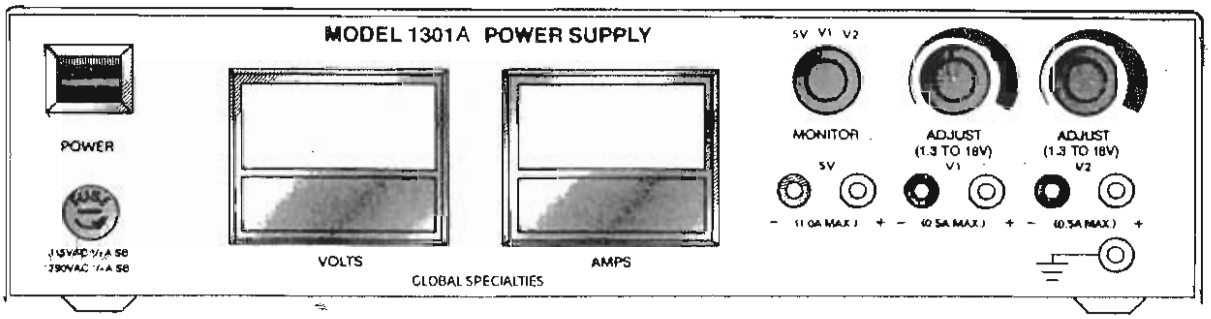
1301A DC POWER SUPPLY

Instruction Manual



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GLOBAL SPECIALTIES®
Unit No. 2, Highland Industrial Centre,
1486 Highland Avenue,
Cheshire CT 06410,
U.S.A.

SPECIFICATIONS

POWER REQUIREMENTS

105-135 VAC, 57-63 Hz fused at 0.5 A (215-250 VAC, 50-60 Hz fused at 0.25 A model available)

OUTPUTS

5V

Voltage: 5 V (±0.2 V) fixed
Current: 1.0 amp maximum (current-limited)
Regulation: Line: ≤10 mV @ 1 A (105 to 129 VAC)
Load: ≤50 mV (25-100% full load)
Temperature: ±0.02%/°C
Ripple: Less than 5 mVP-P

V_1

Voltage: 1.3VDC to 18 VDC (continuously variable)
Current: 0.5 A maximum at 15 VDC
Regulation: Line: ≤30 mV @ 0.5 A (105 to 129 VAC)
Load: ≤150 mV (25-100% full load)
Temperature: ±0.04%/°C
Ripple: Less than 10 mVP-P

V_2

Voltage: 1.3VDC to 18 VDC (continuously variable)
Current: 0.5 A maximum at 15 VDC
Regulation: Line: ≤30 mV @ 0.5 A (105 to 129 VAC)
Load: ±150 mV (25-100% full load)
Temperature: ±0.04%/°C
Ripple: Less than 10 mVP-P

CONTROLS

POWER ON with indicator light, variable *Adjust* (V_1), variable *Adjust* (V_2), *Monitor* (5 V, V_1, V_2)

MONITORS

Two meters display the voltage and current of the output selected by the *Monitor* switch. Voltage meter range is 0-20 V. Current meter range is 0-1 A. Accuracy ±5% of full scale.

SHORT CIRCUIT PROTECTION

Current limited (external short circuit will not damage power supplies)

LINE CORD

3 wire

DIMENSIONS

4 x 14 x 7 inches H x W x D (102 x 356 x 178 mm)

STOCK NO

05-1301

WEIGHT

5 lbs (2.27 kg)

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INTRODUCTION

The Global Specialties Model 1301A Power Supply is a versatile triple-output unit which can be used in both digital and analog circuit applications. It consists of three independent power supplies: a fixed 5 V supply rated at 1.0 A maximum; and two variable 1.3 to 18 V supplies rated at 0.5 A maximum.

The three supplies are isolated; and any supply can be floated to a DC level from any other supply,or from the equipment under test; all three supplies can be floated to different DC levels. if desired. Independent , series, back-to-back, and parallel (with suitable current balancing resistors) connections are permissible. Each supply is protected against short circuits and thermal overloads. A separate binding post connected to the chassis and earth ground is available.

The Model 1301A is an excellent general purpose power supply for engineering lab applications and it is ideal for microcomputer testing and servicing. It can be used for breadboarding and prototyping: and the ammeter allows the user to determine the power supply requirements of the circuit being evaluated. Priced ecomomically, the power supply is practical for production lines, schools, service shops, hobbyists, and wherever a compact, reliable DC power supply is needed.

