EUROELETTRA
elettronica - computers
strumentazione

INSTRUCTION MANUAL

DIGITAL DC POWER SUPPLY

Model: TPS 2000D/4000D Series

TOPWARD

TABLE OF CONTENTS

Picture of Models TPS-2000D & 4000D..... 1
Introduction..... 2
Before We Begin..... 3
Front Panel of Model TPS-2000D & 4000D Series..... 4
Front Panel Description..... 5
Operating Instructions..... 7
Operating Cautions..... 9
Block Diagrams.....10
Maintenance & Calibration.....12
Troubleshooting.....14
Circuit Diagrams.....17
Component Layout.....21
Specifications.....22
Parts List.....24

PICTURE OF MODELS TPS-2000D & 4000D



TPS-2000D Series



TPS-4000D Series

INTRODUCTION

The Topward Models TPS-2000D and 4000D series are bench top laboratory DC power supplies which incorporate a 3 1/2 digits LCD meter for monitoring voltages and currents. In monitoring mode, the LCD meter displays the output voltage in 4 automatic ranges from 199.9 mV to 199.9 V, and current in 1 fixed range of 19.99 Amps. In DVM mode, the meter displays the measured DC voltage up to 200 volts.

The models 2000D are single output, and 4000D are triple outputs supplies. The two main supplies in models 4000D can be operated in series, or tracking mode. A fixed 5V, 3A output adds versatility to models 4000D.

The models TPS-2000D, 4000D series power supplies are ideal DC power sources for use in schools, service and testing departments, engineering laboratory, even in some battery charging applications.

BEFORE WE BEGIN

The Topward Model TPS-2000D or 4000D is packed in styrofoam to protect it during shipment. You should keep this material, as well as the shipping box, in case your unit must be moved or shipped again.

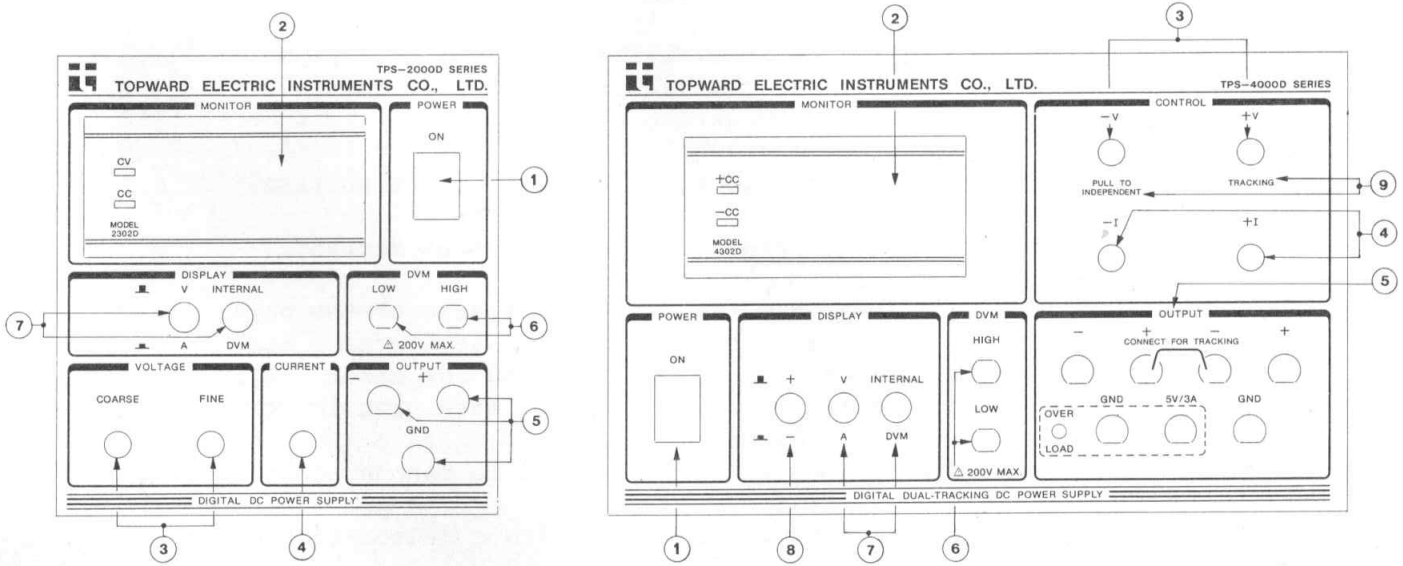
The box should contain the following items:

- Model TPS-2000D or TPS-4000D power supply
- Removeable AC line cord
- Banana plug to alligator clip cable
- Instruction manual

Please check to see that all of the above items are included. Contact your dealer if anything is missing.

FRONT PANEL OF MODEL TPS-2000D & 4000D Series

Figure 1



FRONT PANEL DESCRIPTION

The following is an explanation of the function of each controls and connectors. You should refer to Figure 1 for the locations.

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

2. **VOLTAGE/CURRENT MONITOR** - This monitor displays the output voltage and current of the power supply, or the measured external voltage of the DVM. In addition, LED indicators for enunciating CV, CC modes.

3. **VOLTAGE ADJUSTMENT** - This control sets the output voltage.

4. **CURRENT ADJUSTMENT** - This control sets the output current.

5. **OUTPUT TERMINALS** - These are the output terminals of the power supplies. Each supply has three color coded binding posts. In tracking mode (TPS-4000D only), the two inside connectors, one (+) and the other (-), should be shorted together using the metal strip provided. When used in other modes, the metal strip must be removed. Do not overload the 5V/3A output to more than 20 minutes in any one hour period. The GND terminal is connected to earth ground.

6. **DVM INPUT** - Terminals for external DC voltage measurement up to 200 VDC maximum.

7. **V/A, INTERNAL/DVM SWITCHES** - When in internal mode, the V/A switch may be selected to display either the output voltage (V) or current (A). When in DVM mode, the monitor displays the measured voltage from DVM input terminals.

