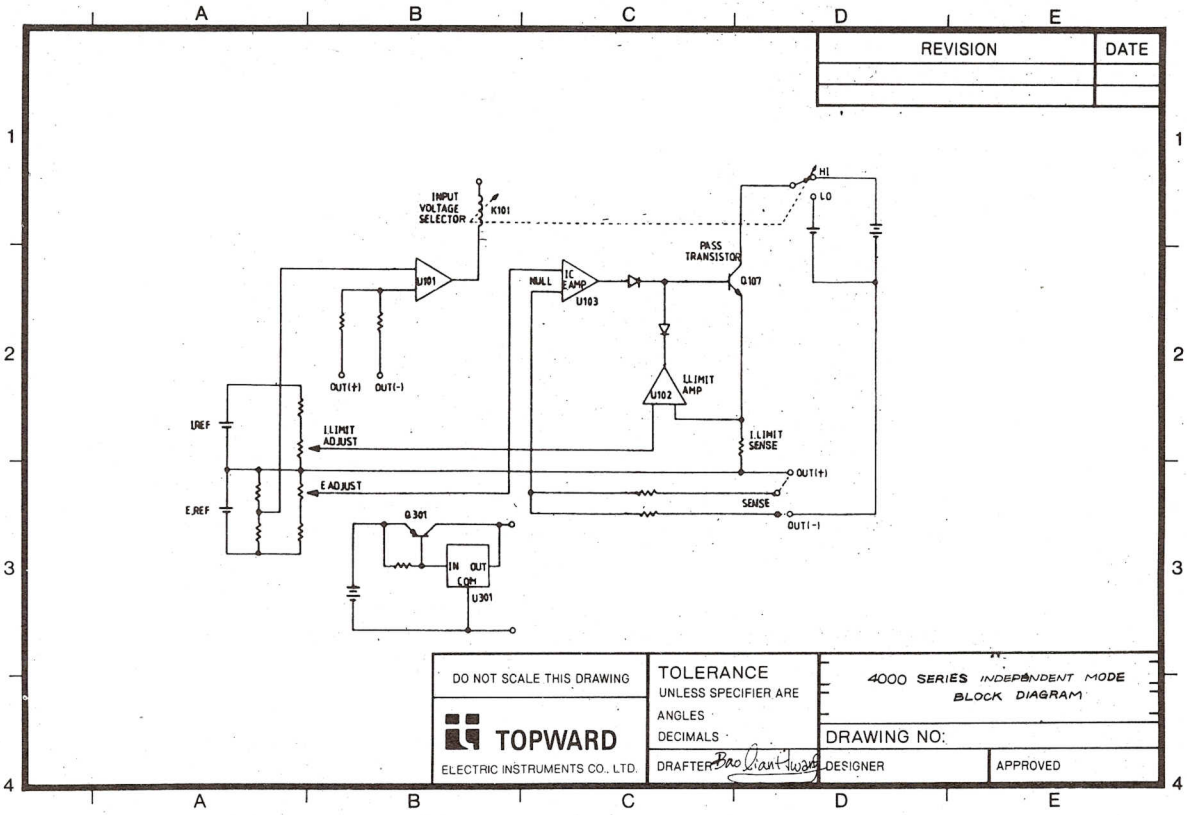
Please follow the following cautions when using your Model TPS-4000 Series power supply to prevent damage to the unit.

