

**XEROX**

**Diablo Systems Incorporated**  
A Xerox Company

**Model 029 Power Supply  
Maintenance Manual**

## WARRANTY

The Model 029 Power Supply is warranted against defective materials and workmanship for one year from the date of shipment. Any questions with respect to the warranty should be taken up with your Diablo Sales Representative.

All requests for repairs should be directed to the Diablo Repair Depot in your area. This will assure you of the fastest possible service.

## PREFACE

The purpose of this manual is to provide the prospective user of Diablo Systems, Inc., Model 029 Power Supply with the unit's characteristics and capabilities, and to enable the power supply's user to properly operate and maintain the unit.

Comments on this manual or its use are invited, and may be forwarded to:

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SECTION 1

GENERAL DESCRIPTION AND SPECIFICATIONS

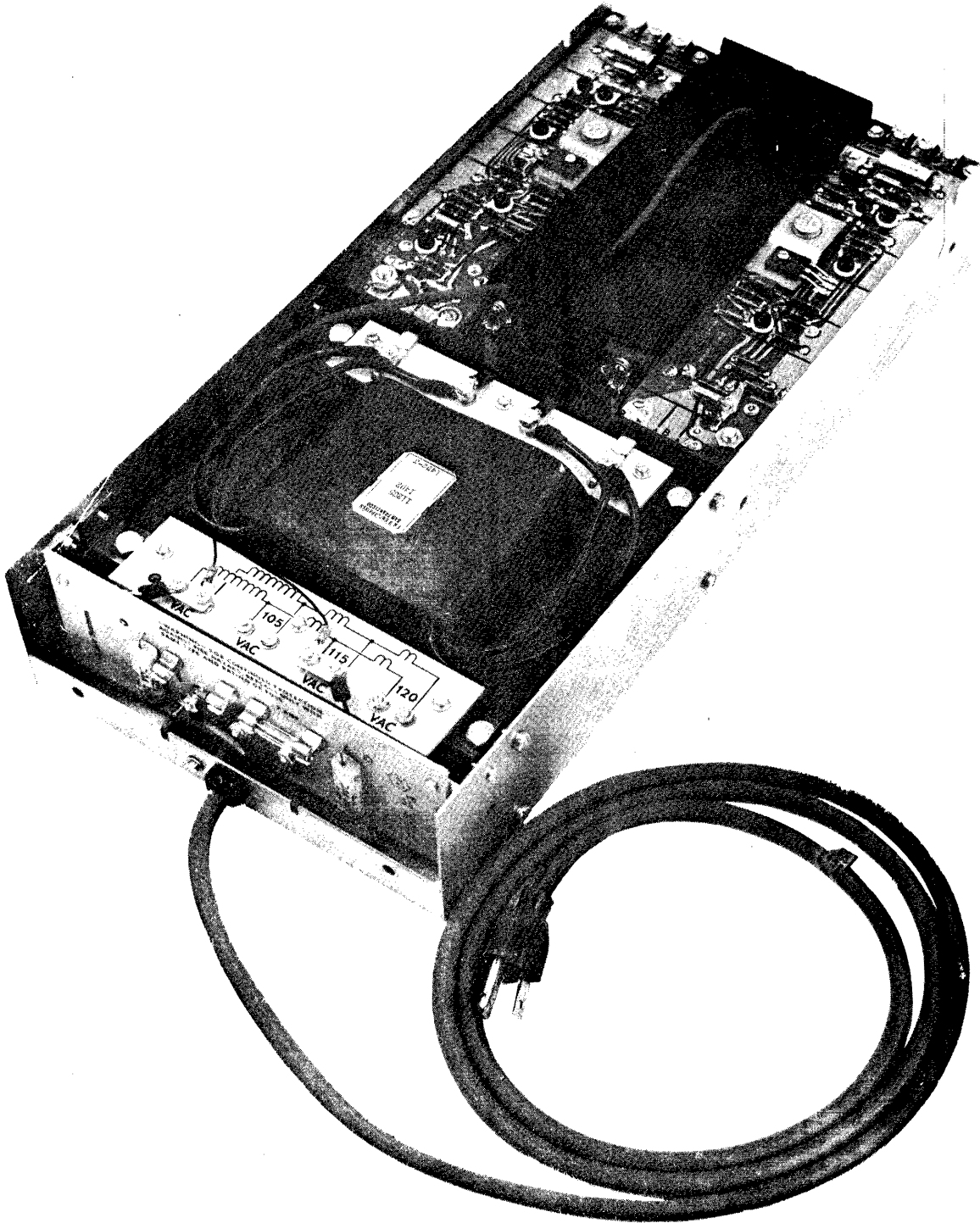


Figure 1-1 MODEL 029 POWER SUPPLY

## 1.1 INTRODUCTION

This manual describes the installation, operation, and maintenance of Diablo Systems, Inc., Model 029 Power Supply, shown in Figure 1-1. The power supply is designed specifically to provide the power required by one or two Diablo Series 30 Disk Drives. Circuit configuration and component values were selected to accommodate the peculiarities of the dynamic load presented by the Series 30 Disk Drive, including flyback current spikes. The Model 029 may be used, however, for supplying power to any equipment having the appropriate power requirements. Nominal output voltages of the Model 029 are +15VDC and -15VDC.