OPERATING CONTROLS, INDICATORS, METERS AND TERMINALS

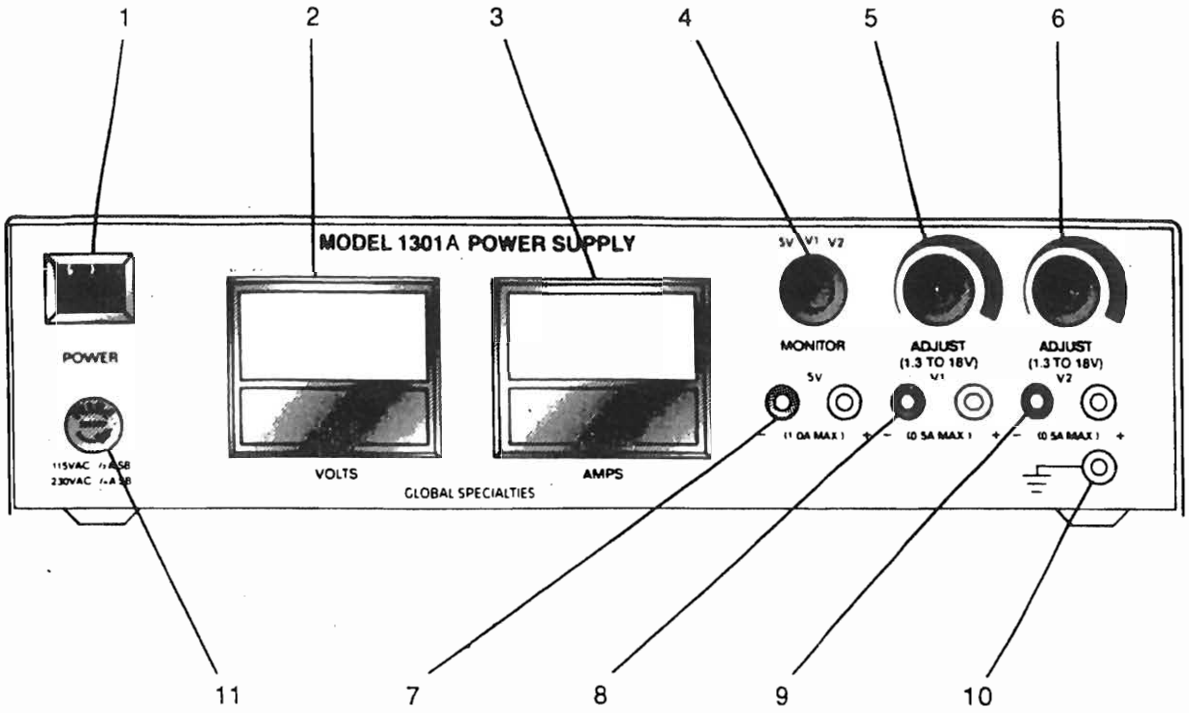


Figure 1: Operating controls, indicators, meters, terminals, and fuse.

1. POWER ON-OFF switch and indicator: Push-on/push-off switch. Internal lamp illuminates when power is on.
2. VOLTMETER: Indicates the voltage of the regulated power supply selected by the MONITOR SWITCH.
3. AMMETER: Indicates the current drawn from the regulated power suppy selected by the MONITOR switch.
4. MONITOR switch: Selects the regulated power supply measured by the meters (5 VDC fixed, V1 variable or V2 variable).
5. V1 ADJUST control: Adjusts output of V1 supply from 1.3 to 18 V. Clockwise rotation increases voltage.
6. V2 ADJUST control: Adjusts output of V2 supply from 1.3 to 18 V. Clockwise rotation increases voltage.
7. 5 V terminals: Output terminals for 5 V supply. Red terminal is (+); Black terminal is (−).
8. V1 terminals: Output terminals for variable supply V1. Red terminal is (+); Black terminal is (−).
9. V2 terminals: Output terminals for variable supply V2. Red terminal is (+); Black terminal is (−).
10. Ground terminal: Binding post connected to the chassis and to earth ground through the third wire of the AC power line cord.
11. Line fuse: ½-A slow-blow for 115 VAC unit, ¼-A slow-blow for 230 VAC unit.

