Contents

GENERAL DESCRIPTION

FEATURES

- Floating outputs
- Precision voltage setting
- Selectable current mode
- Panel volt-amp meter
- LED mode indicators
- Metal-film or wire-wound resistors
- Toroidal transformers
- Separate regulator PC boards
- Low MTTR
- Programmable version option
- High isolation between outputs/ case

1.1 DESCRIPTION

Compact, easy to operate, and rugged, the POWER-BOX family of laboratory supplies are handy sources of precision regulated power for both digital and linear work.

The Model 3000 series triple-output units offer four combinations of fully adjustable ranges, in addition to the 5V output: two 0 to 40V ranges (Model 3000A), two 0 to 20V ranges (Model 3000B), one 0 to 30V and one 0 to 60V (Model 3000C) or one 0 to 40V and one 0 to 20V range (Model 3000), with each range independently adjustble by a lockable precision ten-turn potentiometer having a repeatability within 0.25%.

The current limit for the 20, 30, 40 and 60V ranges in all the models is set with single-turn potentiometers, which select constant-current limits between 0 and 100% of the maximum rating and thereby provide the constant-current output mode for the power supplies, in addition to overload protection.

The 5V output, wich is screwdriver adjustable between 3-7V, has a semi-foldback current limit wich holds the over-current limit to about 30% of the maximum rating as long as the short persists.

On top of current-limiting and foldback protection, the supplies have self-resetting thermal-overload switches built into their heat-sinks and replaceable fuses mounted inside the cabinets.

Precision 2.5% panel meters, selected by toggle switches, measure the load current or output voltage, and LEDs indicate the operational mode, constant-current (CC) or constant-voltage (CV) output.

All outputs are completely isolated from each other (and from the case), and they may be connected in series in any polarity combination. Also, the 20 or 40V outputs may be paralleled with each other or with the 5V output when set to the same voltage.

The voltage between outputs and to the chassis may be a maximum of 500VDC. The input to chassis is tested to withstand 2500VAC.

A separate terminal is provided for a chassis (ground) connection.

Regulators for the output voltages are individually mounted on separate PC cards for high isolation and easy replacement of faulty circuits. The mean-time-to-repair (MTTR) of the supplies is very low, approx. 30 minutes. High-quality metal-film resistors, or wire-wound units where needed, are used throughout the power supplies to keep voltage settings stable. Toroidal transformers keep flux leakage and the EMI low. Also, the supplies are not affected by RFI/EMI, and can be used close to radio transmitters.

1.2 SPECIFICATIONS

Input voltage: 115/230VAC +10 -15%, 47-400Hz

Output voltages:

Model 3000	3-7V/3A	0-40V/1.25A	0-20V/2.5A
Model 3000A	3-7V/3A	0-40V/1.25A	0-40V/1.25A
Model 3000B	3-7V/3A	0-20V/2.5A	0-20V/2.5A
Model 3000C	3-7V/3A	0-30V/1.8A	0-60V/0.9A

Constant-Voltage Mode:

Output voltage	Regulation line (±10%)	Regulation load (0-100%)	Ripple output	Temp. coef (/°C)	Drift (8hr after 1/2 hr warm up)	Response (100% step at 5A/uS)
5V	±2mV	±10mV	10mVpp	0.01%	0.1%	50uS 0.2Vpp
20, 30, 40 or 60V	-0.05%	-0.05%	3mVpp	0.005%	0.05%	overshoot

Constant-Current Mode:

20, 30, 40 or 60V	0.4mA	4mA	4mA	0.05%

Output impedance:

4mOhm to 1kHz, increasing to 1Ohm at 10MHz

Output Power:

Peak Intermittent 118W

Please consult the formulas on pages 5 and 6 when calculating the max continuous output power at nominal input voltage.

Ambient operating temperature:

- 20°C to +50°C

Storage temperature:

- 40° to +85°C

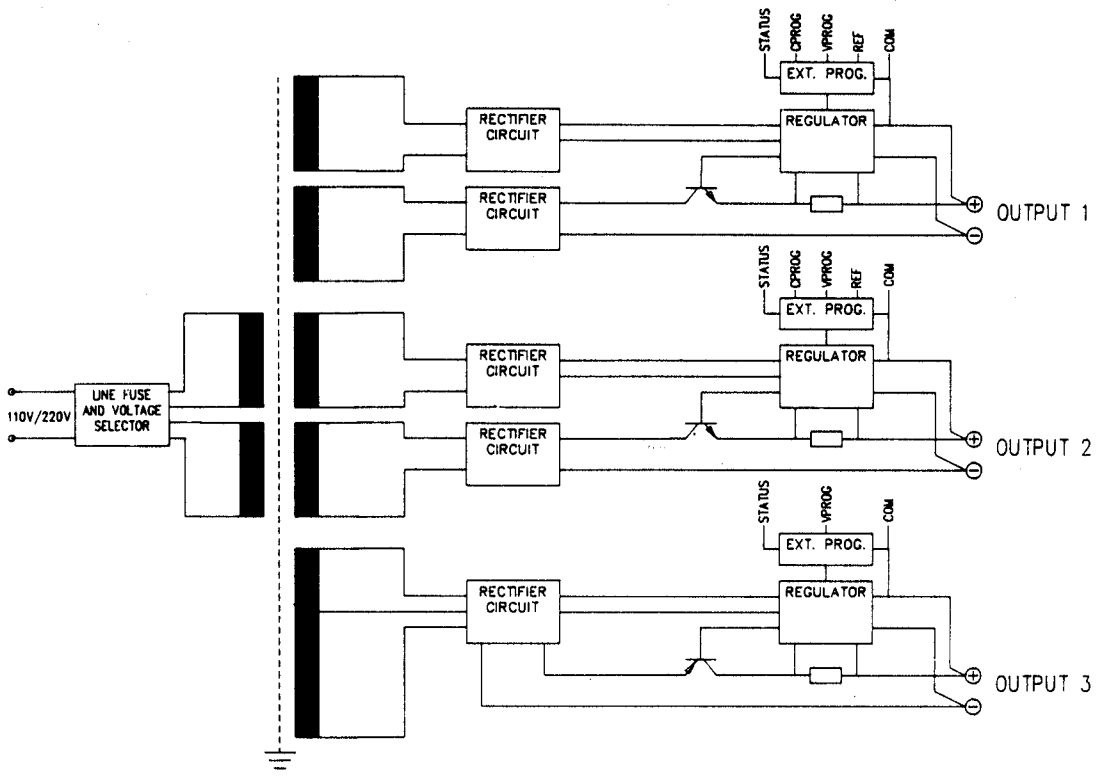
Dimensions:

W = 132 mm (5.2 in.)
H = 175 mm (6.9 in.)
D = 270 mm (0.6 in.)