8. **+ / - SWITCH** - This switch selects the positive or negative output voltage or current to be displayed (TPS-4000D only).

9. **TRACKING/INDEPENDENT SELECT** - When (-V) is pushed in, the main supplies are in tracking mode. The tracking voltage is controlled by (+V) knob. Although (+I) and (-I) still can be set individually. When (-V) is pulled out, the output voltages and currents are independently controlled by (+V), (-V), (+I), (-I) knobs (TPS-4000D only).

OPERATING INSTRUCTIONS

WARNING - Before connecting line power to your TPS-2000D, 4000D power supply, make sure that the AC input voltage setting (S103 and S104 in rear panel) is correct for your power source.

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

2. Set **V/A** and **INTERNAL/DVM** switches (7) to out position. Use **VOLTAGE ADJUSTMENT** knob (3) to set desired output voltage. Now push **V/A** switch to in position and short main **OUTPUT TERMINALS** (5) with cable. Then use **CURRENT ADJUSTMENT** knob (4) to set maximum allowable output current.

3. Connect the appropriate cables to the **OUTPUT TERMINALS** (5) and your circuit.

4. When an unknow DC voltage needs to be measured, push **INTERNAL/DVM** switch (7) to in position. Connect the unknown voltage to **DVM INPUT** terminals (6). The result will then display on the monitor. Do not exceed 200 VDC.

5. To use the tracking mode (TPS-4000D only), short out the two inside **OUTPUT TERMINALS** (5) with the metal strip. Push (-V) **VOLTAGE ADJUSTMENT** knob

(3) to in position. Set the desired tracking voltage with (+V) **VOLTAGE ADJUSTMENT** (3) knob. Current can be set with procedure outlined in step 2 above.

OPERATING CAUTIONS

Please observe the following cautions when operating your TPS-2000D, 4000D power supply. Failure to adhere to these procedures will damage the unit and void your warranty.

1. Verify that the AC voltage setting matches your power source BEFORE applying power to the instruments.

2. Do not connect a voltage that is greater than the set voltage at the output terminals.

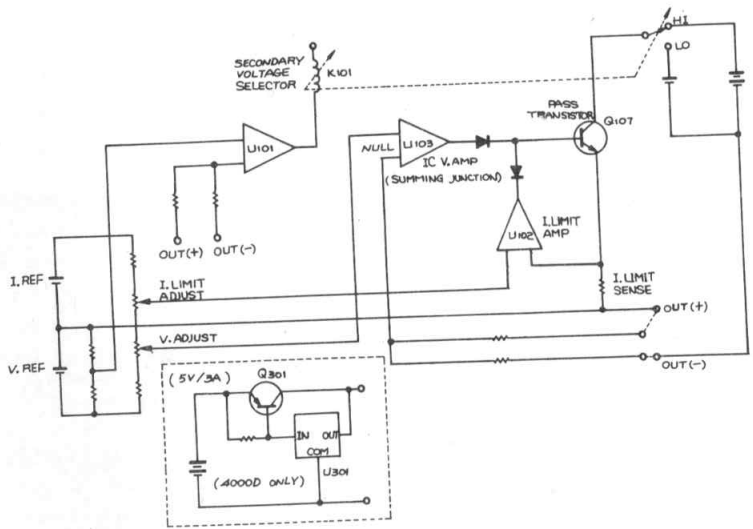
3. Do not overload the 5V/3A output (TPS-4000D only) for more than 20 minutes in any one hour period.

4. Do not apply more than 200 VDC or peak AC voltage into the DVM input.

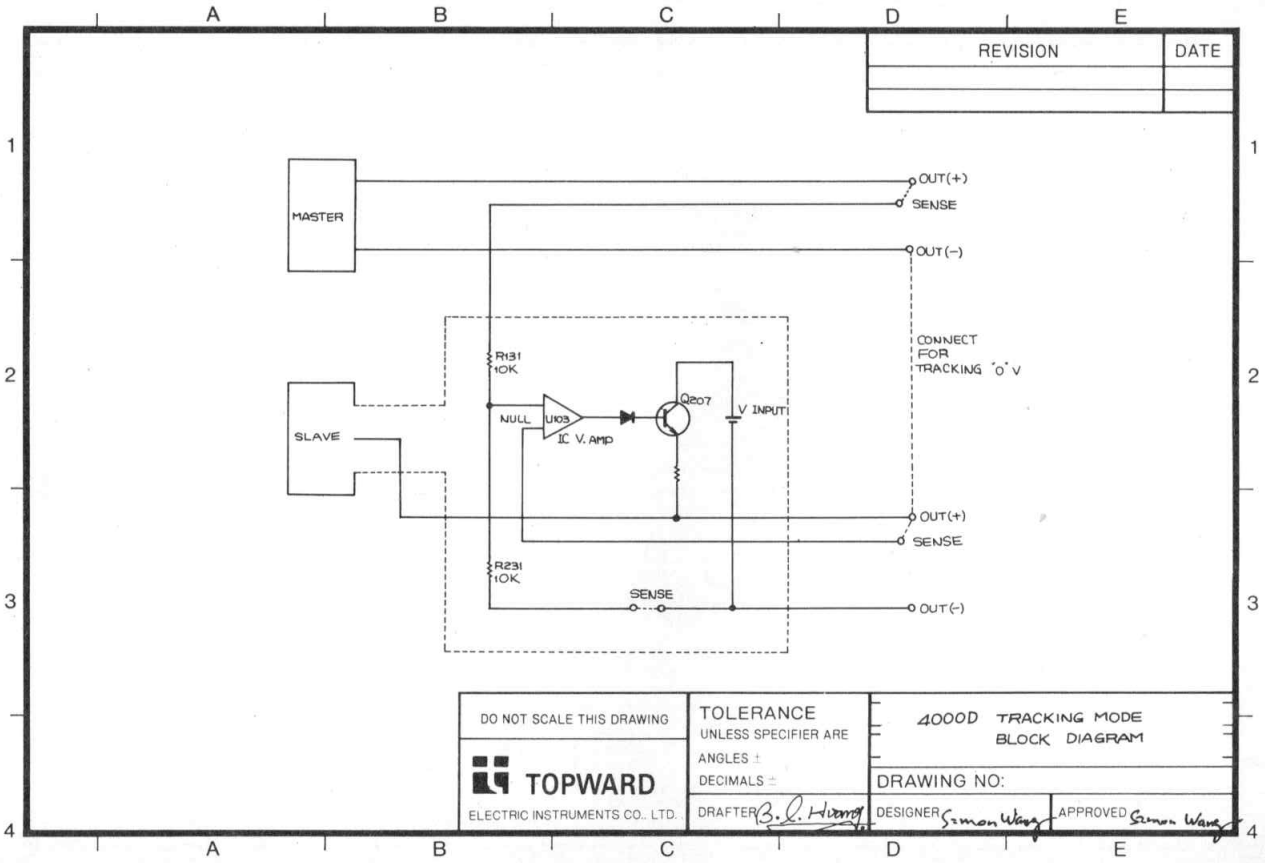
5. Do not parallel the outputs of two or more TPS-2000D or TPS-4000D supplies.