OPERATING FEATURES

GROUNDING

All three supplies are isolated so that, if an earth ground reference is required, any one of the six power supply terminals can be connected to the earth ground terminal. If required, one terminal from one, two or all three supplies can be connected to earth ground.

CURRENT LIMITING

Each power supply is protected against output short circuits. If the output is short-circuited, the voltage drops to zero and the current is limited to about 2.5 A for the fixed supply and about 1 A for the variable supplies. The 1-Ampere meter is protected against short-circuit currents from the fixed 5 V supply.

In addition, each regulator is protected against excessive power dissipation. If too much current is drawn, the power dissipated in the regulator will cause excessive heating. If the temperature of the regulator rises above a certain point, the output of the regulator will be turned off. Note that in the case of the variable supplies, the lower the output voltage, the larger the voltage drop across the regulator. Therefore, for a given output current, the lower the output voltage, the more power dissipated in the regulator. This means that thermal overload protection will take place at a lower current for a lower output voltage.

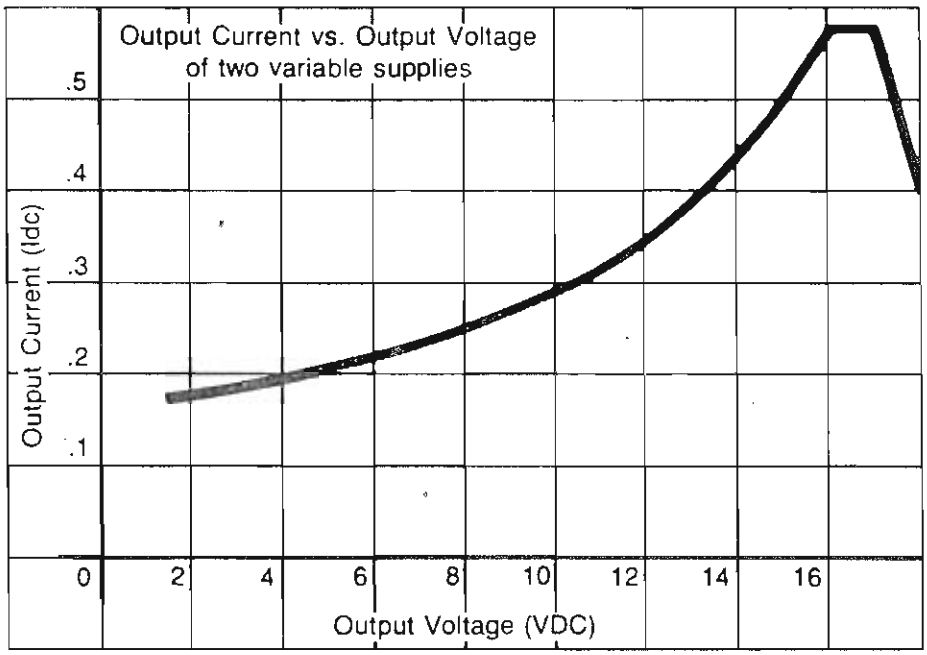


Figure 2. Output current vs. output voltage of the variable supplies.

VENTILATION

The heat created in the power supply is conducted to the case and chassis where it is convected through the ventilation holes in the bottom and rear of the case. For best ventilation, always leave a few inches of space around the unit. Never place the unit on any object that will block the bottom ventilation holes, or that will reduce the clearance provided by the rubber feet on the bottom of the case.

POWER SUPPLY OPERATION

SAFETY PRECAUTIONS

Use only a polarized 3-wire AC outlet. This will connect the chassis, case, and ground terminal to earth ground, and will reduce danger of electrical shock. If a 2-wire-to-3-wire adapter must be used, be sure the ground wire of the adapter is attached to a good earth ground.

OPERATING INSTRUCTIONS

Plug the 1301A into an AC outlet of appropriate voltage and frequency. Push the POWER switch in to turn the unit on. The POWER switch will illuminate. Pushing the switch again will turn the unit off.

It is recommended that connections be made to the power supply terminals with the AC power off and the variable supplies set to their minimum positions (counter-clockwise). The power can then be turned on and the variable supplies set as desired.

The three supplies can each be monitored for voltage and current with the front panel meters by switching the MONITOR control to the position of the suppy of interest, i.e., 5 V for the fixed 5 V supply, V1 for variable supply V1, or V2 for variable supply V2.