1. Verify that the AC voltage setting is the same as your available power BEFORE you apply power for the instrument.

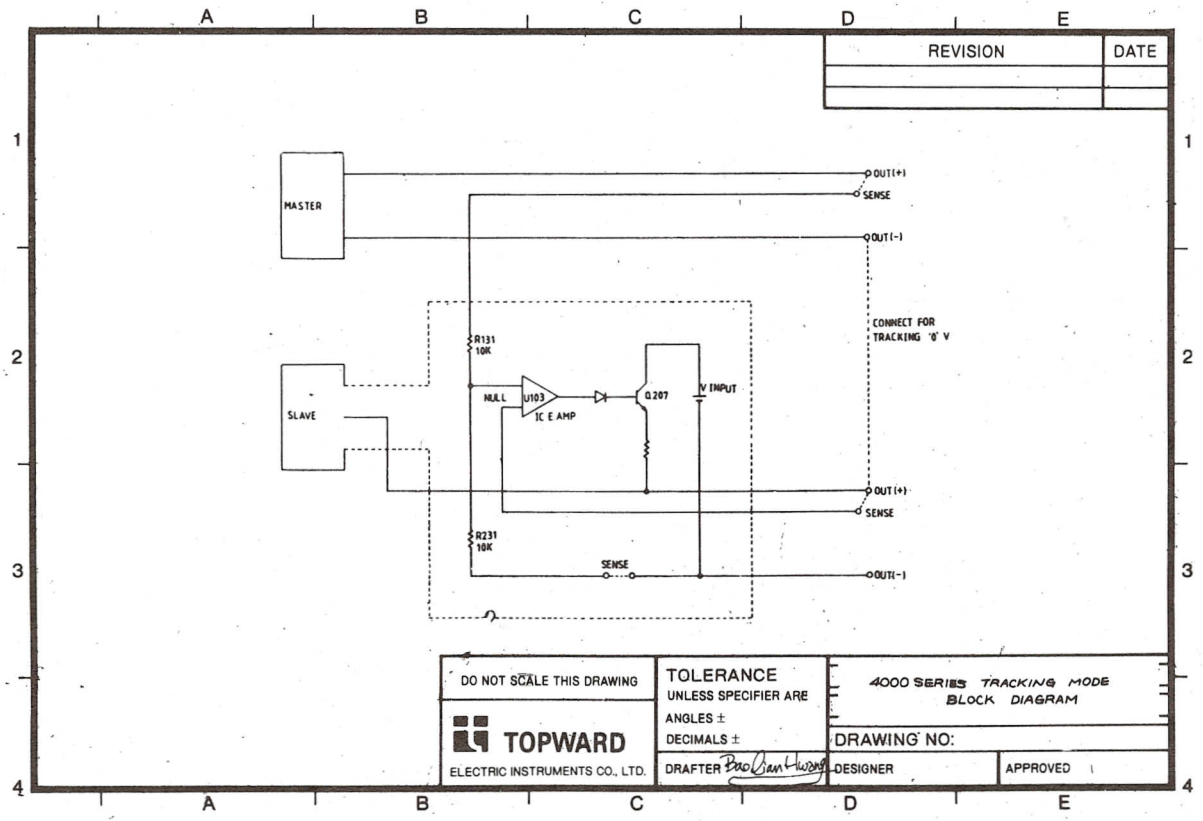
2. Do not connect a voltage that is greater than the current output voltage to the terminals of the instrument.

3. Do not overload the 5 volt/3 amp output (Models 4302 and 4303 only) for more than 20 minutes in any one hour period.

Block Diagram
(Independent Mode)



Block Diagram
(Tracking Mode)



Maintenance & Calibration

To keep your TPS-4000 Series power supply in top working condition, you should periodically calibrate it. As you follow the adjustment procedure below, refer to the component layout diagram for the location of the adjustment components.

1. Mechanical zero adjustment - Using a small screwdriver, turn off the power and adjust the four screws under the meters to read zero.

2. Set the tracking/independent switch (7) to Independent.

3. Turn on the unit and connect a digital multimeter (Topward Model TDM-104 or eqivalent) set to the 200 volt range to the output terminals. Turn the Voltage Adjustment knob (4) fully clockwise. Adjust R33 until the output is within the range 31V - 32V (Models 4302, 4303, 4305) or 62V - 63V (Models 4602, 4603).

4. Turn the Voltage Adjustment knob (4) until the output voltage is exactly 30 volts (Models 4302, 4303, and 4305) or 60 volts (Models 4602 and 4603). Adjust R34 until the meter reads 30 volts (or 60 volts depending on the model).