## 1.2 GENERAL DESCRIPTION

The power supply input voltage is adaptable from 105 to 120VAC and from 210 to 240VAC. Adaption to these voltages is accomplished by taps on the transformers primary windings. Allowable line voltage variation is  $\pm 10\%$  for any primary tap configuration with no degradation to the output voltages.

The power supply has an allowable line frequency range of 47 to 63 Hertz.

Power supply output is available at a *Jones* type terminal strip. Combined noise and ripple on either output voltage does not exceed 10 millivolts peak-to-peak under nominal operating conditions. Both output voltages will remain within  $\pm 3\%$  of their respective values of nominal +15V and nominal -15V rating for the worse case combination of temperature variation [ $0^{\circ}$  to  $55^{\circ}\text{C}$ ], input voltage change [ $\pm 10\%$ ], input frequency change [47 to 63 Hz], and zero to maximum load [14.5 Amperes on +15 and 12 Amperes on -15 volts].

Overvoltage protection is provided, to become effective if the output voltage should reach 17 volts DC,  $\pm 1$  volt. Current limiting is at a nominal 18 Amperes. Each output is equipped with a fuse for protection, should the limiting circuits fail to function. The input voltage line is also fused.

## 1.3 OPERATING SPECIFICATIONS

Parameter	Specification
Input:	
Single Phase AC	105 to 120 volts or 210 to 240 volts [tapped transformer windings]
Line Regulation	$\pm 10\%$ of nominal value
Line Frequency	47 to 63 Hertz
Output:	
Nominal Output	+15 and -15 volts DC, $\pm 3\%$
Ripple Voltage	10 millivolts peak-to-peak maximum [no load] and 100 millivolts peak-to-peak maximum [full load at 115VAC, 60 Hz input]
Current Range	0 to 14.5 Amperes, +15 volts DC 0 to 12.0 Amperes, -15 volts DC
Protection:	
Input	7 Amp fuse with 115 volt range 5 Amp fuse with 230 volt range
Output	15 Amp fuse for +15 volts DC 15 Amp fuse for -15 volts DC
Reverse Polarity	Output clamped to less than .8 volt
Current Limiting	Nominal 18 Amperes for +15 volts DC Nominal 18 Amperes for -15 volts DC
Temperature:	
Operating Ambient	$25^{\circ}\text{C} \pm 15^{\circ}$ [ $77^{\circ}\text{F} \pm 59^{\circ}$ ]
Storage	$-55^{\circ}$ to $85^{\circ}\text{C}$ [ $-131^{\circ}$ to $185^{\circ}\text{F}$ ]
Relative Humidity	10% to 90% [noncondensing]
Physical:	
Height	3.25 inches [8.255 cm]
Width	8.00 inches [20.32 cm]
Depth	17.00 inches [43.18 cm]
Weight	25 pounds [11.25 kg]