BLOCK DIAGRAMS

REVISION	DATE



DO NOT SCALE THIS DRAWING	TOLERANCE UNLESS SPECIFIER ARE	2000D/4000D SERIES BLOCK DIAGRAM
TOPWARD ELECTRIC INSTRUMENTS CO., LTD.	ANGLES ± DECIMALS ±	DRAWING NO:
	DRAFTER B. O. Hsiung	DESIGNER Simon Wang APPROVED Simon Wang


A
B
C
D
E
1
2
3
4
REVISION
DATE
MASTER
OUT(+)
SENSE
OUT(-)
CONNECT FOR TRACKING '0' V
R131 10K
SLAVE
NULL
U103 IC V. AMP
Q207
V INPUT
OUT(+)
SENSE
R231 10K
SENSE
OUT(-)
DO NOT SCALE THIS DRAWING
TOPWARD
ELECTRIC INSTRUMENTS CO., LTD.
TOLERANCE
UNLESS SPECIFIER ARE
ANGLES ±
DECIMALS ±
4000D TRACKING MODE BLOCK DIAGRAM
DRAWING NO:
DRAFTER B. L. Huang
DESIGNER Simon Wang
APPROVED Simon Wang

MAINTENANCE & CALIBRATION

To keep your TPS-2000D, 4000D 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. Pull the **INDEPENDENT** switch (9) to **INDEPENDENT** mode (TPS-4000D only).

2. Turn on the unit and connect a digital multimeter (Topward Model TDM-104 or equivalent) set to the DC 200V range to the output terminals. Turn the **VOLTAGE ADJUSTMENT** knob (3) fully clockwise. Adjust R33 until the output is 105% of the maximum rated voltage. Repeat the above procedure for the other output (TPS-4000D only).

3. Set the multimeter to DC 20A range. Turn the **VOLTAGE ADJUSTMENT** knob (3) to approximately 25% of rated voltage and the **CURRENT ADJUSTMENT** knob (4) to fully clockwise. Adjust R32 until the output current is 105% of the rated current. Repeat the above procedure for the other output (TPS-4000D only).

4. Push the **INTERNAL/DVM** switch (7) in to **DVM** mode. Apply a +190mV into **DVM INPUT** (6). Adjust R412 until the **MONITOR** displays (2) 190.0mV $\pm$ 0.1mV. Change the input voltage to 1.9V. Adjust R404 until the **MONITOR** displays (2) 1.900V $\pm$ 0.001V.

5. Push **V/A** switch (7) in to **A** mode, **INTERNAL/DVM** switch (7) out to **INTERNAL** mode. Turn the **CURRENT ADJUSTMENT** knob (4) until the output current indicated on TDM-104 is exactly 2 amps (Model 2302D, 4302D) or 3 amps (2303D, 4303D). Adjust R34 until the **MONITOR** (2) indictates the same value. Repeat the above procedure for the other output (TPS-4000D only).

TROUBLESHOOTING

1. Power section for control circuit and Reference Voltage

A. Check to be sure that line voltage select switch on rear panel is switched to correct line voltage.

B. With power on, check CC, CV (2000D series only) 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 the voltage of Q105, Q106 emitter with a digital multimeter (Topward Model TDM-104 or equivalent). It should read +9.6V ± 10% on Q105 and -11.5V ± 10% on Q106. The DMM GND (negative) clip must be clipped to the main positive **OUTPUT TERMINAL** (5).

E. Check the voltage of CR113, CR114. It should read + 3.3V ± 10% on CR113 and -8.2V ± 10% on CR114.

2. **Voltage Control Circuit**

A. Turn the **VOLTAGE ADJUSTMENT** knob (3) to minimum and the **CURRENT ADJUSTMENT** knob (4) to maximum. Check to be sure that the voltage of U103 pin 6 is within -5V and -12V.

B. Then turn the **VOLTAGE ADJUSTMENT** knob (3) to maximum and check to be sure that the voltage of U103 pin 6 is +2V $\pm$ 20%.

C. Please note that the positive voltage control current passes through Q101, Q102, and Q107.

D. Check to be sure that the voltage display of the **MONITOR** (2) is controlled by **VOLTAGE ADJUSTMENT** knob (3).

3. **Current Control Circuit**

A. Turn the **CURRENT ADJUSTMENT** knob (4) to minimum. Check to be sure that the voltage of U102 pin 6 is within -5V and -9V.

B.. Turn **VOLTAGE ADJUSTMENT** knob (3) to maximum.

