1332A

REGULATED
DC POWER SUPPLY

Instruction Manual

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M-00149
EDITION : 2- JULY, 2001

PCB Components	Z-TR/01 PCB REV - 01
Ref Designator	**Value**
RESISTORS	
R1	1K,2W,5%,MOR
R2	0.1E,2.5W,5%,WW
R129*	33K,0.25W,5%,MFR
CAPACITORS	
C1	0.1uF,50V,CD
C2	100uF,50V,EL
C3	10uF,50V,EL
DIODE	
CR1	1N5402 X 2

PCB Components	CHASSIS & FRONT PANELS
Ref Designator	**Value**
CHASSIS	
VARISTOR	FOR 115V - 201K FOR 230V - DNR 20D 361
FILTER	YUNPEN EMI 6A/125V/250V
MAINS TRANSFORMER	650VA
INPUT FUSE	FOR 115V - 5Amp TYPE T FOR 230V - 2.5Amp TYPE T
FRONT PANEL	
WW POT	1KE 1W X 2
WW POT	10KE 1W
WW POT	50E 1W
LED GREEN	3mm
LED RED	3mm
ON/OFF SWITCH	DPST CHILLY 3022 6A /125V/250V

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GENERAL INFORMATION

DESCRIPTION

The 1332A Power Supply is a high perfomance single output DC power supply for industrial and laboratory use. Performance with economy have successfully been combined to provide a compact, fully solid state instrument.

The output is continuously variable from 0 to 32V and can supply 5A max, and can be adjusted continuously throughout the output range. The front panel CURRENT control can be used to establish the output current limit (overload or short circuit). When the supply is used as a constant voltage source the VOLTAGE controls can be used to limit the output voltage. When the unit is used as a constant current source, CURRENT controls can be used to limit the output current. The unit will automatically cross over from constant voltage to current mode and vice-versa, if the output current or voltage exceeds these preset limits. Output voltage and current are continuously monitored on two front panel meters.

The load terminals are provided on the front panel. Either the positive or negative output terminal may be grounded or the power supply can be operated floating at upto a maximum of ±300VDC above ground.

All the outputs are floating i.e. neither the output positive terminal nor the negative terminal (nor any point within the regulator circuitry) is connected to ground.

The power supply is designed to operate in ambient temperature of upto 40°C and full output may be drawn continuously provided free air circulation is allowed.The unit works from mains supply of 115V/230VAC, 47-63 Hz with selectable Switch.

PCB Components **2 X Z-DPM/01 PCB REV - 01**

Ref Designator	Value
RESISTORS	
R1	39K,0.25,5%,MFR
R2	470K,0.25W,5%,MFR
R3	1M,0.25W,5%,MFR
R4*	SEL(INPUT)
R5	10K,0.25W,5%,MFR
R6	2K4,0.25W,5%,MFR
R7	330E,0.25W,5%,MFR
R8	330E,0.25W,5%,MFR
R9	6K8, 0.25W,5%,MFR
PRESETS	
PR1	2.5K,LIN,VER (REF ADJ)
CAPACITORS	
C1	220pF,50V,CD
C2	0.1uF,100V,MP
C3	0.01uF,50V,CD
C4	0.47uF,100V,MP
C5	0.1uF,100V,MP
C6	0.1uF,100V,MP
C7	10uF,50V,EL
C8	0.1uF,50V,CD
C9	10uF,50V,EL
C10	0.1uF,50V,CD
IC's	
IC1	7107 DECODER DRIVER
VR1	TL - 431
FND's	
DS1	TSD566 GREEN
DS2	TSD566 GREEN
DS3	TSD566 GREEN
LED's	
LED1*	3MM GREEN(VOLTAGE) FOR 'CV' MODE
LED2*	3MM RED (CURRENT) FOR 'CC' MODE
MISCILLANEOUS	
J1	2.54PITCH,3PIN M
J2	NOT USED.
J3	2.54PITCH,4PIN M