NOTE: WHEN THE VARIABLE SUPPLIES ARE LIGHTLY LOADED, VOLTAGES GREATER THAN 18 VDC MAY BE READ; HOWEVER OPERATION AT A VOLTAGE GREATER THAN 18 VDC IS NOT RECOMMENDED.

COMBINING POWER SUPPLIES

Each of the three supplies can be used independently. Any two, or all three,can be used simultaneously if desired. Power supplies can be combined to get increased voltage or current, as described below and listed in the accompanying interconnection table.

Series Connection

The outputs of the V1 and V2 supplies may be connected in series to provide a variable 2.6- 36 V output at up to 0.5 A (see FIGURE 3A). The total voltage may be read by adding the separate voltage readings of the V1 and V2 supplies. Load current may be monitored from either the V1 or V2 supply. For best results, set the two voltages to the same value so that power dissipation is divided evenly, and thermal shutdown will not unnecessarily occur.

If a 36-41 V supply is needed, the 5 V supply may be connected in series with the V1 and V2 supplies with a maximum current of 0.5 A (see FIGURE 3B). (This actually has a range of 7.6-41 V). Again, the total voltage may be read by adding the individual voltages, and the current may be read by reading any of the individual currents.

If one of the variable supplies must be used alone, the other variable supply may be connected in series with the fixed 5 V supply to create a 6.3-23 V variable supply at currents up to 0.5 A (see FIGURE 3C). The total voltage may be summed from individual voltages, and the current read from either supply.

DC POWER SUPPLY INTERCONNECTION TABLE

POWER SUPPLY	CONNECTION	VOLTAGE RANGE	MAX CURRENT
5 V (Fixed)	–	5 V	1.0 A
V1 (Var)	–	1.3-18 V	0.5 A
V2 (Var)	–	1.3-18 V	0.5 A
V1 + V2	Series	2.6-36 V	0.5 A
V1 + V2	Parallel (w/equalizing resistors)	1.3-18 V	1.0 A
5 V + V1 *or* V2	Series	6.3-23 V	0.5 A
5 V + V1 *and* V2	Series	7.6-41 V	0.5 A

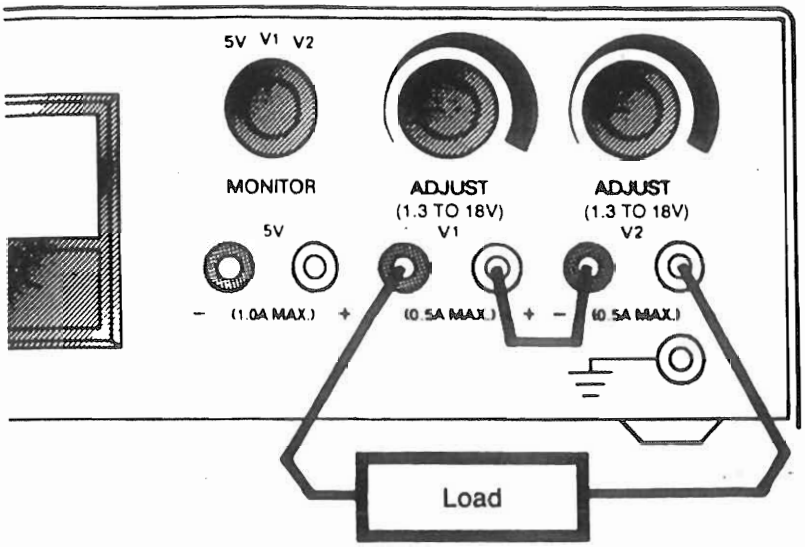


Figure 3A. Series connection for a 2.6 to 36 V supply @ 0.5 A.