## SECTION 2

### INSTALLATION AND OPERATION

#### CAUTION

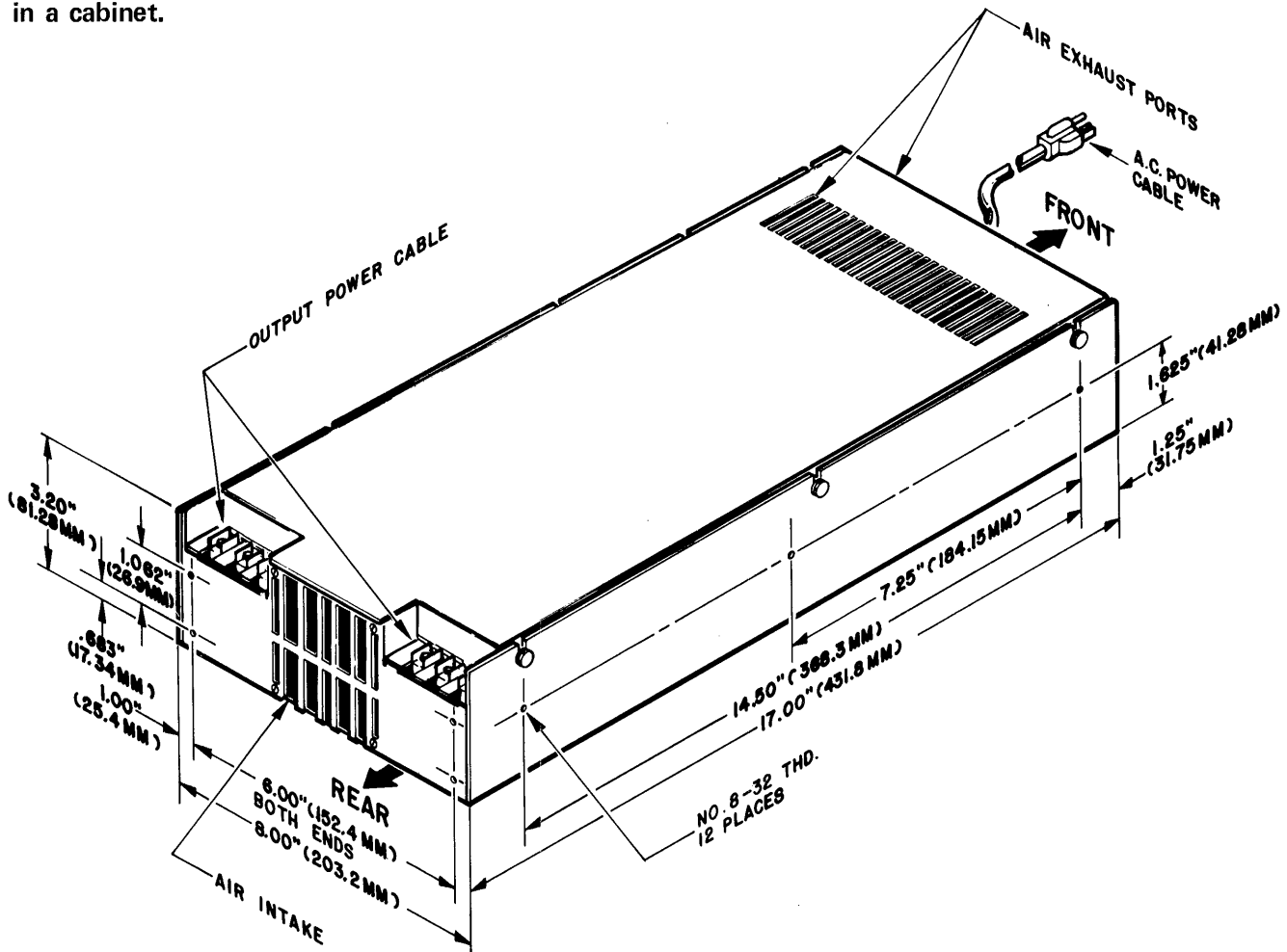
The transformer is connected, at the factory, for operation from a 115VAC, 60Hz source with one side connected to earth ground, unless otherwise specified. If operation from a different power source is desired, or if earth ground is not on the proper side of the line, the transformer connections and/or fusing must be changed prior to applying any power to the unit. It is advisable that any changes to the connections be made prior to installation of the unit in a cabinet.

#### 2.1 UNPACKING

Use normal care while opening the reusable shipping container for the Model 029 Power Supply. Optional DC power cables and rack mounting hardware are normally packaged separately.

#### 2.2 GENERAL INSTALLATION CONSIDERATIONS

Figure 2-1 shows the principal dimensions of the power supply. The unit can be either bench mounted or installed in a standard 19-inch [482.6 mm] rack. Although there is no restriction as to which end of the power supply faces the rear of