Weight:

7 kg 14 lbs

1.3 OVERALL BLOCK DIAGRAM

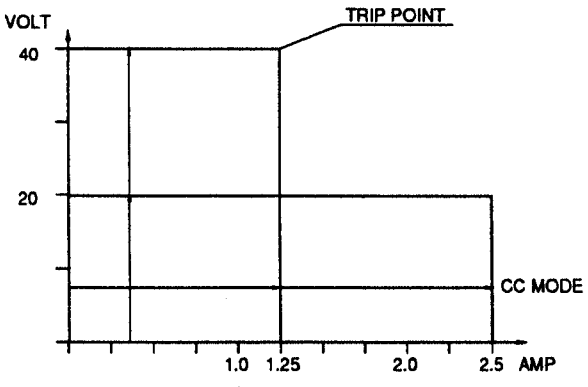


1.4 MODES OF OPERATION

Voltage and current output can be independently set for the two main outputs by precision front-panel controls. The 5V output can be set over a limited voltage range of 3-7V and has a fixed current limit with a semifoldback characteristic.

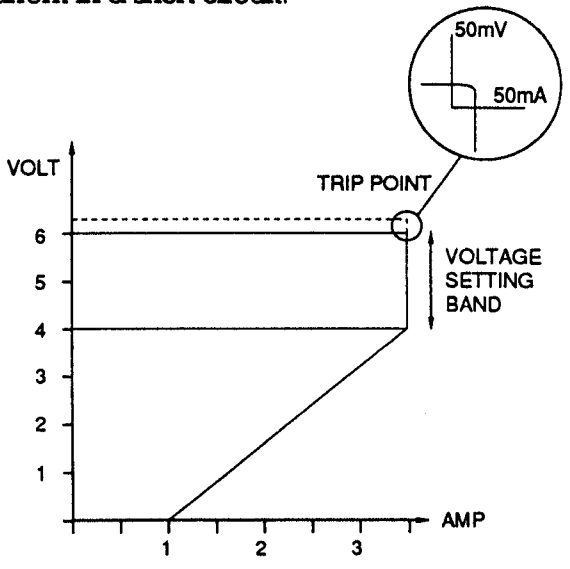
Constant-voltage, constant-current modes

Two LED diodes mounted on the front panel, indicate mode of operation — constant voltage (CV) or constant current (CC). When the load current is increased to the constant-current trip point (see graph), the unit automatically transfers to the constant-current mode and the CC LED lights. Below the CC trip point the unit is in the CV mode and the CV LED lights. The CC mode also acts as a protective circuit to limit load current on an overload or short circuit.



Semifoldback output

The 5V output is set by a screwdriver front-panel control on the front panel over a range of 3-7V. The current limit is fixed at 3 Amp and has a current trip-point approx. 120-130% above this value. The current limiting circuit has a semifoldback characteristic, which reduces the current to approx. 30% of the trip-point current in a short circuit.



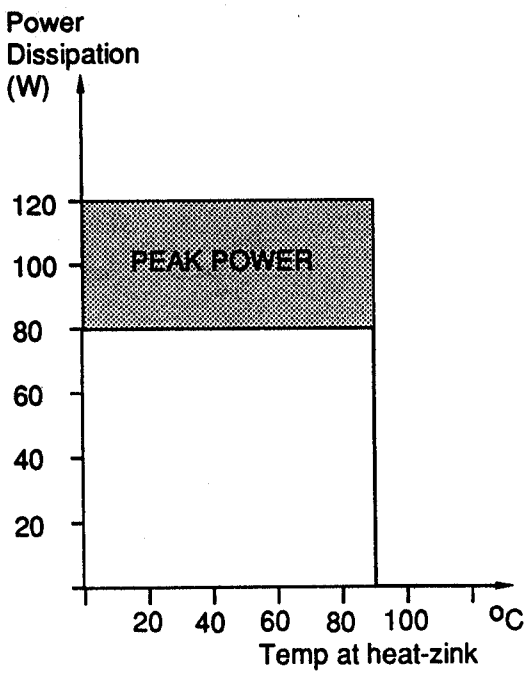
Maximum output power limitation

The Powerbox 3000, A, B, and C have a maximum peak output power of 118W and a continuous output power of approx. 80W measured at full output voltage under normal temperature conditions 25°C

These power supplies are series regulated where the power loss is directly proportioned to the output voltage set and the load current. If the output voltage is decreased to half the maximum output voltage available, the maximum power loss is doubled.

Under some circumstances when a low voltage and a very high current is drawn out from each output the Powerbox units may be overheated and the thermostat will then automatically switch the mains off and will detect when the unit have reached an acceptable temperature again. Note red field on panel meters wich inficate if combination of voltage and current could cause overtemperature shut down.

At 20°C ambient temperature and 110 or 220V input the PB3000 could dissipate about 80W internally before the temperature switch shut the power off. To calculate the internal power dissipation (P_{int}) use the following formulas:



	V1,2,3 = Output voltages	I1,2,3 = Output currents		
PB3000				
	Output 1 (40V)	I1 x (56-V1) =		
	Output 2 (20V)	I2 x (31-V2) =		
	Output 3 (5V)	I3 x (12-V3) =		
		+		
		Pint =		(W)
PB3000A				
	Output 1 (40V)	I1 x (56-V1) =		
	Output 2 (40V)	I2 x (56-V2) =		
	Output 3 (5V)	I3 x (12-V3) =		
		+		
		Pint =		(W)

	V1,2,3 = Output voltages	I1,2,3 = Output currents		
PB3000B				
	Output 1 (20V)	I1 x (31-V1) =		
	Output 2 (20V)	I2 x (31-V2) =		
	Output 3 (5V)	I3 x (12-V3) =		
		+		
		Pint =		(W)
PB3000C				
	Output 1 (60V)	I1 x (84-V1) =		
	Output 2 (30V)	I2 x (41-V2) =		
	Output 3 (5V)	I3 x (12-V3) =		
		+		
		Pint =		(W)

Please note that the constant within parenthesis should be increased with 20% at 264V input.

1.5 PARALLEL OPERATION

The outputs of the POWERBOX 3000 are fully isolated and independent of each other, and may be connected in parallel operation with each other or with any other power supply. However, the voltage of each unit in the CV mode must be carefully set to the same value otherwise unsymmetrical loading will occur.

1.6 SERIAL OPERATION

Two or more fully isolated outputs from POWERBOX 3000, 3000A and 3000B, may be connected in serial operation. But do not exceed the maximum chassis isolation voltage of 500VDC.