5. Set the multimeter to measure DC amperes and the range to 20A. Turn the voltage adjustment knob to approximately 25% of full scale and the Current adjustment knob to maximum. Adjust R32 until the output current is between 2.1A - 2.2 A (Models 4302 and 4602), 3.1A - 3.2A (Models

4303, 4603) or 5.1A - 5.2A (Model 4305).

6. Turn the Current adjustment knob until the output current is exactly 2 amps (Model 4302 or 4602), 3 amps (4303, or 4603) or 5 amps (Model 4305). Adjust R35 until the meter indicates the above values.

Troubleshooting

1. Control Section for Power Supply and Correct Reference Voltage (for both channel and independent modes)
   A. Check to be sure that voltage select switch on bottom is switched to correct line voltage.
   B. With power on, check CC, CV, and power LED. If there is indication of functional error, turn off power. Then check transformer and fuse on rear panel.
   C. Turn on power again and consult circuit diagram. There are two diode bridge circuits. The upper one from CR101 to CR104 is for the main power source. The lower one from CR105 to CR108 is for the control circuit and the reference voltage generator.
   D. Check to be sure that the Q105 emitter is set at a positive reading of 9.6V±10% and that the Q106 emitter is set at a negative reading of 11.5V±10%. The DMM GND (negative) clip must be clipped to the main output (positive) terminal.
   E. Check VR103 to be sure that VR103 shows a positive reading of 3.3V±10% and that VR104 shows a negative reading of 8.2V±10%.

2. Voltage Control Circuit

A. Turn the voltage vernier (main and fine) to minimum and the current vernier to maximum. Check to be certain that the U103 pin 6 shows a reading of from -5V to -12V.
B. Then turn the voltage vernier to maximum and check to see that U103 pin 6 shows a reading of +2V ±20%.
C. Please note that the positive voltage control current passes through Q101, Q102, and Q107.
D. The voltage meter is controlled by the voltage vernier.

3. Current Control Circuit

A. Turn the current vernier to minimum. Check to be sure that the U102 output shows a reading of from -5V to -9V.
B. Turn both voltage verniers to maximum.
C. Connect the positive output terminal and the negative output terminal with a 5 Ohm 50W resistor or similar component.
D. The current meter is controlled by the current vernier.