C. Connect the positive **OUTPUT TERMINAL** (5) and the negative **OUTPUT TERMINAL** (5) with a 5 Ohm 50W resistor or similar component.

D. The current display of the **MONITOR** (2) is controlled by the **CURRENT ADJUSTMENT** knob (4).

4. **Relay Circuit and the CC, CV LED**

A.The U101 (relay control IC) is controlled by the main output voltage. At approximately half of the maximum output voltage, the relay will change state.

B. The CC LED is controlled by the constant current mode. The CV LED is controlled by the constant voltage mode.

5. **Tracking**

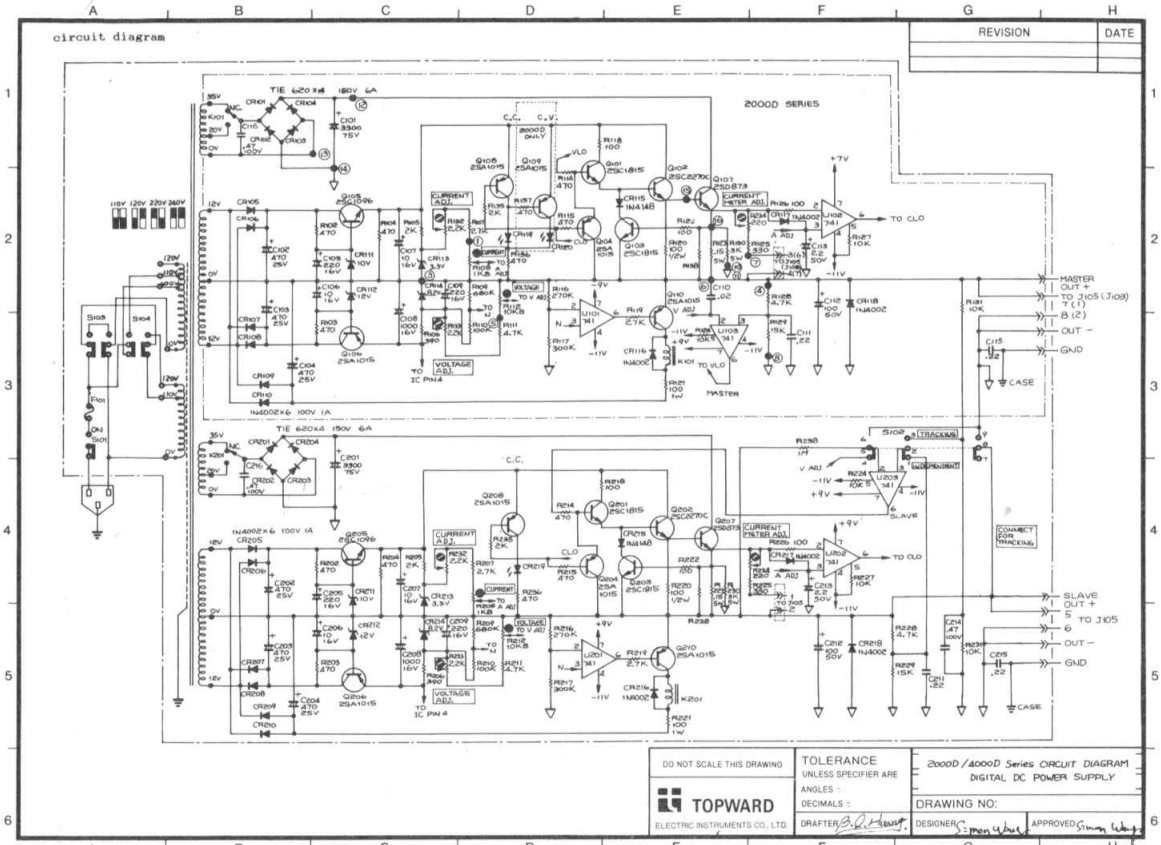
A. Push the **INDEPENDENT** switch (9) in to **TRACKING** mode.

B. U203 is controlled by the master output voltage. The output voltage control current passes through Q201, Q202 and Q207.