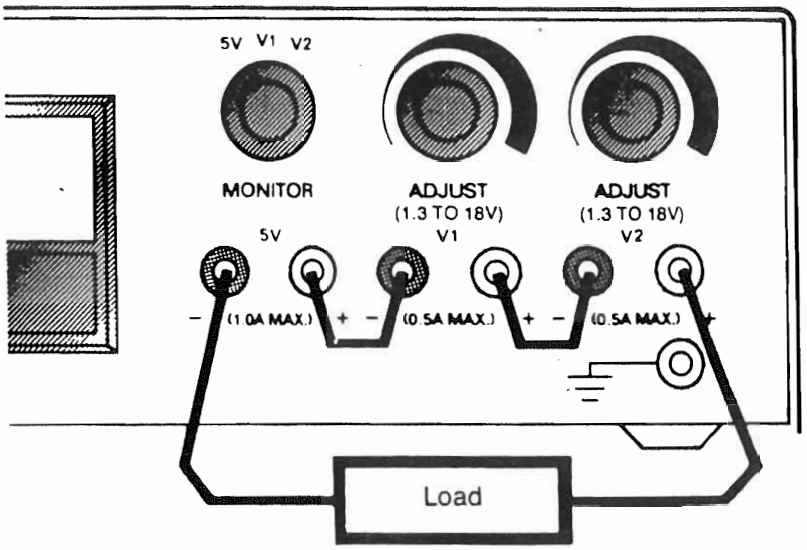


Figure 3B. Series connection for a 36 to 41 V supply @ 0.5 A.

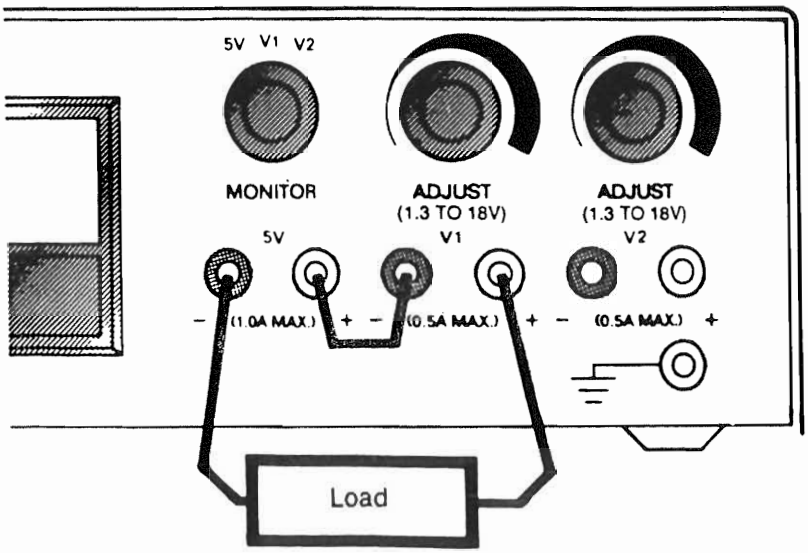


Figure 3C. Series connection for a 6.3 to 23 V supply @ 0.5 A.

CAUTION: THE POWER SUPPLIES SHOULD NOT BE INTERCONNECTED IN ANY MANNER WHICH CAUSES CURRENT TO FLOW INTO A (+) TERMINAL OR OUT OF A (—) TERMINAL. AN EXAMPLE OF THIS IS A SERIES SUBTRACTION. (see FIGURE 4).

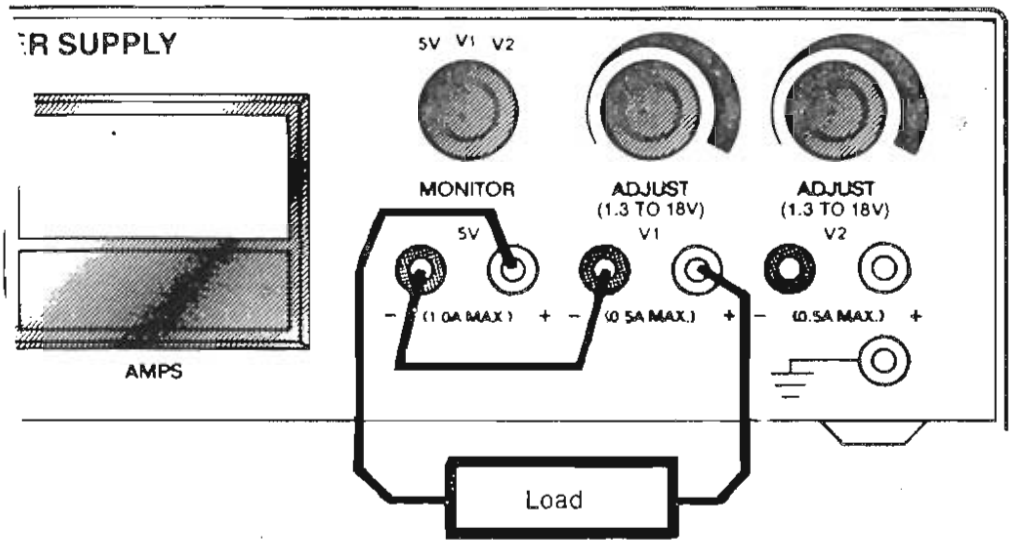


Figure 4. Example of an improper connection: series subtraction.