4. Relay Circuit and the CC and CV LED

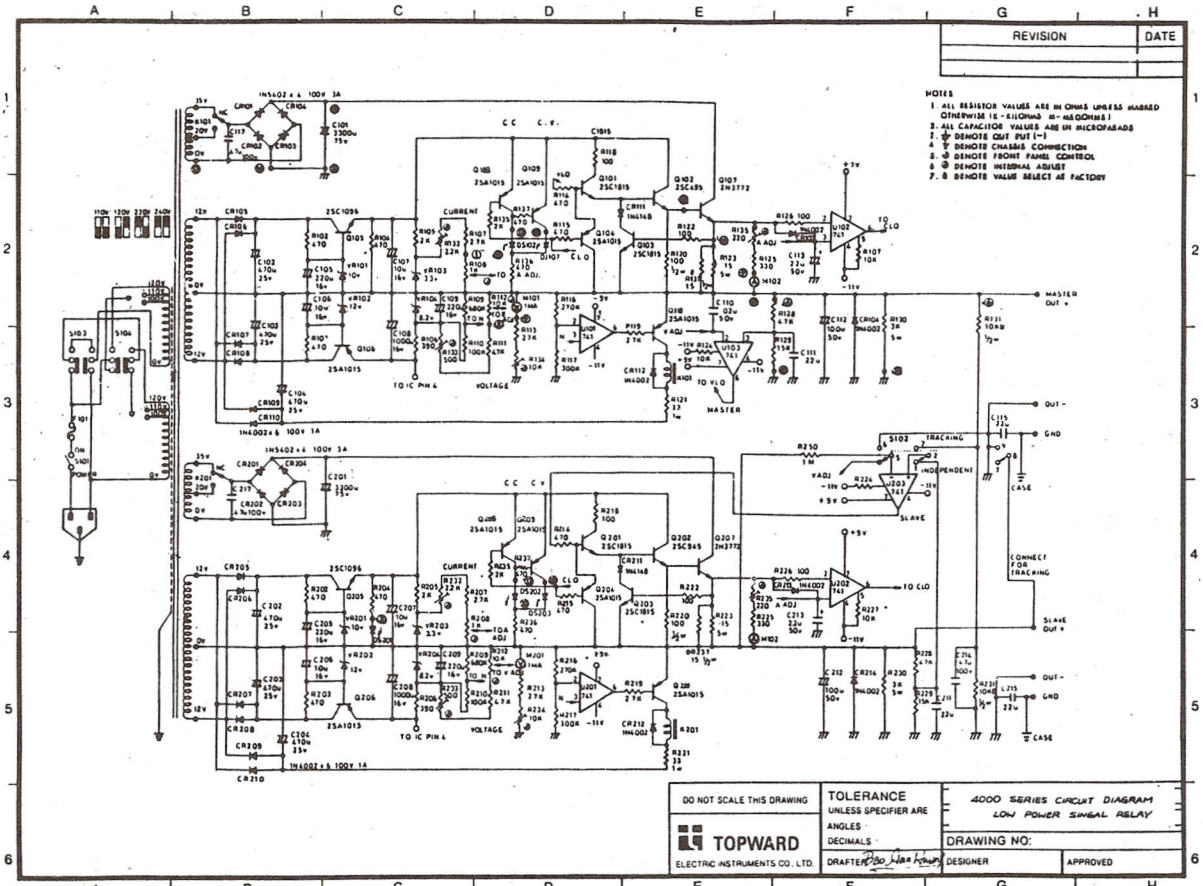
A. The U101 relay control IC is controlled by the output voltage. At approximately half of maximum output the relay will change state. Please note that with specially ordered power supplies