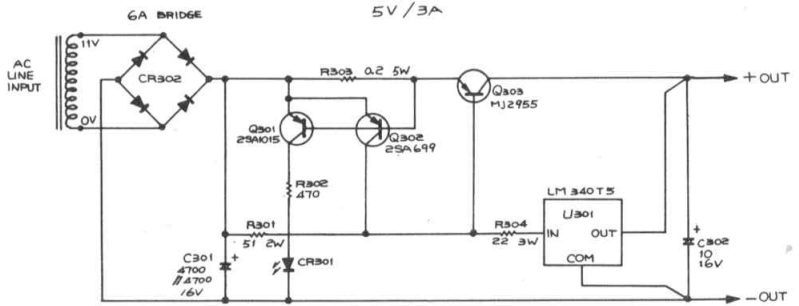
6. **Monitor**

A. Check to be sure that the voltage of U402 pin 3 is +9V $\pm$ 5%.

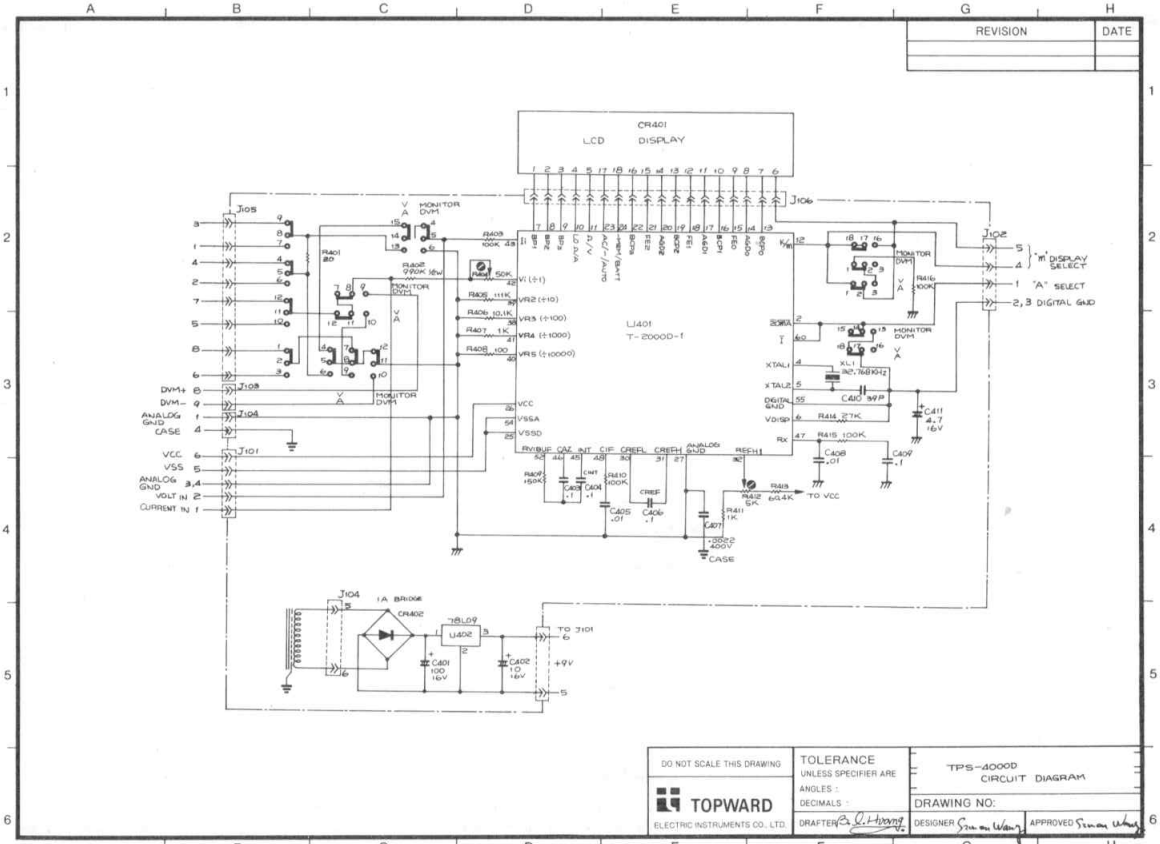
B. U401 is an 3 1/2 digit LCD DVM chip. If the display is not working, check for bad connections or defective display module.

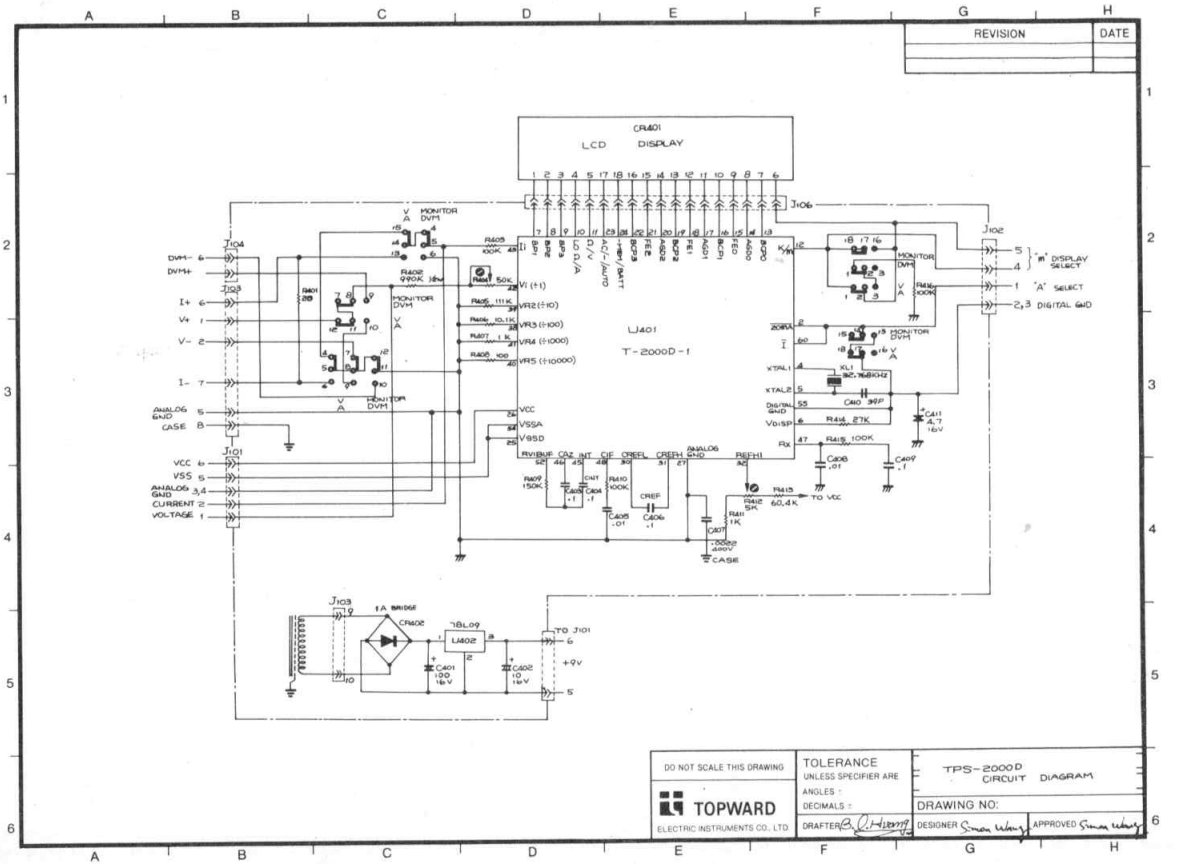

circuit diagram
REVISION
DATE
2000D SERIES
MASTER
SLAVE
TO CLO
TO J105 (J103)
CASE
GND
DO NOT SCALE THIS DRAWING
TOLERANCE
UNLESS SPECIFIER ARE
ANGLES :
DECIMALS :
TOPWARD
ELECTRIC INSTRUMENTS CO., LTD.
DRAFTER
DESIGNER
APPROVED
2000D /4000D Series CIRCUIT DIAGRAM
DIGITAL DC POWER SUPPLY
DRAWING NO:

REVISION	DATE



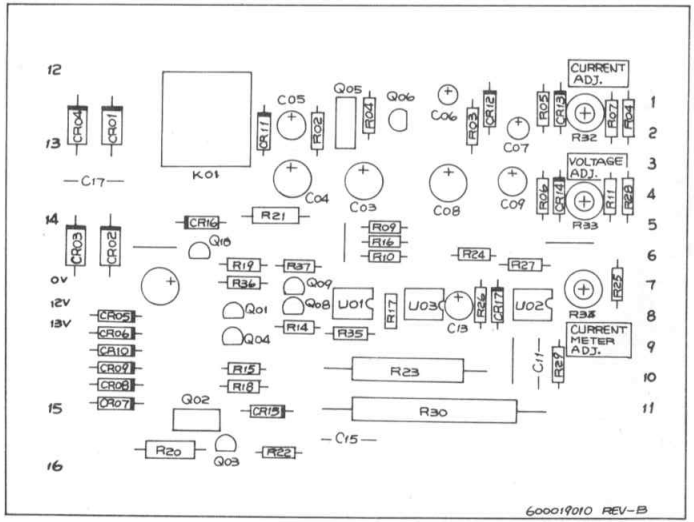
DO NOT SCALE THIS DRAWING	TOLERANCE UNLESS SPECIFIER ARE ANGLES ± DECIMALS ±	4000D SERIES 5V/3A CIRCUIT DIAGRAM
TOPWARD ELECTRIC INSTRUMENTS CO., LTD.	DRAFTER B.L. Hwang.	DRAWING NO: DESIGNER Simon Wang. APPROVED Simon Wang.

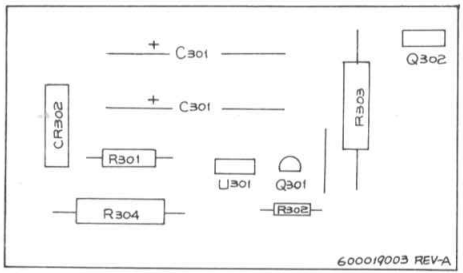

REVISION
DATE
CR401
LCD DISPLAY
J106
J105
J102
J103
J104
J101
MONITOR DVM
LU401
T-2000D-1
XL1
INC.768KHz
C410 39P
R414 27K
R415 100K
C411 4.7 16V
C408 .01
C409 .1
R416 100K
'm' DISPLAY SELECT
'A' SELECT
2,3 DIGITAL GND
DVM+
DVM-
ANALOG GND
CASE
VCC
VSS
ANALOG GND
VOLT IN
CURRENT IN
1A BRIDGE
CR402
7BL09
U402
C401 100 16V
C402 10 16V
+9V
-5
TO J101
TO VCC
C407 .0022 400V
CASE
DO NOT SCALE THIS DRAWING
TOLERANCE
UNLESS SPECIFIER ARE
ANGLES :
DECIMALS :
TOPWARD
ELECTRIC INSTRUMENTS CO., LTD.
DRAFTER
TPS-4000D
CIRCUIT DIAGRAM
DRAWING NO:
DESIGNER
APPROVED

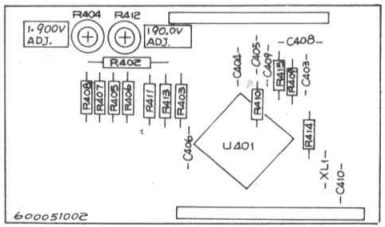

REVISION
DATE
CR401
LCD DISPLAY
J106
J104
J103
J101
J102
U401
T-2000D-1
DVM+
DVM-
I+
V+
V-
I-
VCC
VSS
CURRENT
VOLTAGE
ANALOG GND
CASE
MONITOR DVM
DISPLAY SELECT
'A' SELECT
DIGITAL GND
TO VCC
CASE
TO J101
+9V
1A BRIDGE
CR402
78L09
U402
DO NOT SCALE THIS DRAWING
TOLERANCE
UNLESS SPECIFIER ARE
ANGLES ±
DECIMALS ±
TOPWARD
ELECTRIC INSTRUMENTS CO., LTD.
DRAFTER
DESIGNER
APPROVED
TPS-2000D
CIRCUIT DIAGRAM
DRAWING NO:

COMPONENT LAYOUT

REVISION	DATE







DO NOT SCALE THIS DRAWING	TOLERANCE UNLESS SPECIFIER ARE	2000D / 4000D SERIES DIGITAL DC POWER SUPPLY COMPONENT LAYOUT
TOPWARD ELECTRIC INSTRUMENTS CO., LTD.	ANGLES ± DECIMALS ±	DRAWING NO:
	DRAFTER B. L. Hwang	DESIGNER Simon Wang APPROVED Simon Wang

SPECIFICATIONS

Mode			2303D	2302D	4303D	4302D
Output	DC Voltage		0-30V	0-30V	0±30V	0±30V
	DC Current		0-3A	0-2A	0±3A	0±2A
Loading Effect (Load Regulation)	CV		0.02% + 2mV			
	CC		0.02% + 0.5mA			
Source Effect (line Regulation)	CV		0.02% + 2mV			
	CC		0.02% + 0.25mA			
PARD (Ripple & Noise) At Any Line Voltage	CV		0.5mV(rms), 4mV(p-p)			
	CC		0.5mA(rms), 4mA(p-p)			
Programming Speed Typical Time to Change Output from 0.5% to 99.5% of Rate Value	Up	NL	400mS			
		FL	600mS			
	Down	NL	2.5 S			
		FL	200mS			
Output Impedance (Typical)			5mΩ + 2uH			
Display			3 1/2 LCD display with unit indicator			