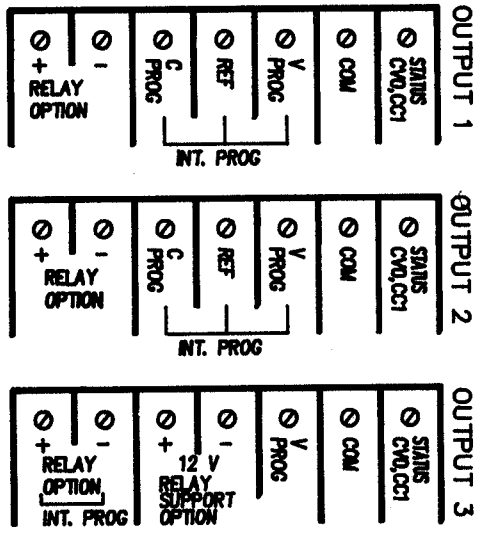
1.7 PROGRAMMABLE OPERATION (optional)

The PB3000 series can optionally be supplied with remote voltage and current programming. Units with suffix/P have the programming option installed from factory. It is also possible to field install this option. Please contact Powerbox for more details.

Front-panel programming.

Refer to figure below for connection of jumpers for front-panel programming. Connect screw terminal 3, 4, and 5 together on 20-60V outputs. For the 5V output, connect screw terminal 1 and 2 together.

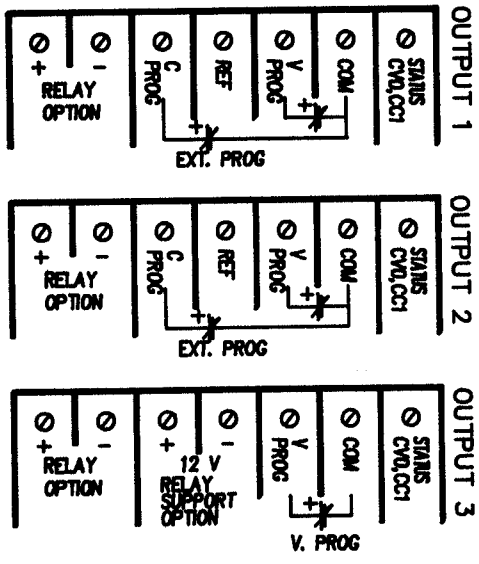
Internal programming



Remote programming

In remote programming mode all front panel controls must be in max clockwise position. Please connect the barrier strip at the output according to figure below for external programming.

External programming



For external programming use 0-10V for 0 - max voltage and current output.

If the PB3000 is programmed from Powerbox' IEEE-powercontroller PC4400 or equivalent controller the screw terminal output 7 monitors CV or CC-mode status: Status voltage below 0V means that PB3000 works in CV-mode. Status voltage over 3V means that PB3000 works in CC-mode.

This status signal could be connected to the interrupt input of the powercontroller.

Optional relay

It is possible to mount an optional relay on the programming PC-board. This relay will switch between internal and external reference voltage and by this selects between internal or external programming. In internal mode the normal potentiometers at the front panel will set the voltage and current. When applying a voltage to the relay input, the unit works in external programming mode and requires a 0-10VDC input signal for a maximum output voltage or a maximum output current from the PB3000.

Warning

Please note if voltage at relay option drops to 0 the internal reference voltage will be connected and output and current will automatically increase to max.

INSTALLATION

2.1 UNPACKING & INSPECTION

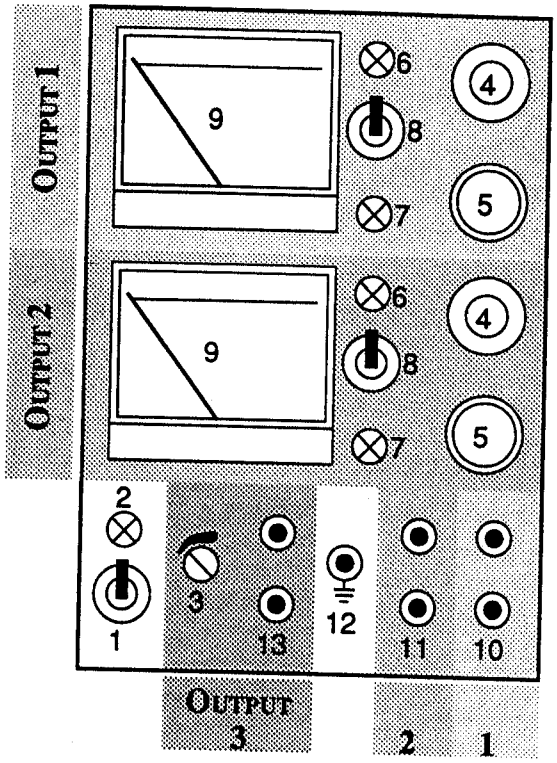
After carefully unpacking the instrument, inspect the external parts for damage to knobs, dials, indicators, surface areas etc. If there is damage file a claim with the carrier that transported the instrument. Retain the shipping container and packing material for use in case reshipment is required.

2.2 POWER REQUIREMENTS

Before connecting the instrument to the line power, be sure that the 115/230V switch S504 on the power card inside the unit. Also, change the line fuse in accordance with the table below. Be sure that the plug on the power cord is the proper mate for the line receptacle.

Fuse: 115VAC 5A Slow Blow 5x20mm
230VAC 2.5A Slow Blow 5x20mm

2.3 CONTROLS & CONNECTORS



1. Line-voltage switch
2. Line-voltage indicator
3. Voltage control for 5V output: adjustable 3-7V
4. Voltage control: outputs 1 and 2
5. Current control: outputs 1 and 2
6. Constant-voltage indicator: outputs 1 and 2
7. Constant-current indicator: outputs 1 and 2
8. Voltage/current toggle-switch selectors
9. Output voltage-and-current meters:
10. Output terminals for output 1
11. Output terminals for output 2
12. Ground connection
13. Output terminals for 5V output

CIRCUIT DESCRIPTION

3.1 GENERAL

The power-main input is connected to a 115/230V input selector, which connects the transformer windings in series for 230V-50Hz and in parallel for 115V-60Hz input. The power transformer, a toroid type, transforms the 230/115V to secondary voltage suitable for the three completely separated and independent regulated systems.

The power supplies are fully protected against overheating by a self-resetting thermal overload switch built into the supplies' heat-sink extrusion. If, for any reason, the unit runs too hot, the thermostat will switch off both sides of the mains simultaneously.

Snubbers and other protection circuits protect the units from breakdown resulting from working near transmitters and from inductive loads. Diodes across transistors and the inputs of operational amplifiers, also prevent breakdowns from voltage spikes.

3.2 THE 3-7V 3A OUTPUT

The 5V supply employs a conventional uA723 voltage regulator. To avoid a large voltage drop, the regulator has a separate voltage supply connected from the power transformer. For a low power-loss at short circuit and at the same time maximum power over the full voltage-setting range, a current-limit system called semi-foldback is used where the current falls to 30% of specified maximum current at short circuit.

The semi-foldback action is obtained by connecting a reference voltage to the input of the current amplifier (see schematic). The regulator series element is a Darlington transistor.

3.3 20, 30, 40, & 60V OUTPUTS

The two main outputs (20 and 40V, 30 and 60V) use a quadruple operational amplifier for reference, voltage and current control.