there may be a four state relay change.
B. The CC LED is controlled by the constant current mode. Otherwise it will be controlled by the constant voltage mode.

5. Tracking

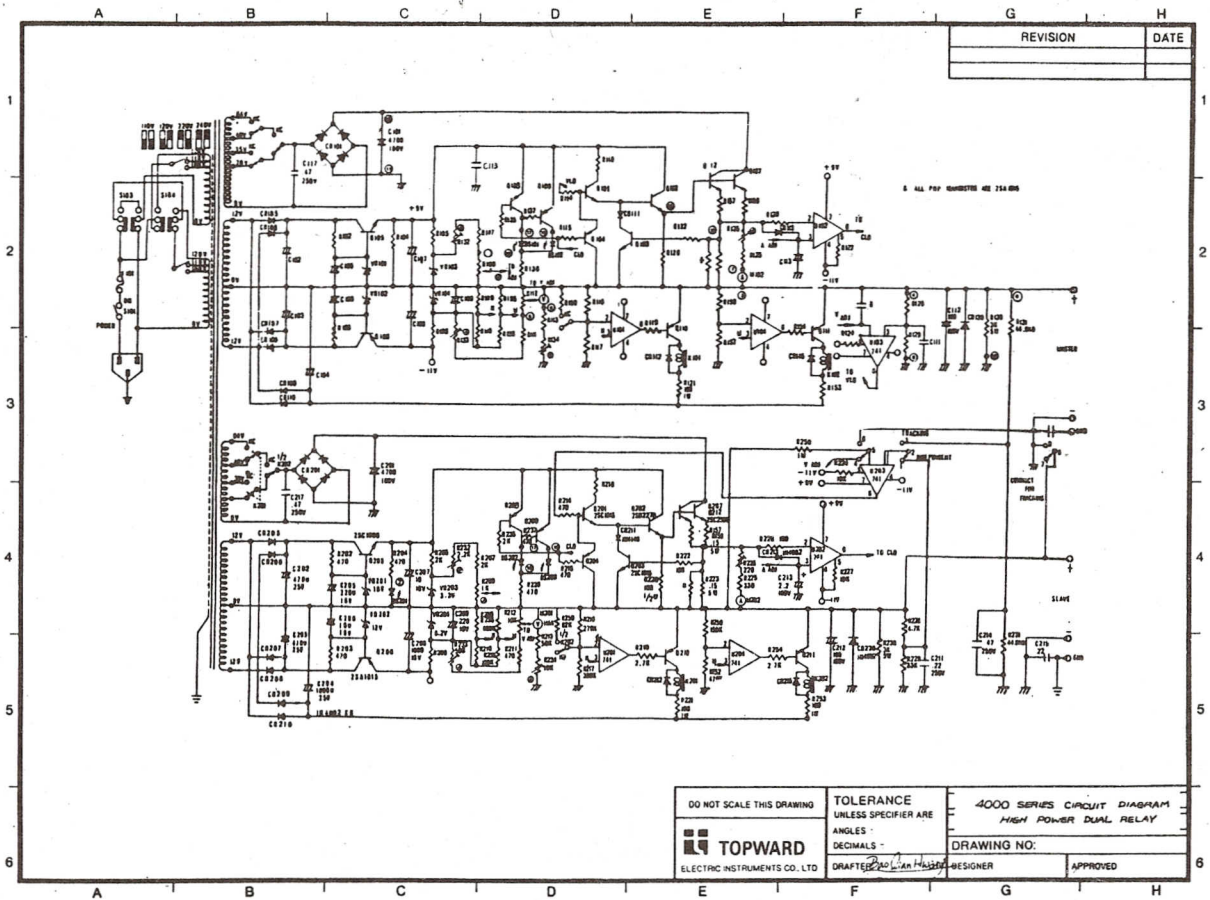
   A. Turn the tracking switch to tracking location.