PCB Components **ZSDT-CT/05 PCB**

Ref Designator	Value
ZENERS	
Z1	1N758, 10V, 0.4W
Z2	1N758, 10V, 0.4W
Z3	1N750, 4.7V, 0.4W
BRIDGE	
BR1	10A/600V PC MTG BRIDGE
BR2	CSB-1, 100V/1A BRIDGE.
ICs	
IC1	4N25 OPTO
IC2	7812
IC3	TL431
IC4	LM324
IC5	7812
IC6	TL431
IC7	79L05
IC8	7805
TRANSISTORS/FET/SCR	
Q1	BC109
Q2	MPSA12
Q3	BC557
Q4	BC557
Q5	BC547
FET1	IRFP150
SCR1	2N6396
FET2	IRFP150
CONNECTORS	
CON2	2.54mm PITCH, 12PIN M
CON3	2.54mm PITCH, 12PIN M L TYPE
CON4	2.54mm PITCH, 8PIN M
MISCELLANEOUS	
TP1	RIM PIN MALE
TP2	RIM PIN MALE
TP3	RIM PIN MALE
TP4	RIM PIN MALE
TP5	RIM PIN MALE
TP6	RIM PIN MALE
SPADE CON	12H750

SPECIFICATIONS

Detailed specifications of the power supply are given in the following table.

OUTPUT VOLTAGE : 0-32V DC continuously variable with coarse and fine voltage controls

LOAD CURRENT : 0-5 Amp max., continuously variable with coarse and fine controls

CONSTANT VOLTAGE MODE
REGULATION

LINE : Less than ± 0.01% +2mV for ±10% change in line voltage.

LOAD : Less than ± 0.01% + 2mV for load change from zero to full load.

RIPPLE & NOISE : Less than 1mV rms max. (20Hz - 20MHz)

CONSTANT CURRENT MODE
REGULATION

LINE : Less than ± 0.1% +250µA for ±10% change in line voltage.

LOAD : Less than ±0.1% +250µA for change in output voltage from 0 volts to max.output voltage.

RIPPLE & NOISE : 0.04% rms.(2.0 mA)

OUTPUT POLARITY : Floating w.r.t. ground.

OVERLOAD PROTECTION : Automatic overload and short circuit protection.

TRANSIENT RESPONSE : 100µsecs to within 10mV of set output voltage for load change from 10% to 90%.

STABILITY

Total drift within 8 hours, : ±0.1% +2.5mV in constant voltage mode.

after warm up under : ±0.5% +2mA in constant current mode.
constant line,load & temp.

PANEL METERS : Digital panel meters (marked V for voltmeter and A for ammeter) are provided with an accuracy of ± 3 counts.

MODE INDICATION : Respective LED lights up when the unit is working in CV or CC mode.

OUTPUT CONTROLS : Single turn coarse and fine voltage and current controls are provided on the front panel

OPERATING TEMP. : 0-40°C.

INPUT VOLTAGE : 115V / 230V AC, ± 10%, 47 - 63Hz single phase

DIMENSIONS (W x D x H) : 230mm x255mm x133mm

WEIGHT : 9.0Kg. nett. Approx.

Ref Designator	Value
C20	220µF/50V, ELE
C21	47µF/50V, ELE
C22	10µF/50V, ELE
C23	0.1µF/50V, CD
C24	10µF/50V, ELE
C25	10µF/50V, ELE
C26	0.1µF/50V, CD
C27	470µF/50V, ELE
C29	1000µF/35V,ELE
DIODES	
CR1	Not Used
CR2	1N4007, 1KV/1A
CR3	1N4007, 1KV/1A
CR4	1N4007, 1KV/1A
CR5	1N4007, 1KV/1A
CR6	1N4007, 1KV/1A
CR7	1N4007, 1KV/1A
CR8	1N4007, 1KV/1A
CR9	1N4007, 1KV/1A
C10	1N4007, 1KV/1A
CR11	1N4007, 1KV/1A
CR12	1N4007,1KV/1A.
CR13	1N4007,1KV/1A.
CR14	1N4007,1KV/1A
CR15	1N4007,1KV/1A
CR16	1N4007, 1KV/1A
CR17	1N4007, 1KV/1A
CR18	1N4007, 1KV/1A
CR19	1N4007, 1KV/1A
CR20	1N4007, 1KV/1A
CR21	1N4007, 1KV/1A
CR22	1N4007, 1KV/1A
CR23	1N4007, 1KV/1A
CR24	1N4007, 1KV/1A
CR25	1N4148, 100V/10mA
CR26	1N4148, 100V/10mA
CR27	1N4148, 100V/10mA
CR28	1N4148, 100V/10mA
CR29	1N4007, 1KV/1A
CR30	1N4007, 1KV/1A