In the CV mode, the operational amplifier senses the reference voltage through R13-R12 and receives a feed-back signal via variable resistor (P401) and resistor R15. The operational amplifier attempts to keep the input voltage near zero across pins 9 and 10 by sinking current to the bases of the serial elements, T101-T501 resp T202-T502 for output 2, which in turn adjust the output voltage to keep the system in balance and the supply's output voltage constant.

If P5 is adjusted counter-clockwise, the output from the operational amplifier will decrease, and vice versa.

In the CC mode, the regulation system works similarly to the CV mode, but a voltage drop across a current shunt R23 is sensed. The reference is sensed through R7-R5 and feedback received via P4 (R10). The operational amplifier works only in the constant-current mode, with pins 5 and 6 kept near zero by adjusting the base current to T2, T3 thereby keeping the output current constant.

Potentiometer P4 can set a value between 0-100% of the maximum rated output current.

The LED diodes indicate a CV or CC mode of operation and are connected in series with the CV or CC operational amplifiers.

Output voltage and current can be monitored with the two panel meters. Voltage or current scales are selectable by a toggle switch.

CALIBRATION AND MAINTENANCE

4.1 GENERAL

The power supply is burned-in and calibrated prior to shipment. Calibration should remain valid for a minimum of 1 year. A complete set of factory test-data sheets shipped with each instrument establishes when recalibration is needed.

4.2 FACTORY REPAIR, FIELD SERVICE

Although the supplies are designed for easy diagnosis and repair with just basic test equipment, Powerbox maintains both factory and field-repair services for those customers not possessing the necessary capability. When returned for calibration or repair, the unit should be accompanied with a detailed description of the specific problems to help minimize turnaround time.

4.3 REQUIRED TEST INSTRUMENTS

A. Oscilloscope.
100MHz bandwidth sensitivity. Minimum 50mV per division. HP Type No. 1740 A, or equivalent.

B. DMM.
4-1/2 digit, AC-DC voltage and current ranges. Min. 5A DC. Fluke Type No. 8060 A, or equivalent.

C. Insulated and adjustable transformer.
0-125 or 0-250VAC. 1000W, Variac, or equivalent.

D. Dynamic load.
A dynamic load rated 50W min. having the voltage and current range of the unit under test.

E. DMM.
3-1/2 digit with AC-DC volt and current ranges. Fluke Type No. 8020 A, or equivalent.

WARNING:
High voltage is present inside cover. Service and calibration by authorized personnel only.

4.4 CALIBRATION PROCEDURE

Take off the wrap-around bottom cover plate by unscrewing the 4 self-tapping screws in the bottom of the unit.

A. Adjust all trimmers to the middle positions.

5V

B. Connect the 5V regulator card to connector J30 on mother board, a DMM and a scope to the 5V output terminals.

1. Turn power on.
2. Adjust the voltage and current. The adjustment range should be 3-7V at maximum 3 Amp with a power input voltage of 198VAC (or 99, depending on line connection). The max. ripple should be 10mV p-p at full current.
3. Short the 5V output terminals with the current meter and measure voltage and current. The measurements should be 60mV max. at 0.8 Amp.

Optional

4. At the 5V regulation board is a trimmer potentiometer used for calibration of unit in external programming mode. To trim the 5V output in external mode adjust potentiometer at the frontpanel to 5V output. Cut R12 and R13 mounted on the 5V regulation board and apply a programming voltage at the screw terminal strip at the back side of the unit.
5. Set the input voltage to 10V, set the trimmer at the 5V regulation board to a desired voltage 7V. If you then program and want 5V output at the output 3 a programming voltage shall be 7.1V.

Control of line and load regulation.

1. Vary the power input voltage over the range 198-242VAC (230V input) or 99-125VAC (115V input). The maximum deviation from 5V should be 4mV with a load of 3A.
2. Vary the load from 0 to 3A with an input voltage of 115 or 230VAC. The max. deviation from 5V should be 20mV.
3. Turn the power off.

20-60V

C. Adjust all controls on the front panel to the zero position, counter clockwise.

D. Connect power plug to an adjustable transformer and set to 50VAC.

1. The power-on LED should light
2. The power input current should be a max. of 10 mA at 50VAC input; a max. of 15mA at 110VAC input; and a max. of 30mA at 220VAC input.
3. Turn power off.

E. Connect one of the 20,30, 40 or 60V PC boards to the mother board.

1. Turn the power on.
2. CC LED should light.
3. Connect DMM and oscilloscope to output.
4. Connect a DMM to TP1 plus and minus. Adjust trimmer P1 to 10.00VDC (reference trimmer).
5. Adjust current control 1/8-turn clockwise (one scale makring). The CV indication now should light and the CC should be off.
6. Adjust output voltage control to maximum. Carefully and slowly vary output voltage with trimmer P2 (CV trimmer at regulation board) to get the correct output reading, 20.00, 30.00, 40.00 or 60.00V at max. scale. (Adjust trimmer P2 very carefully). Maximum deviation from 20, 30, 40 or 60V should be less than 100mV.
7. Set the instrument toggle switch to the volt position, adjust output voltage to half of maximum scale, a 10.00 15.00, 20.00 or 30.00V reading with DMM. Adjust P102 alt P204 (depending on output on mother board for correct voltage reading with the analog meter on the front panel.
8. Set the current potentiometer to half scale. Connect the dynamic load and current meter to the output. Then adjust the load so that the current limit is reached and the CC indicator lights.
9. Adjust front-panel current potentiometer carefully towards max. output. Vary the current with the load and simultaneously adjust trimmer P3 (CC indication on PC board) for the correct max. output current, 2.5, 1.8, 1.25 or 0.9A with the DMM. (Adjust trimmer P3 very carefully). Check the calibration of the analog meter and readjust trimmer P101 alt P203 if needed.
10. Calibrate the analog front-panel meter with trimmer P101 alt P203 so that the internal meter corresponds to the external DVM reading.
11. Vary current potentiometer over full range of 0-100% and time measure current and check CC indication.

F. Calibrate second 20, 30, 40 or 60V output with exactly the same procedure.

G. Disconnect all regulator PC cards - A, B and C.

H. Fix the trimmer positions with drops of Glyptol or other suitable sealing material.

4.5 MAINTENANCE

Maintenance: Only by authorized personnel. High voltage is present inside cover.

4.6 TROUBLE SHOOTING

1. No output from any output:

A. Unit overheated. Thermostat has disconnected line voltage: Disconnect power and load, wait 5 minutes and unit should reset and be ready for normal operation.

B. Check mains fuse.If blown, use slow-blow 5A for 115VAC input and 2.5A for 230VAC input.

C. Check transformer winding connections. They must be in series for 230VAC operation and in parallel for 115VAC operation see section 2.2.