   B. U203 is controlled by the master output which is positive. Its output passes through Q201, Q202, and Q207 to the positive slave output.

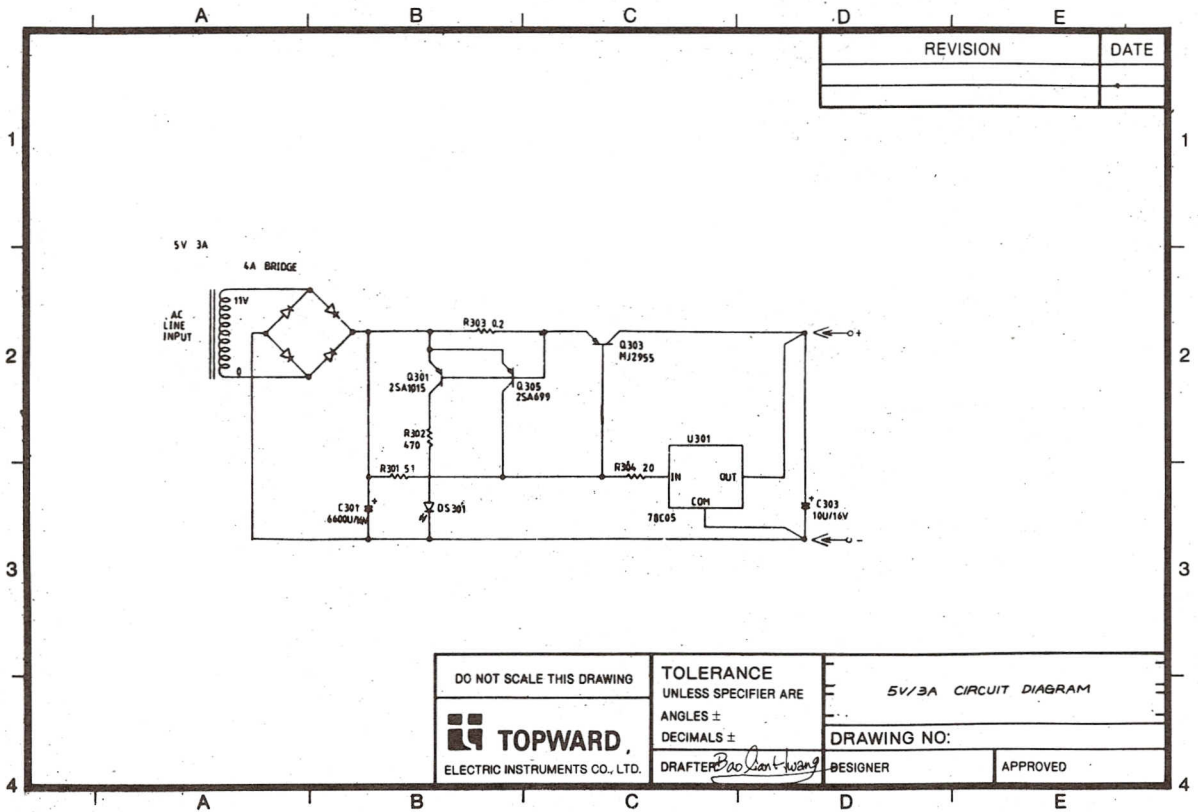
Circuit Diagram



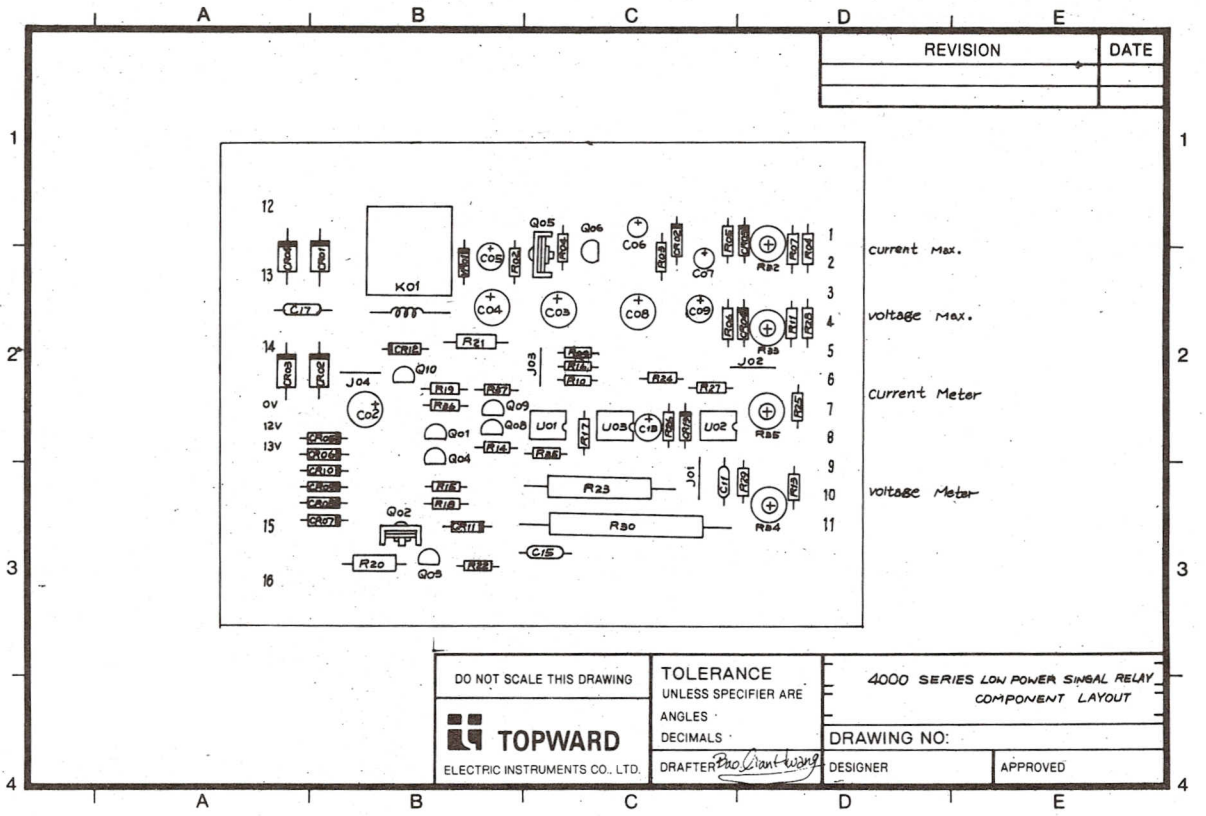
Circuit Diagram



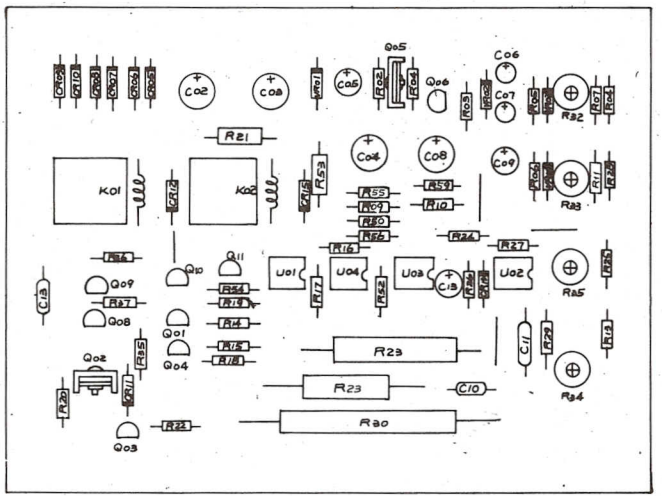
5V/3A Circuit Diagram



Component Layout



REVISION	DATE



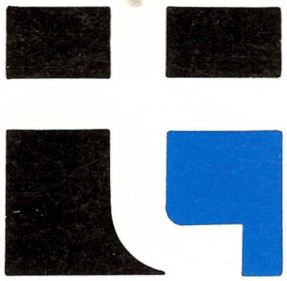
DO NOT SCALE THIS DRAWING	TOLERANCE UNLESS SPECIFIER ARE ANGLES ± DECIMALS ±	4000 SERIES HIGH POWER DUAL RELAY COMPONENT LAYOUT
TOPWARD ELECTRIC INSTRUMENTS CO., LTD.	DRAFTER Rae Chen Huang	DRAWING NO: DESIGNER / APPROVED

Specifications

Mode			4303	4302	4309	4603	4602
Output	DC Voltage DC Current		0-30V 0-3A	0-30V 0-2A	0-30V 0-5A	0-60V 0-3A	0-60V 0-2A
Loading Effect (Load Regulation)	CV CC		0.02%+2mV 0.02%+0.5mA				
Source Effect (Line Regulation)	CV CC		0.02%+2mV 0.02%+0.25mA				