Ref Designator	Value
R37	2K, MFR, 1/4W, 5%
R38	1K, MFR, 1/4W, 5%
R39	1K, MFR, 1/4W, 5%
R40	4.7K, MFR, 1/4W, 5%
R41	330K, MFR, 1/4W, 5%
R42	100E, MFR, 1/4W, 5% (I CAL)
R43*	3.9K, MFR, 1/4W, 5% (I CAL)
R44	1K, MFR, 1/4W, 5%
R45	1K, MFR, 1/4W, 5%
R46*	10K, MFR, 1/4W, 5% (V CAL)
R47*	100E, MFR, 1/4W, 5% (V CAL)
R48	2K, MFR, 1/4W, 5%
R49	Shorting Link
R50	Shorting Link
R51	10E, MFR, 1/4W, 5%
R59	10E, MOR, 2W
PRESETS	
PR101	5K, PRE, LIN, (V)(DEV. DROP)
PR102	500E, PRE, LIN, (V)(V CAL)
PR103	500E, PRE, LIN, (V)(I CAL)
CAPACITORS	
C1	0.1µF/100V, MP
C2	0.1µF/250VAC MKP
C3	15,000µF/50V ELE
C4	0.1µF/50V, MP 10%
C5	33µF/50V, ELE
C6	100µF/50V, ELE
C7	100µF/50V, ELE
C8	1µF/50V, ELE
C9	4.7µF/50V, ELE
C10	10µF/50V, ELE
C11	100µF/50V, ELE
C12	47µF/50V, ELE
C13	1kpF/50V, CD
C14	1kpF/50V,.CD
C15	0.1µF/50V, CD
C16	10µF/50V, ELE
C17	10µF/50V, ELE
C18	0.1µF/50V, CD
C19	220µF/50V, ELE

LOCATION AND DESCRIPTION OF OPERATING CONTROLS

In order to use the full capabilities of the 1332A, it is highly recomended that the user become familiar with the controls associated with this instrument. (See **Figure 1**)

Figure 1. Location of operating controls.

1-Power ON/OFF switch.

2-Supply LED Display.
Display Voltage 0 to 32VDC

3-Supply LED Display.
Displays current 0 to 5AMP.

4-Variable coarse voltage control.
Clockwise rotation increases variable o/p voltage in CV mode.

5-Variable fine voltage control.
Clockwise rotation increases variable output voltage in CV mode.

6-Current coarse Control.
Clockwise rotation increases variable output current in CC mode.

7-Current Fine Control Clockwise rotation increases variable output current in CC mode.

8-CV LED
Constant Voltage mode Indication

9-CC LED
Constant Current Mode Indication

10-Output terminals
Red terminal is output (+)ve.
Black terminal is output (-)ve.

11-Ground terminal.

INSTALLATION

INITIAL INSPECTION : As soon as the power supply unit is unpacked inspect for any damage that may have occured during transit. Save all packing material until inspection is completed. If any damage is found, notify the carriers immediately. Our authorised representatives should also be notified.

PHYSICAL CHECK : This check should confirm that there are no broken knobs or connectors, that the cabinet and panel surfaces are free of dents and scratches and the meters are not scratched and cracked.

ELECTRICAL CHECK : The power supply unit should be checked against electrical specifications.An in-cabinet performance check will verify proper operation.

INSTALLATION DATA : The power supply unit is shipped ready for bench operation. It is necessary only to connect the unit to a rated source of power and it is ready for operation.

LOCATION : The power supply unit is naturally cooled.Sufficient space should be kept around the unit while in operation, so that heat sinks do not remain in confined space or close to another heating source.The ambient temperature of the area around the unit should be less than 40°C.

INPUT POWER REQUIREMENTS : The power supply unit may be operated continuously from input voltage of 115V / 230V 47-63Hz power source with selectable Switch.

REPACKAGING FOR SHIPMENT : To ensure safe shipment of the power supply unit, it is recommended that the package designed for the unit be used. The original packaging material is reusable. Be sure to attach a tag to the unit specifying the owner, and the fault observed with a brief description.