PARALLEL CONNECTION

The V1 and V2 supplies may be connected in parallel to double the available load current, i.e. 1.3 -18 V at up to 1 A. Current equalizing resistors must be used, as shown in FIGURE 5.

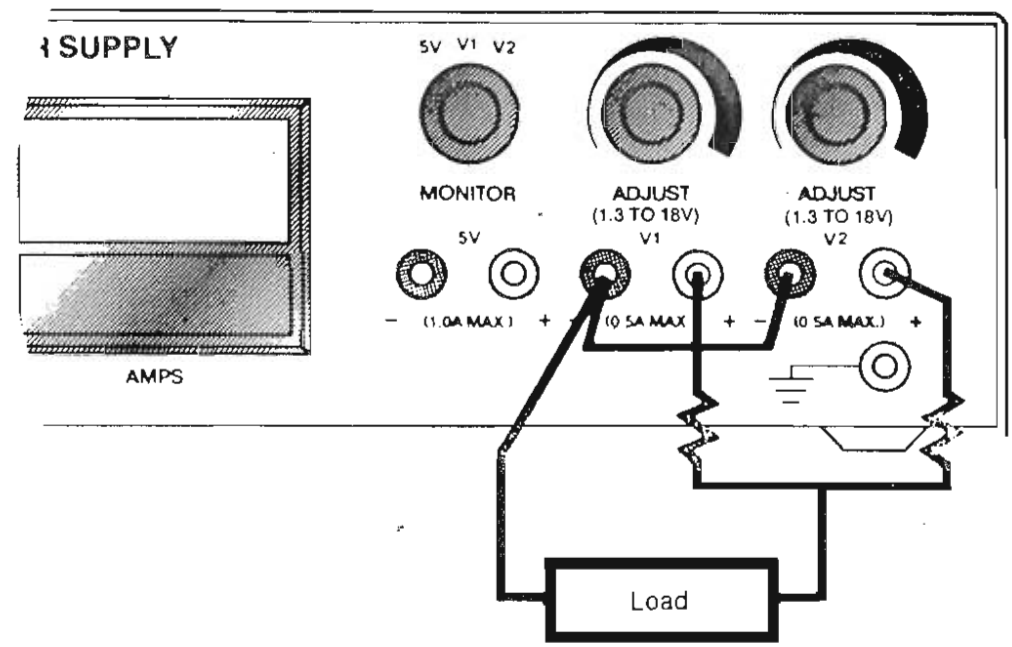


Figure 5. Parallel connection of the variable supplies using current-equalizing resistors.

For best results, set the V1 and V2 supplies to the desired voltage before any connections are made. If the current equalizing resistors are matched, current balance can be obtained by measuring the differential voltage between the V1 and V2 supplies with an external voltmeter, and adjusting for zero. If the resistors are not well matched,it is preferable that current balance be achieved by slightly unbalancing the V1 and V2 supplies. A precise voltage reading can be made by measuring across the load with an external voltmeter.

OPERATING PRECAUTIONS

The power supply is ideally suited to virtually any type of IC breadboarding from TTL, CMOS and ECL to op-amps, audio, comparators, video amps and phase-locked loops. However, certain normal breadboarding precautions should be taken to avoid ground loops and inadvertent loading. In addition, observance of load polarity is important.

Polarity

Observe proper polarity when connecting the power supply to the load, especially if the load is polarity-sensitive and does not have reverse polarity protection.

Ground Loops

A ground loop is a voltage drop on a ground bus, caused by a power stage output entering the ground bus some distance away from the power supply ground binding post.

This small voltage drop, though only millivolts or microvolts, is part of the output load. If a preamplifier input or circuit ground is connected to a portion of this ground bus, feedback and oscillation can occur. To prevent this, all output stages should be positioned as close as possible to the ground terminal, preamps farther away. Many audio ICs have separate input and output grounds to prevent ground loops.