PARD (Ripple & Noise) At Any Line Voltage	CV CC		0.5mV(rms), 4mV(p-p) 0.5mA(rms), 4mA(p-p)				
Programming Speed Typical Time to Change Output from 0.5% to 99.5% of Rate Value	Up Down	NL FL NL FL	400mS 600mS 2.5S 200mS		400mS 600mS 3.0S 250mS		
Output Impedance (Typical)			5mΩ+2μH				
Input 115V/230V±10%			3.7A 400W 50-60 Hz	2.6A 290W 50-60 Hz	5.7A 630W 50-60 Hz	6.1A 680W 50-60 Hz	4.3A 470W 50-60 Hz
Constant 5V Output Load and Source Effect Ripple and Noise < 2mV			Voltage Range: 4.75V Min, 5.25V Max 0.1%+5mV Output Current 3A±10% 4302 and 4303 Only				
Dimensions: (Width, Height, Depth in mm) Weight: (in KG) Accessory: ACS-002 (Banana-Clip)			250x140x360 10 2	250x140x360 10 2	250x140x420 14.5 2	250x140x420 14.5 2	250x140x420 13.2 2

Operating Temperature Range: 0° C to 40° C in Operation
-20° C to 55° C in Storage

Notes: NL=No Load, FL=Full Load
CV=Constant Voltage, CC=Constant Current



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