REMOVING COVER : The top cover is retained in place by 6 self tapping screws & two handle mounting screws. To remove cover, proceed as follows :

a) Remove the handle mounting screws.
b) Remove the self tapping screws on sides.
c) Lift the cover from rear side, slide backwards & pull.

PCB Components **ZSDT-CT/05 PCB**

Ref Designator	Value
R37	2K, MFR, 1/4W, 5%
R38	1K, MFR, 1/4W, 5%
R39	1K, MFR, 1/4W, 5%
R40	4.7K, MFR, 1/4W, 5%
R41	330K, MFR, 1/4W, 5%
R42	100E, MFR, 1/4W, 5% (I CAL)
R43*	3.9K, MFR, 1/4W, 5% (I CAL)
R44	1K, MFR, 1/4W, 5%
R45	1K, MFR, 1/4W, 5%
R46*	10K, MFR, 1/4W, 5% (V CAL)
R47*	100E, MFR, 1/4W, 5% (V CAL)
R48	2K, MFR, 1/4W, 5%
R49	Shorting Link
R50	Shorting Link
R51	10E, MFR, 1/4W, 5%
R59	10E, MOR, 2W
PRESETS	
PR101	5K, PRE, LIN, (V)(DEV. DROP)
PR102	500E, PRE, LIN, (V)(V CAL)
PR103	500E, PRE, LIN, (V)(I CAL)
CAPACITORS	
C1	0.1µF/100V, MP
C2	0.1µF/250VAC MKP
C3	15,000µF/50V ELE
C4	0.1µF/50V, MP 10%
C5	33µF/50V, ELE
C6	100µF/50V, ELE
C7	100µF/50V, ELE
C8	1µF/50V, ELE
C9	4.7µF/50V, ELE
C10	10µF/50V, ELE
C11	100µF/50V, ELE
C12	47µF/50V, ELE
C13	1kpF/50V, CD
C14	1kpF/50V,.CD
C15	0.1µF/50V, CD
C16	10µF/50V, ELE
C17	10µF/50V, ELE
C18	0.1µF/50V, CD
C19	220µF/50V, ELE

SECTION 5
PART LIST & SCHEMATICS

PCB Components **ZSDT-CT/05 PCB**

Ref Designator	Value
RESISTORS	
R1	270E, 2W, 5%, MOR
R2	47E, MFR, 1/4W, 5%
R3	10K, MFR, 1/4W
R4*	1K, MFR, 1/4W, 5%
R5	10E, MFR, 1/4W, 5%
R6	3.9K, MFR, 1/4W
R7	3.3K, 2W, 5%, MOR
R8	10K, MFR, 1/4W
R9	8.2K, MFR, 1/4W
R10	100K, MFR, 1/4W
R11	4.7E, MFR, 1/4W.
R12	1.5K, MFR, 1/4W.
R13	180K, MFR, 1/4W.
R14	390E, MFR, 1/4W.
R15	6.8K, MFR, 1/4W, 5%
R16	12K, MFR, 1/4W, 5%
R17	3.9K, MFR, 1/4W, 5%
R18	10K, MFR, 1/4W
R19	10K, MFR, 1/4W
R20	10K, MFR, 1/4W
R21	3.3K, 2W, 5%, MOR
R22	270E, 2W, 5%, MOR
R23#	82K, MFR, 1/4W, 5%
R24	4.7K, MFR, 1/4W, 5%
R25	24E, MFR, 1/4W, 5%
R26	820E, MFR, 1/4W, 5%
R27#	330K, MFR, 1/4W, 5%
R28#	39K, MFR, 1/4W, 5%
R29#	180K, MFR, 1/4W, 5%
R30	1K, MFR, 1/4W, 5%
R31	15E, MFR, 1/4W, 5%
R32	6.8K, MFR, 1/4W, 5%
R33	15K, MFR, 1/4W, 5%
R34	6.8K, MFR, 1/4W, 5%
R35	15K, MFR, 1/4W, 5%
R36	1K, MFR, 1/4W, 5%

OPERATING INSTRUCTIONS

TURN ON SETTING PROCEDURE

The following procedure describes the use of controls and indicators.

a. Ensure that the AC power switch is in the "OFF" position.

b. Connect the unit to a specified input voltage.

c. Turn the VOLTAGE and CURRENT controls fully counter-clockwise.

d. Set ‘POWER ON’ Switch to "ON" position,The front panel digital meters will light up and voltmter and ammeter displays will read zero,and observe that CV LED glows.

e. Adjust the ”VOLTAGE” controls till the desired voltage is indicated on voltmeter.

f. To check "CONSTANT CURRENT" mode, turn OFF the supply. Short circuit the output terminals of the power supply and turn ON the supply.

g. Adjust 'CURRENT' controls until the desired out put current is indicated on ammeter. Also check that the CC LED glows.

h. Remove the short circuit.