Bypass Capacitors

Even though the power supplies are tightly regulated, a short length of power bus can present enough inductance to cause linear IC oscillation at high frequencies. For this reason, effective bypass capacitors are needed to bypass the power buses as close as possible to the power supply pins of the IC. Disc ceramics (0.1 μf) work well and should be placed across as many ICs as possible. Do not use electrolytic or paper capacitors,because they have high inductances and cease to act as bypasses above one or two MHz. Bypassing is required with digital ICs also; problems such as inability to reset or to clear and false triggering can occur without the use of bypass capacitors.

MAINTENANCE AND CALIBRATION

METER ADJUSTMENT

No internal adjustment is necessary for the voltmeter. Occasionally, the meter may need to be re-zeroed using the screwdriver adjustment on the face of the meter; this should be accomplished with the AC power OFF.

Ammeter adjustment takes two forms, meter re-zeroing and internal calibration. To re-zero, turn AC power ON and, with the monitor switch set to either variable supply, set the voltage to approximately 10 volts. With no load connected to the supply, zero the meter using the screwdriver adjustment on the face of the meter.

Recalibration is accomplished separately for each of the outputs. To recalibrate, disassemble the case as outlined under CASE DISASSEMBLY AND REASSEMBLY. Connect a resistive load no less than 30 ohms, 7.5 watts, in series with a calibrated ammeter, to the V1 supply. Turn power ON, set the MONITOR switch to V1, and set the output voltage to 15. Now adjust trimpot R14 on the main PC board until the front panel ammeter reading is the same as that of the calibrated ammeter. Repeat this procedure for the V2 supply, this time adjusting trimpot R17. To calibrate the ammeter in the 5 V range, use a resistor no less than 5 ohms, 5 watts, and adjust trimpot R9 using the procedure described above.

Upon completion, reassemble the case as outlined under CASE DISASSEMBLY AND REASSEMBLY.

FUSE REPLACEMENT

Remove the line cord from the AC outlet before changing fuses. Remove the fuse by turning the fuse holder cap counter-clockwise with a standard screwdriver. Replace it with a ½ A slow-blow fuse (120 VAC unit)or a ¼ A slow-blow fuse (230 VAC unit). Replace the fuse holder cap by turning it clockwise into the fuse holder with a standard screwdriver.

CASE DISASSEMBLY AND REASSEMBLY

Remove the line cord from the AC outlet before disassembling the case. To disassemble, first remove the two screws from each side of the case, then lift the cover off the chassis.