Mode		2303D	2302D	4303D	4302D
Output Voltage Monitor		199.9mV, 1.999V, 19.99V, 199.9V 4 Auto-ranges			
Output Current Monitor		19.99A			
DVM		±199.9mV, ±1.999V, ±19.99V, ±199.9V 4 Auto-ranges			
Accuracy		± (0.2% + 2d)			
Tracking Error				± (0.2% + 5mV)	
5V/3A Output	Output Voltage			5V ± 5% (Fixed)	
	Output Current			3A (Max.)	
	Ripple and Noise			< 2 mVrms	
	Regulation			0.1% ± 5 mV	
Input 110V/120V + 10% 50-60Hz 220V/240V + 10%		1.5A 170W	1.1A 120W	3.7A 400W	2.6A 290W
Dimensions: (W, H, D in mm)		125x140x300	125x140x300	210x140x363	210x140x363
Weight: (in Kg)		4.9	4.2	9.8	8.2
Accessory: ACS-002 (Banana-Clip)		1	1	2	2
Operating Temperature Range:		0°C to 40°C in Operating			
		-20°C to 55°C in Storage			
Notes: NL=No Load, FL=Full Load; CV=Constant Voltage, CC=Constant Current					

PARTS LIST

DESIGNATION	DESCRIPTION				
(600019010 REV-B)					
C 101/201	CAP	ELEC	3300UF	+80%-20%	75V
C 102/202	CAP	ELEC	470UF	+80%-20%	25V
C 103/203	CAP	ELEC	470UF	+80%-20%	25V
C 104/204	CAP	ELEC	470UF	+80%-20%	25V
C 105/205	CAP	ELEC	220UF	+80%-20%	16V
C 106/206	CAP	ELEC	10UF	+80%-20%	16V
C 107/207	CAP	ELEC	10UF	+80%-20%	16v
C 108/208	CAP	ELEC	1000UF	+80%-20%	16V
C 109/209	CAP	ELEC	220UF	+80%-20%	16V
C 110/210	CAP	MYLAR	.02UF	+-10%	50V
C 111/211	CAP	MYLAR	.22UF	+-10%	50V
C 112/212	CAP	ELEC	100UF	+80%-20%	50V
C 113/213	CAP	ELEC	2.2UF	+80%-20%	50V
C 114/214	CAP	MYLAR	.47UF	+-10%	100V
C 115/215	CAP	MYLAR	.22UF	+-10%	50V
C 116/216	CAP	MYLAR	.47UF	+-10%	100V
CR 101/201	DIODE	TIM620	200V	6A	
CR 102/202	DIODE	TIM620	200V	6A	
CR 103/203	DIODE	TIM620	200V	6A	
CR 104/204	DIODE	TIM620	200V	6A	
CR 105/205	DIODE	1N4002	100V	1A	

DESIGNATION	DESCRIPTION
CR 106/206	DIODE 1N4002 100V 1A
CR 107/207	DIODE 1N4002 100V 1A
CR 108/208	DIODE 1N4002 100V 1A
CR 109/209	DIODE 1N4002 100V 1A
CR 110/210	DIODE 1N4002 100V 1A
CR 111/211	ZENER 10V +-5% 0.5W
CR 112/212	ZENER 12V +-5% 0.5W
CR 113/213	ZENER 3.3V +-5% 0.5W
CR 114/214	ZENER 8.2V +-5% 0.5W
CR 115/215	DIODE 1N4148
CR 116/216	DIODE 1N4002 100V 1A
CR 117/217	DIODE 1N4002 100V 1A
CR 118/218	DIODE 1N4002 100V 1A
CR 119/219	LED LTL3218A RED SQUARE
Q 101/201	TRANS 2SC1815
Q 102/202	TRANS 2SC2270C
Q 103/203	TRANS 2SC1815
Q 104/204	TRANS 2SA1015
Q 105/205	TRANS 2SC2270C
Q 106/206	TRANS 2SA1015
Q 107/207	TRANS 2SD873
Q 108/208	TRANS 2SA1015

DESIGNATION		DESCRIPTION		
Q	109/209	TRANS	2SA1015	
Q	110/210	TRANS	2SA1015	
R	102/202	RES	CARBON 470 OHM	+-5% 1/4W
R	103/203	RES	CARBON 470 OHM	+-5% 1/4W
R	104/204	RES	CARBON 470 OHM	+-5% 1/4W
R	105/205	RES	CARBON 2K	+-5% 1/4W
R	106/206	RES	CARBON 390 OHM	+-5% 1/4W
R	107/207	RES	CARBON 2.7K	+-5% 1/4W
R	108/208	RES	VR 1KB KNURL SHAFT	
R	109/209	RES	CARBON 680K	+-5% 1/4W
R	110/210	RES	CARBON 100K	+-5% 1/4W
R	111/211	RES	CARBON 4.7K	+-5% 1/4W
R	112	RES	VR 10KB KNURL SHAFT 160 4 POLE SW (S102)	
R	212	RES	VR 10KB KNURL SHAFT 160	
R	114/214	RES	CARBON 470 OHM	+-5% 1/4W
R	115/215	RES	CARBON 470 OHM	+-5% 1/4W
R	116/216	RES	CARBON 270K	+-5% 1/4W
R	117/217	RES	CARBON 300K	+-5% 1/4W
R	118/218	RES	CARBON 100 OHM	+-5% 1/4W
R	119/219	RES	CARBON 2.7K	+-5% 1/4W
R	120/220	RES	CARBON 100 OHM	+-5% 1/2W
R	121/221	RES	CARBON 100 OHM	+-5% 1W