2. No output from 5V terminals:

A. Measure voltage at pin 12 IC1 (uA 723): should be 20-22VDC, if not, check diode D3.

B. Measure voltage at pin 1 to 7V at the connector J301: should be 10-12VDC, if not, check bridge rectifier D503

C. Measure reference voltage, at pin 6 IC1 to pin 7 at J301 (uA 723): should be approx. 7V, if not, change IC.

D. Measure voltage between emitter and base on transistor T503, if 10-12V change transistor T503, if less than 1.4V change IC1.

E. Check C401 and D407 for short circuit.

3. Obtain 12V at 5V output terminals:

A. Check for short circuit in transistor T503.

B. Change IC1 (uA 723).

C. Check the feedback circuit from output to pin 3 on IC1.

4. No output from 20, 30, 40 or 60V outputs:

A. Check unregulated voltage across C105 alt. C206. It should be approx. 30V for the 20V, 40V for the 30V, 60V for the 40V, and 80V for the 60V ranges. Check bridge rectifier D501 alt. D502 and the AC to them, if voltage is too low or missing.

B. Check voltage across capacitor C101 alt. C204. It should be approx. 20V. Diode D106 alt. D208 and AC power source voltage must be present.

C. Check reference voltage at TP1 at regulator board. It should be 10.00V. Check transistor T1 on regulator board.

D. Change operational amplifier.

E. Measure voltage between the base of T2 and T3. It should be equal to the value preset at the out put, less the base- to emitter- voltage of T3.

F. Check current sensing action through R5 resistance.

5. Obtain unregulated 30, 40, 60 or 80V at 20, 30, 40 or 60V output terminals:

A. Check transistors T101 alt. T102 (depending on output) and T501 alt. T502 for short circuits.

B. Check diode D401, D402 alt. D403, D404 and LED D408, D409 alt. D410, D411 for open circuits.

C. Change operational amplifier IC1.

D. Check the sensing leads for open circuit and also the 401 alt. P403 controls.

E. Check the following components carefully: P2, R15, R16, and in particular R12 (regulator board).

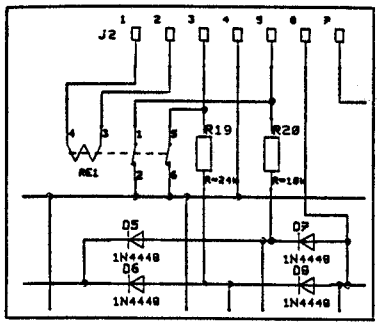
Note:
After repair use the calibration procedure explained under item 4.4 to recalibrate the unit.

LIMITED WARRANTY

Each instrument manufactured and sold by POWERBOX, or its authorized agents, is warrented to be free from defects in material and workmanship and to perform within applicable specifications for a period of five years (5) after the original shipment date. POWERBOX's obligations under this guarantee is limited to repairing or replacing any instruments or parts thereof, which within five years (5) after delivery to the original purchaser shall be returned to POWERBOX with transportation charges prepaid, and shall be proved after POWERBOX's examination to be defective, and to have been operated within specified limits.

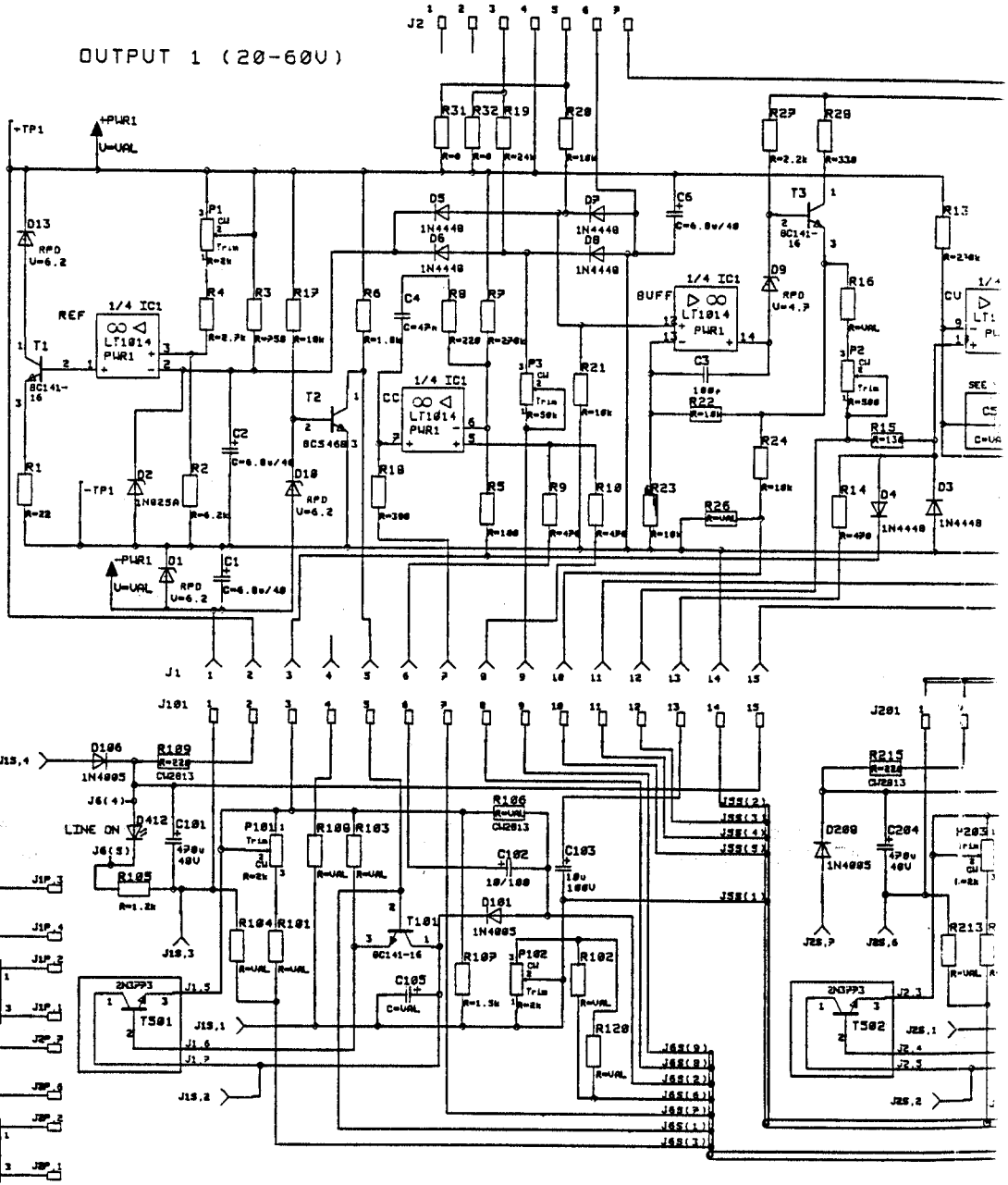
We reserve the right to discontinue instruments without prior notice, and to make modifications at any time without incurring any obligations to make such modifications to instruments previously sold.