CONSTANT VOLTAGE MODE :

To select a constant voltage output, proceed as follows :

a. Connect a digital voltmeter (DVM) across the out put terminals, observing correct polarity. The DVM must be rated for better than 0.5% accuracy.

b. Turn the CURRENT controls clockwise. And Slowly If a load change causes the current limit to be exceeded, the power supply will automati cally cross over to constant current output at cur rent limit and output voltage will drop proportion ately. In setting the current limit, allowance must be made for high peak currents which can cause unwanted crossover.

CONSTANT CURRENT MODE :

To select a constant current output, proceed as follows :

a. Short circuit the output terminals of the power supply.

b. Connect a DC Ammeter OR a shunt-digital voltmeter (DVM) combination across the output terminals, using appropriately-guaged wire and hardware. The recommended current ratings for the ammeter or he shunt and the wire must be at least 10% more than the output current of the power supply model. The ammeter or shunt-DVM combination must be rated better than 0.5% accuracy.

c. Turn the VOLTAGE controls clockwise. And Turn the CURRENT controls slowly clockwise. The CURRENT control range will be from minimum to maximum rated output current. Adjust CURRENT controls for desired output current.

d. Compare the ammeter reading with the front panel ammeter reading. Or, compare the DVM reading with the front panel ammeter reading using I = V/R, where V is the DVM reading and R is the DC shunt resistance.

e. Open output terminals and adjust VOLTAGE controls for maximum output as required by the load conditions.

If a load change causes the voltage limit to be exceeded, the power supply will automatically cross over to constant voltage output at the preset voltage limit and output current will drop proportionately. In setting voltage limit, allowance must be made for high peak voltages which can cause unwanted crossover. Turn the VOLTAGE controls clockwise and observe both the front panel voltmeter and the DVM. Compare the DVM reading with the front panel voltmeter reading to verify the accuracy of the internal voltmeter

c. The VOLTAGE control range will be from minimum to the maximum rated output voltage. Adjust desired voltage by adjusting the voltage controls.

d. Short circuit output terminals and adjust CURRENT controls for maximum output current as required by the load conditions.

SERVICE AND WARRANTY INFORMATION

FACTORY SERVICE AND REPAIR :

Global Specialties will service and repair this instrument free of charge for a period of one full year subject to the warranty conditions stated below.

To obtain a return merchandise authorisation (RMA) required for all returns, phone our customer service department for a RMA and all shipping instructions :

GLOBAL SPECIALTIES
70 Fulton Terrace,
New Haven,
Connecticut 06512,
TEL.: (203) 466 – 6103
FAX : (203) 468 – 0060
Email : eblaur@aol.com

ATTN : Customer Service Department

WARRANTY

Global Specialties warrants this device to be free from defective material or workmanship for a period of 3 years from the date of original purchase.

Global Specialties under this warranty is limited to repairing the defective device when returned to the factory,shipping charges prepaid, within three full years from the date of original purchase.

Units returned to Global Specialties that have been subject to abuse, misuse, damage or accident or have been connected, installed or adjusted contrary to the instructions furnished by Global Specialties, or that have been repaired by unauthorised persons will not be covered by this warranty.

Global Specialties reserves the right to discontinue models, change specifications ,price or design of this device at any time without incurring any obligation whatsoever.

The purchaser agrees to assume all liabilities for any damages and/or bodily injury which may result from the use or misuse of this device by the purchaser his employees or agents. This warranty is in lieu of all other representations or warranties expressed implied and no agent or representitive of Global Specialties is authorised to assume any other obligation in connection with the sale and purchase of this device.

CASE DISASSEMBLY AND ASSEMBLY

WARNING

Potentially lethal AC power is present whenever theline cord is plugged into the AC outlet,even when the power switch is OFF. Always disconnect the power cord when opening the case. Avoid touching the fuse post on the inside of the unit.