DESIGNATION		DESCRIPTION	
R 122/222	RES	CARBON 100 OHM	+-5% 1/4W
R 123/223	RES	WIRE WOUND 0.15 OHM	+-5% 5W
R 124/224	RES	CARBON 10K	+-5% 1/4W
R 125/225	RES	CARBON 330 OHM	+-5% 1/4W
R 126/226	RES	CARBON 100 OHM	+-5% 1/4W
R 127/227	RES	CARBON 10K	+-5% 1/4W
R 128/228	RES	CARBON 4.7K	+-5% 1/4W
R 129/229	RES	CARBON 15K	+-5% 1/4W
R 130/230	RES	METAL-OXIDE FILM FIXED 3K	+-10% 5W
R 131/231	RES	MF 10K	+-0.25% 1/4W
R 132/232	RES	SVR 2.2K	
R 133/233	RES	SVR 2.2K	
R 134/234	RES	SVR 220 OHM	
R 135/235	RES	CARBON 2K	+-5% 1/4W
R 136/236	RES	CARBON 470 OHM	+-5% 1/4W
R 137	RES	CARBON 470 OHM	+-5% 1/4W
R 238	RES	CARBON 1M	+-5% 1/4W
U 101/201	IC	LINE UA741	
U 102/202	IC	LINE UA741	
U 103/203	IC	LINE UA741	

DESIGNATION		DESCRIPTION	
(600019003 REV-A)			
C	301	CAP	ELEC(T) 4700UF +80%-20% 16V
C	301	CAP	ELEC(T) 4700UF +80%-20% 16V
C	302	CAP	ELEC 10UF +80%-20% 16V
CR	301	LED	5Ø RED ROUND
CR	302	DIODE	6A BRIDGE
Q	301	TRANS	2SA1015
Q	302	TRANS	2SA699
Q	303	TRANS	MJ2955
R	301	RES	METAL-OXIDE FILM FIXED 51 OHM +-5% 2W
R	302	RES	CARBON 470 OHM +-5% 1/4W
R	303	RES	WIRE WOUND 0.2 OHM +-10% 5W
R	304	RES	METAL-OXIDE FILM FIXE 22 OHM +-10% 3W
U	301	IC	LINE LM340T5
(600051001,600051002,600051004)			
C	401	CAP	ELEC 100UF +80%-20% 16V
C	402	CAP	ELEC 10UF +80%-20% 16V

DESIGNATION		DESCRIPTION			
C	403	CAP	PMD	0.1UF	+-10% 100V
C	404	CAP	PMD	0.1UF	+-10% 100V
C	405	CAP	MYLAR	0.01UF	+-10% 50V
C	406	CAP	PMD	0.1UF	+-10% 100V
C	407	CAP	MYLAR	0.0022	+-10% 400V
C	408	CAP	MYLAR	0.01UF	+-10% 50V
C	409	CAP	MYLAR	0.1UF	+-10% 100V
C	410	CAP	CER	39PF	+-10% 50V
C	411	CAP	ELEC	4.7UF	+80%-20% 16V
CR	401	LCD	DISPLAY VIM 301-2		
CR	402	DIODE	1A BRIDGE		
R	401	RES	CARBON	20 OHM	+-5% 1/4W
R	402	RES	MF	990K	+-5% 1/4W
R	503	RES	CARBON	100K	+-5% 1/4W
R	404	RES	SVR	50K	6CKPV(1S)
R	405	RES	MF	111K	+-0.1% 1/4W
R	406	RES	MF	10.1K	+-0.1% 1/4W
R	407	RES	MF	1K	+-0.1% 1/4W
R	408	RES	MF	100 OHM	+-0.1% 1/4W
R	409	RES	MF	150K	+-1% 1/4W
R	410	RES	CARBON	100K	+-5% 1/4W

DESIGNATION			DESCRIPTION		
R	411	RES	MF	1K	+-1% 1/4W
R	412	RES	SVR	5K	6CKPH(1S)
R	413	RES	MF	60.4K	+-1% 1/4W
R	414	RES	CARBON	27K	+-5% 1/4W
R	415	RES	CARBON	100K	+-5% 1/4W
R	416	RES	CARBON	100K	+-5% 1/4W
U	401	IC	T-2000D-1		
U	402	IC	78L09		
X	401	CRYS	32.768KHZ		
F	101	FUSE 4A L=30.5MM D=6.5Ø			
K	101	RELAY 12V 160 OHM 1POLE 5A COIL			
S	101	SW POWER SWITCH R13-66			
S	103	SW SLIDE SWITCH 6P 6A 125V			
S	104	SW SLIDE SWITCH 6P 6A 125V			
T	101	TRANSFORMER			
		1 SW PUSH SWITCH			
		1 LED SOCKET 5Ø			

DESIGNATION	DESCRIPTION
1	FUSE SOCKET 14.5Ø R3-13A
1	CONNECTOR 6PIN PITCH=2.54MM
1	CONNECTOR 5PIN PITCH=2.54MM
1	CONNECTOR 6PIN PITCH=2.54MM
1	CONNECTOR 8PIN PITCH=2.54MM
2	CONNECTOR 2PIN PITCH=2.54MM
3	CONNECTOR SOCKET 6PIN
2	CONNECTOR SOCKET 5PIN
1	CONNECTOR SOCKET 8PIN
1	PARALLEL WIRE 18PIN
2	TERMINAL R1-14 WHITE
3	TERMINAL R1-14 RED
2	TERMINAL R1-14 BLACK
1	TERMINAL R1-16 RED
1	TERMINAL R1-16 BLACK
2	TERMINAL 3601-0
4	KNOB PN-37 BLACK
3	KNOB 4548 GRAY
3	TO-3 BLACK
2	CONDUCT RUBBER
1	3P-2P AC CORD
1	AC SOCKET 6A 250VAC
5	U TYPE HEAT SINK