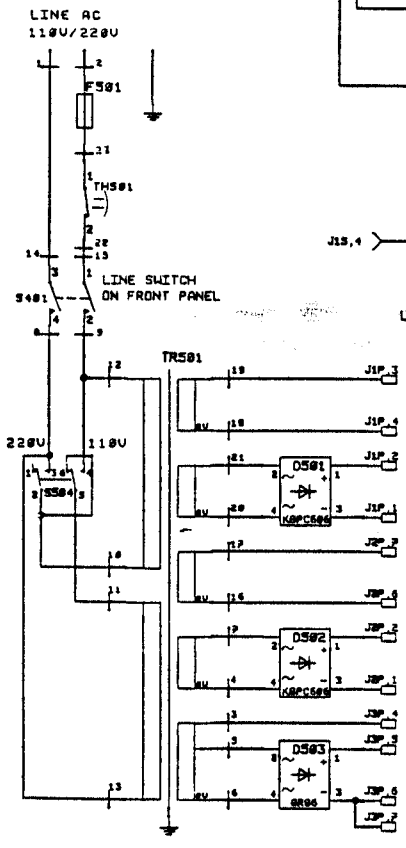
CIRCUIT DIAGRAM 77015E01/A



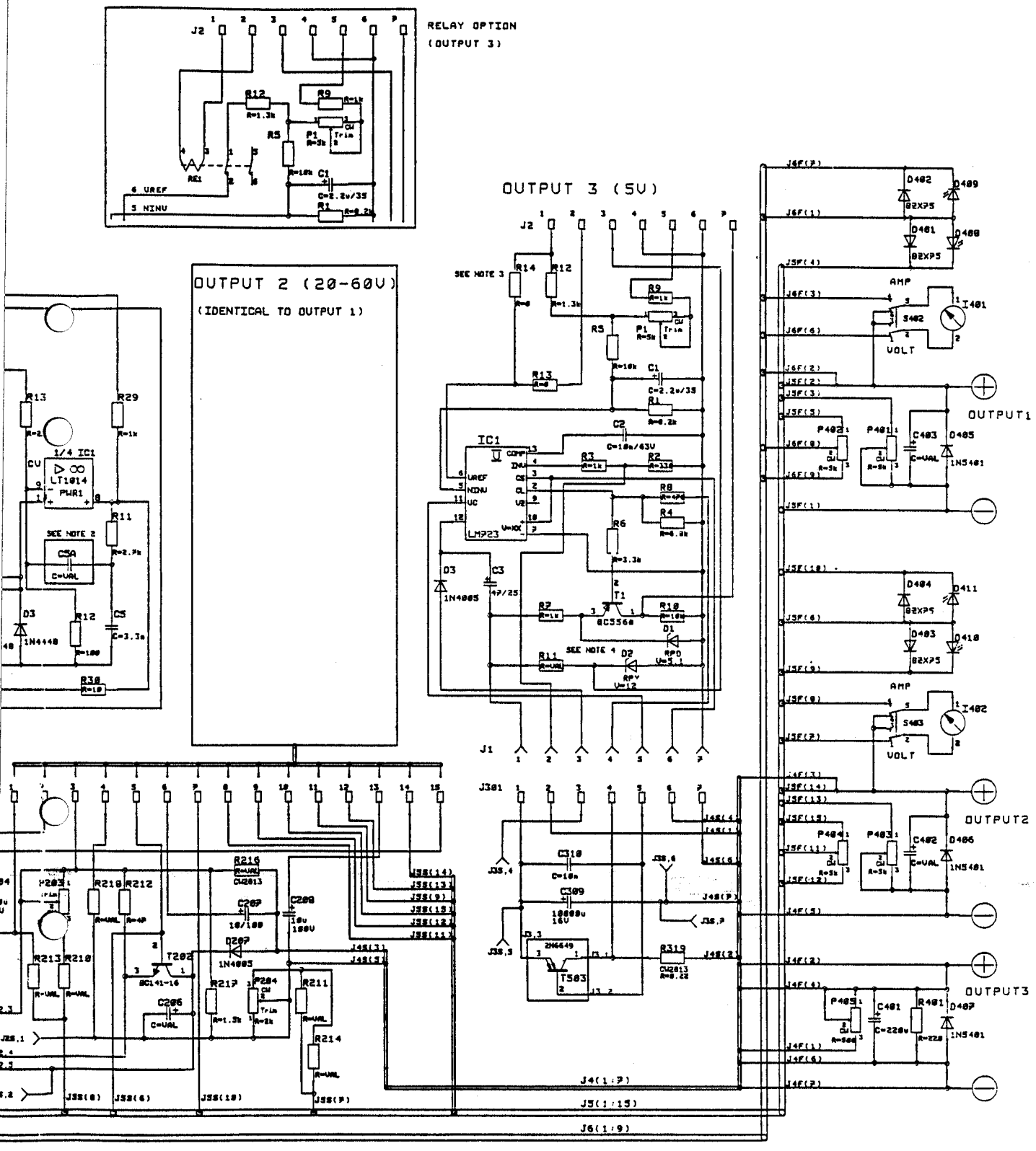
RELAY OPTION
(OUTPUTS 1 & 2)

OUTPUT 1 (20-60V)





R1XX etc. = MOTHER BOARD (OUTPUT 1)
D2XX etc. = MOTHER BOARD (OUTPUT 2)
C3XX etc. = MOTHER BOARD (OUTPUT 3)
S4XX etc. = FRONT CARD OR FRONT PANEL
T5XX etc. = POWER CARD OR BACK PANEL



NOTES: 1, FOR VALUE ON COMPONENTS WITH STRINGS AS R=VAL (C=VAL etc.) PLEASE SEE COMPONENT LIST.

2, CSA (OUTPUT 1 & 2) IS NOT MOUNTED.

3, R14 (OUTPUT 3) IS NOT MOUNTED IN PROGRAMMABLE VERSIONS.

4, R11 AND D2 (OUTPUT 3) ARE ONLY MOUNTED WITH RELAY OPTION.