Should access to the inside of the unit be required, proceed as follows

1. Remove the line cord from the AC outlet before disassembly

2. To disassemble the case,remove the screws that secure the cover to the chassis and lift the cover off.

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

MAINTENANCE AND RECALIBRATION

ADJUSTMENTS :

All circuitry is factory -calibrated. No user adjustments are required.

FUSE REPLACEMENT :

Remove the line cord from the AC outlet before changing fuses. Using the screwdriver, remove the fuse holder cap. Replace the fuse with another of identical type and current rating. Replace the fuse holder cap.

If a load change causes the current limit to be exceeded, the power supply will automatically cross over to constant current output at current limit and output voltage will drop proportionately. In setting the current limit, allowance must be made for high peak currents which can cause unwanted crossover.

CONSTANT CURRENT MODE :

To select a constant current output, proceed as follows :

a. Short circuit the output terminals of the power supply.

b. Connect a DC Ammeter OR a shunt-digital voltmeter (DVM) combination across the output terminals, ing appropriately-guaged wire and hardware. The recommended current ratings for the ammeter or

the shunt and the wire must be at least 10% more than the output current of the power supply model. The ammeter or shunt-DVM combination must be rated better than 0.5% accuracy.

c. Turn the VOLTAGE controls clockwise. And Turn the CURRENT controls slowly clockwise. The CURRENT control range will be from minimum to maximum rated output current. Adjust CURRENT controls for desired output current.

d. Compare the ammeter reading with the front panel ammeter reading. Or, compare the DVM reading with the front panel ammeter reading using I = V/R, where V is the DVM reading and R is the DC shunt sistance.

e. Open output terminals and adjust VOLTAGE controls for maximum output as required by the load conditions.
If a load change causes the voltage limit to be exceeded, the power supply will automatically cross over to constant voltage output at the preset voltage limit and output current will drop proportionately. In setting voltage limit, allowance must be made for high peak voltages which can cause unwanted crossover.

LOAD CONNECTIONS :

The load should be connected to the power supply output terminals using separate pairs of connecting wires. This will minimize mutual coupling effects between loads and will retain full advantage of the low output impedance of the power supply. Each pair of connecting wires should be as short as possible and twisted or shielded to reduce noise pick up. (If a shielded pair is used, connect one end of the shield to ground at power supply and leave the other end unconnected).

Positive or negative voltage can be obtained from this supply by grounding either one of the output terminals or one end of the load. Always use two leads to connect load to the supply, regardless of where the set up is grounded. This will eliminate any possibility of the output current return paths through the power source ground which would damage the line cord plug. This supply can also be operated upto ±300V DC above ground, if neither output terminal is grounded.

POWER SUPPLY OPERATION

INITIAL SET UP :

Refer to the preceding section for initial set up of the power supply.

OPERATING INSTRUCTIONS :

Proper operation of most circuitry depends on correct supply voltages. It is recommended that the power supply be set to the required voltage levels with the load disconnected. When the desired voltage is set (using the variable voltage control),turn the AC power OFF, connect the load to the power supply. then turn the AC power ON. Output voltage and current of the power supply may be read on the separate digital panel meters continuously.

OPERATING PRECAUTIONS

The power supply is ideally suited for virtually any type of IC bread boarding from TTL, CMOS and ECL to op-amps, audio and video amps, phase locked loops, and microprocessor circuitry. However,certain normal bread boarding precautions should be taken to avoid ground loops and inadvertent loading. Observance of correct load polarity is also important since most ICs may be damaged by improper power supply connections.

POLARITY :

Observe proper polarity when connecting the power supplies 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 micro Volts, is a part of the output load. If a preamplifier input of circuit ground is connected to a portion of this ground bus, feedback and oscillation may occur. To prevent this all output stages should be positioned as close as possible to the ground terminal,preamps farther away. Many audio IC's have seperate input and output grounds to prevent ground loops.

Eventhough power supplies are tightly regulated, a short length of a 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. Place these capacitors as close as possible to the power supply pins of the IC.Disc ceramics (0.1µF) work well and should be placed across as many ICs as possible. Do not use elec trolytic or paper capacitors because they have high inductances and cease to act as bypasses above one or two MHz. Bypassing is required with digital IC's also; problems such as inability to reset or to clear and false triggering can occur if IC's are not properly bypassed.