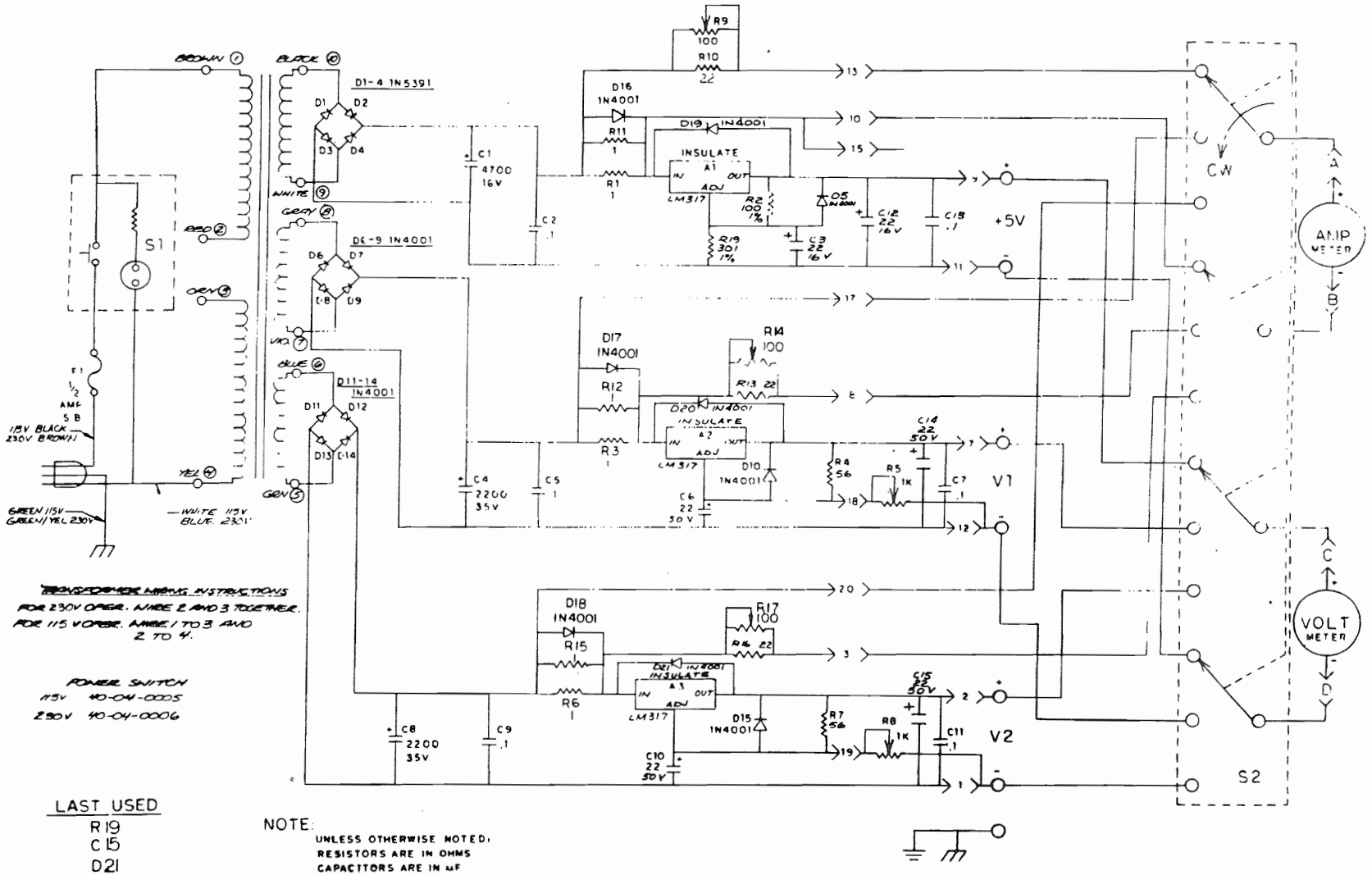
To reassemble the case, place the cover on the chassis, line up the screw holes and replace the four screws.

CIRCUIT DESCRIPTION

AC power is applied to the primary of the transformer through the fuse and POWER switch. Each of the three power supplies has its own transformer secondary, bridge rectifier, filter capacitor, high frequency bypass capacitor, current sensing resistors, and LM317 voltage regulator.

In the V1 supply, resistor R4 is connected across the OUT and ADJ terminals of A2, which develops a constant 1.25 volts (nominal) across it. This constant voltage across a fixed resistor generates a constant current flow, which also flows through variable resistor R5. Therefore, as the resistance of R5 is changed, the voltage across it is changed, and consequently the output voltage is changed. Capacitor C6 improves ripple rejection, and diode D10 protects A2 from damage from C6, as might occur if the supply output is short-circuited. Diode D20 further protects the regulator, protecting it against improper connections which might cause the output to be connected to a voltage which is above the regulator input voltage. Capacitor C14 improves the transient response, and capacitor C7 prevents the regulator from high-frequency oscillations which may occur if the load on the supply is far from the output terminals. Resistors R3 and R12 are used to sense load current, developing a voltage across them that is proportional to the current flow through them. This voltage is applied to the ammeter, which is actually a voltmeter, through series resistor R13. Trimpot R14 is adjusted to calibrate the ammeter in the V1 range. To protect the ammeter from damage in the event of a short on the output, diode D17 limits the voltage which appears across the R3/R12 network.

The operation of the V2 and 5 V supplies are identical, except that, in the case of the 5 V supply, the variable resistor is replaced with a fixed resistor which sets the output to a fixed 5 volts.



TRANSFORMER WIRING INSTRUCTIONS

FOR 230V OPER. WIRE 2 AND 3 TOGETHER.

FOR 115 V OPER. WIRE 1 TO 3 AND 2 TO 4.

POWER SWITCH

115V 40-04-0005

230V 40-04-0006

LAST USED

R19
C15
D21
A3
S1
F1
T1

NOTE:

UNLESS OTHERWISE NOTED:
RESISTORS ARE IN OHMS
CAPACITORS ARE IN uF

Model 1301 DC Power Supply Schematic