6.2 FRONT CARD AND HARDWARE

Part/Type	3000	3000A*	3000B*	3000C*
R401 SK4	220ohm			
P401 3590S	5kohm			
P402 91R1AR22B	5kohm			
P403 35095	5kohm			
P404 91R1AR22B	5kohm			
P405 RG161	500			
C401 EB	220/16			
C402 EB	220/40	100/63	220/40	100/63
C403 EB	100/63	100/63	220/40	47/100
D401 B2X75C2U8	B2X75C2U8			
D402 B2X75C2U8	B2X75C2U8			
D403 B2X75C2U8	B2X75C2U8			
D404 B2X75C2U8	B2X75C2U8			
D405 1N5401	1N5401			
D406 1N5401	1N5401			
D407 1N5401	1N5401			
D408 LED D5401R	LED D5401R			
D409 LED D5401R	LED D5401R			
D410 LED D5401R	LED D5401R			
D411 LED D5401R	LED D5401R			
D412 LED D5401R	LED D5401R			

* If nothing specified below, use values in 3000 column

Other komponents and hardware

Part	Description			
BB132	Front profile delux Nut U500 LED connector 641535-2 Scale H 507 Knob 020-3525 1/4" axle Nut cover 044-3125 Cover plate 040-3025 Spacer ENINT 7LG20			
S401	Main switch	APR 5646A9		
S402	Switch	S246 MINRCD9		
S403	Switch	S246 MINRCD9		
Front name plate		20/40 (3000)	40/40 (3000A)	20/20 (3000B) 30/60 (3000C)
I401	Instrument	KP69		
I402	Instrument	KP69		
5087	Scale	KP69 20V		
5088	Scale	KP69 40V		
5289	Scale	KP69 30V		
5288	Scale	KP69 60V		
J4F	Methode	3100-8-207-01	7 pin	
J5F	Methode	3100-8-215-01	15 pin	
J6F	Methode	3100-8-209-01	9 pin	
2 pcs	Terminal	red 2410-104		
3 pcs	Terminal	blue 2410-105		
1 pc	Terminal	yellow 2410-106		
1 pc	Terminal	green 2410-107		

6.3 MAIN CARD

Type	Part no.	3000 (20/40) Value	A (40/40) Value*	B (20/20) Value*	C (30/60) Value*
R101	MK4	1kohm			not used
R102	MK4	39kohm		27kohm	68kohm
R103	MK4	47 ohm			100ohm
R104	MK4	680kohm		1Mohm	
R105	MK4	1.2kohm			
R106	CW-2B-13	1ohm		0.5ohm	
R107	VITROHM 206-0	1.5kohm			
R108	MK4	220kohm			620kohm
R109	CW-2B-13	220ohm			
R110	MK4	not used	not used	75kohm	430kohm
R210	MK4	1kohm			not used
R211	MK4	27kohm	39kohm	27kohm	30kohm
R212	MK4	47ohm			
R213	MK4	1Mohm	680kohm		
R214	MK4	75kohm	not used		750kohm
R215	CW-2B-13	220ohm			
R216	CW-2B-13	0.5ohm	1ohm		
R217	VITROHM 206-0	1.5kohm			
R218	MK4	220kohm			1.2Mohm
R319	CW-2B-13	0.22ohm			
P101	3386P	2kohm			
P102	3386P	2kohm			
P203	3386P	2kohm			
P204	3386P	2kohm			
C101	EB	470/100			
C102	EB	10/100			
C103	EB	10/100			
C105	EVY	2200/100		4700/40	
C204	EB	470/40			
C206	EVY	4700/40	2200/100		
C207	EB	10/100			
C208	EB	10/100			
C309	EVY	10000/16			
C310	RMY607	10n/63			
D101	1N4005	1N4005			
D106	1N4005	1N4005			
D207	1N4005	1N4005			
D208	1N4005	1N4005			
T101	BC141-16	BC141-16			
T202	BC141-16	BC141-16			
J101	Methode 3100-8-215-01 15 pin				
J201	Methode 3100-8-215-01 15 pin				
J301	Methode 3100-8-207-01 7 pin				
J1S	Methode 3000-107-2103 7 pin				
J2S	Methode 3000-107-2103 7 pin				
J3S	Methode 3000-107-2103 7 pin				
J4S	Methode 3000-109-2103 9 pin				
J5S	Methode 3000-115-2103 15 pin				
J6S	Methode 3000-107-2103 7 pin				

* If nothing specified below, use values in 3000 column

6.4 REGULATOR PC CARD A/B

Part no.	Value	Type	Manufacturer	Note
R1	22	MK2	RESISTA	
R2	6.2K	MK2	RESISTA	
R3	750	MK2	RESISTA	
R4	2.7K	MK2	RESISTA	
R5	100	MK2	RESISTA	
R6	1.8K	MK2	RESISTA	
R7	270K	MK2	RESISTA	
R8	220	MK2	RESISTA	
R9	470	MK2	RESISTA	
R10	470	MK2	RESISTA	
R11	2.7K	MK2	RESISTA	
R12	100	MK2	RESISTA	
R13	270K	MK2	RESISTA	
R14	470	MK2	RESISTA	
R15	130	MK2	RESISTA	
R16	2.2K	MK2	RESISTA	20V 2.5A
R16A	1.5K	MK2	RESISTA	30V 1.8A
R16B	1K	MK2	RESISTA	40V1.25A
R16C	560	MK2	RESISTA	60V0.9A
R17	18K	MK2	RESISTA	
R18	390	MK2	RESISTA	
R19	24K	MK2	RESISTA	
R20	10K	MK2	RESISTA	
R21	10K	MK2	RESISTA	
R22	10K	MK2	RESISTA	
R23	10K	MK2	RESISTA	
R24	10K	MK2	RESISTA	
R26	2	MK2	RESISTA	20V2.5A
R26A	3	MK2	RESISTA	30V1.8A
R26B	8.2	MK2	RESISTA	40V1.25A
R26C	12	MK2	RESISTA	60V0.9A
R27	2.2K	MK2	RESISTA	
R28	330	MK2	RESISTA	
R29	1K	MK2	RESISTA	
R30	10	MK2	RESISTA	
R31	0	MK2	RESISTA	
R32	0	MK2	RESISTA	
P1	2K	3296Z	BOURNS	REF ADJ
P2	500	3296Z	BOURNS	C-ADJ
P3	50K	3296Z	BOURNS	C-ADJ
C1	6.8u40V	TAN ETR-3	ERO	
C2	6.8u40V	TAN ETR-3	ERO	
C3	100p	ROP766FA	RESISTA	
C4	47n	MKT1826	ERO	
C5	3.3n	KC1850	ERO	
C6	6.8u40V	TAN ETR-3	ERO	
D1	6.2V 0.5W	RPD		
D2	6.2V 20ppm	1N825A	THOMS	
D3	SW DIOD	1N4148		
D4	SW DIOD	1N4148		
D5	SW DIOD	1N4148		
D6	SW DIOD	1N4148		
D7	SW DIOD	1N4148		
D8	SW DIOD	1N4148		
D9	4.7V 0.5W	RPD		
D10	6.2V 0.5W	RPD		
D11	2.8V Vf	BZX75	PHILIPS	
D12	2.8V Vf	BZX75	PHILIPS	
D13	6.2V 0.5W	RPD		
T1	60V 1A	NPN BC141-16	SGS	
T2	65V 0.1A	NPNBC546B		
T3	60V 1A	NPN BC141-16	SGS	
IC1	QUAD OP	LT1014DN	LT	
J1	15POL	2145A	MX	
J2	7POL	1100-7	METOD	
TP1	2pol	MFSS100	PANDUIT	REF
K1	2POL	CUP-P002B112CP	CLAREELFA	OPTION EXT/INT
PC	D01071-1			

6.5 REGULATOR PC CARD C

Part no.	Value	Type	Manufacturer	Note
R1	10K	MK2	RESISTA	PC2
R2	330	MK2	RESISTA	PC2
R3	1K	MK2	RESISTA	PC2
R4	6.8K	MK2	RESISTA	PC2
R5	10K	MK2	RESISTA	PC2
R6	3.3K	MK2	RESISTA	PC2
R7	1K	MK2	RESISTA	PC2
R8	470	MK2	RESISTA	PC2
R9	1K	MK2	RESISTA	PC2
R10	10K	MK2	RESISTA	PC2
R11	WK4		RESISTA	PC2
R12	1.3K	MK2	RESISTA	PC2
R13	0	MK2	RESISTA	PC2
R14	0	MK2	RESISTA	PC2
P1	5K	3296Z	BOURNS	PC2
C1	2.2u 35V	ETR3	ERO	PC2
C2	10n 63V	KC1850	ERO	PC2
C3	47u 25V	EKO	ROE	PC2
D1	5.1V 0.5W	RPD		PC2
D2	12V 1.3W	RPY		PC2
T1	65V0.1A	PNP BC556B		PC2
IC1	SP REG	RC723CE		PC2
J1	7pol	2145A	MX	PC2
J2	7pol	1100-7	METHOD	PC2
PC	D02071-1			PC2

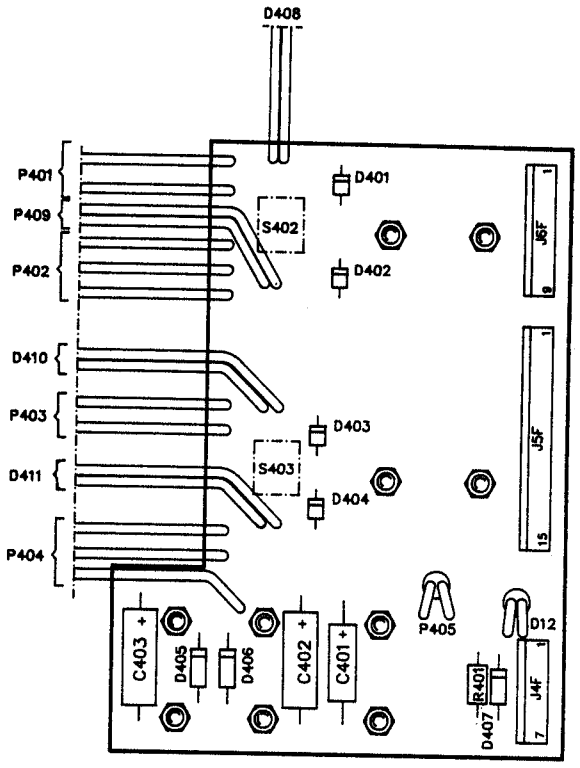
6.6 POWER CARD

Part no.	Type
D501	KPBC 602
D502	KPBC 602
D503	BK86
T501	2N3773
T502	2N3773
T503	2N6649
S504	Switch SCL 5872.4.60
TH501	Thermal breaker R100-76-190C
F501	Fuse 5 x 20 mm 2,5AT + Fuseholder 19596 + Cover 19583
J1P	Methode 3100-8-207-01 7 pin
J2P	Methode 3100-8-207-01 7 pin
J3P	Methode 3100-8-207-01 7 pin
TR501	Transformer 2307 (3000) 1022-C (3000 A) 1029-B (3000B) 2306 (3000 C)

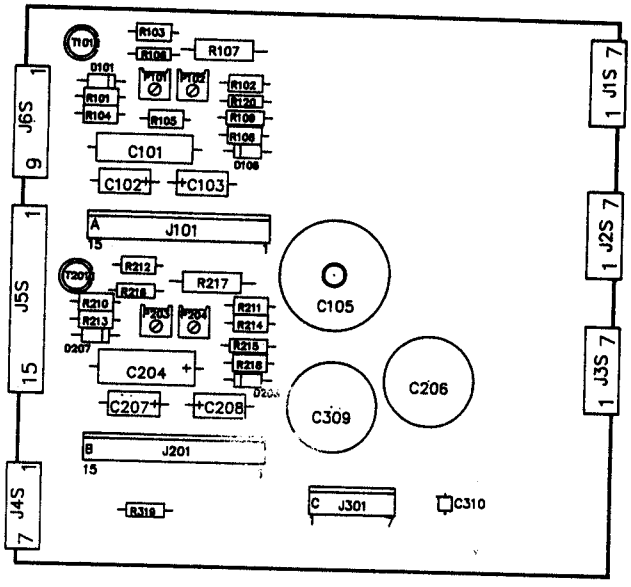
7 Circuit Board Layouts

CONTENTS

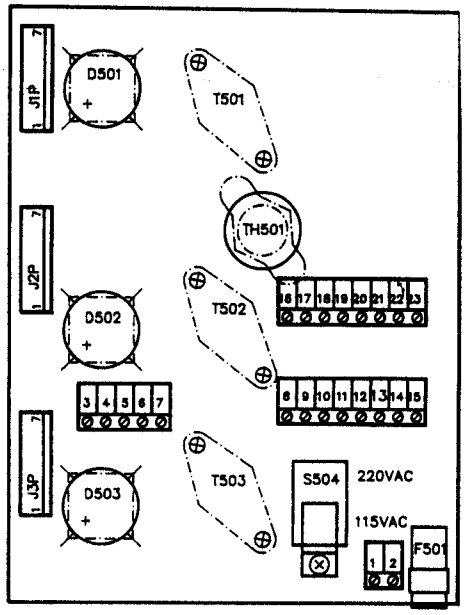
7.1 Front Card 77015S01



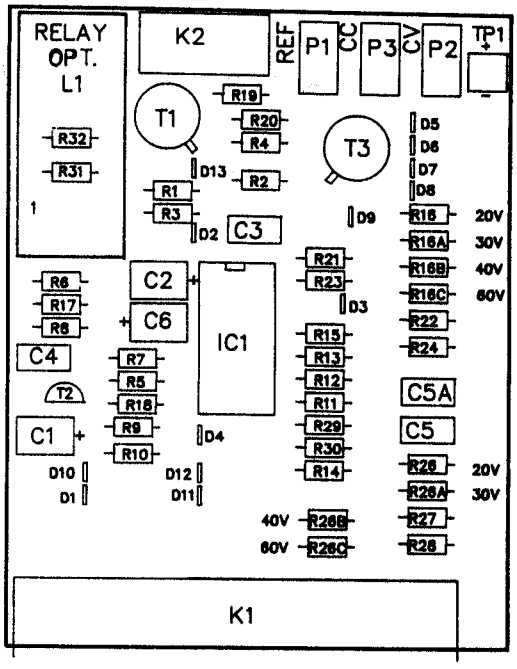
7.2 Main Card 77015S02



7.3 Power Card 77015S03



7.4 Regulator Card Output 1 & 2 77015S04



7.5 Regulator Card Output 3
77015S05