AIR INTAKE AND EXHAUST PORTS SHOULD BE UNRESTRICTED

Figure 2-1 OUTLINE DIMENSIONS

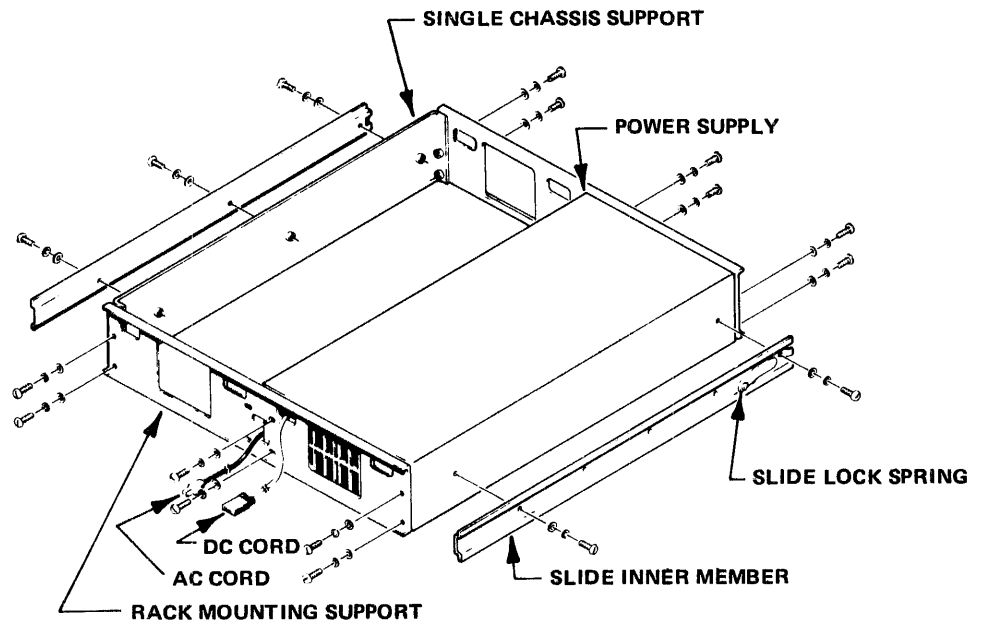
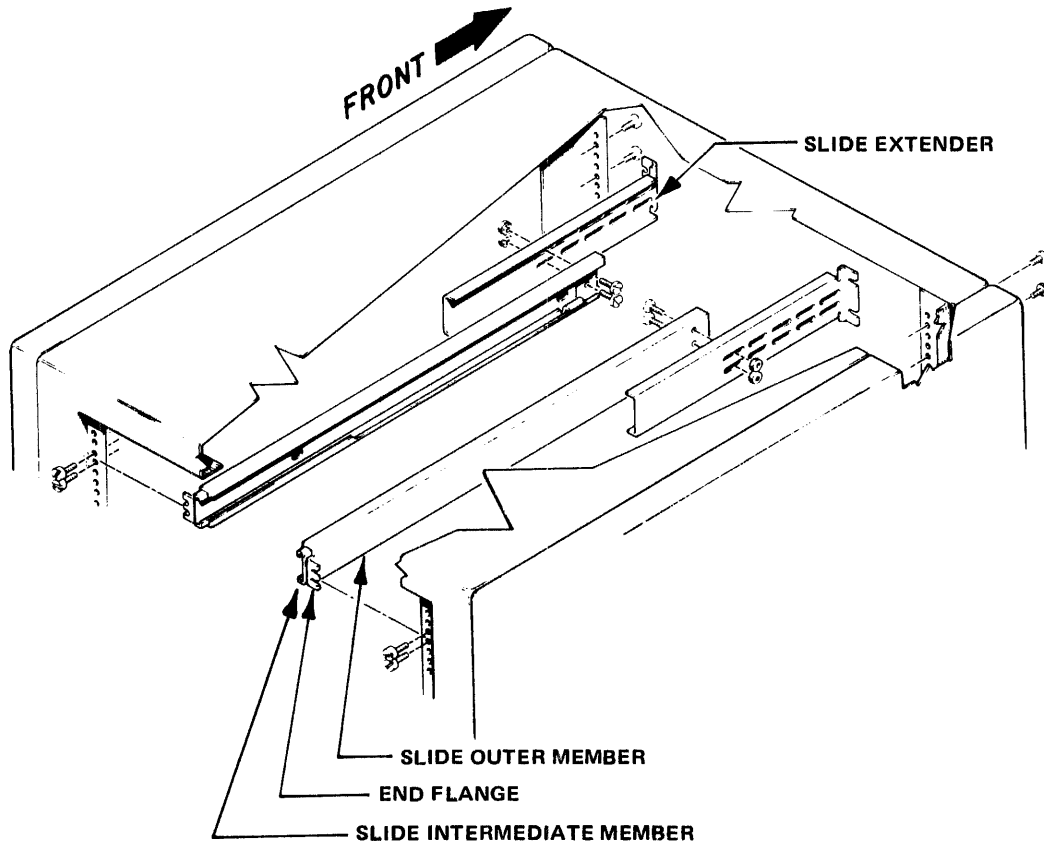


Figure 2-2 RACK ADAPTOR INSTALLATION (TYPICAL)



the cabinet, it is normal for the end with the DC power cable to face the rear, since the DC inputs of the various Diablo products are at the rear.

Maximum ventilation is obtained if all three [front, top and bottom] air exhaust ports are unrestricted. As a minimum, both the rear intake port and one exhaust port must have a clearance of at least three inches [76.2 mm] from the closest obstruction.

### 2.2.1 Bench Mounting

If the unit is bench mounted, it is advisable to attach adhesive rubber feet on the bottom surface, so that the bottom air exhaust port will not be covered. Clearance between the bench and the power supply should be at least one-fourth inch [6.35 mm]. Numerous satisfactory types of such rubber feet are readily available on the market.

### 2.2.2 Rack Mounting

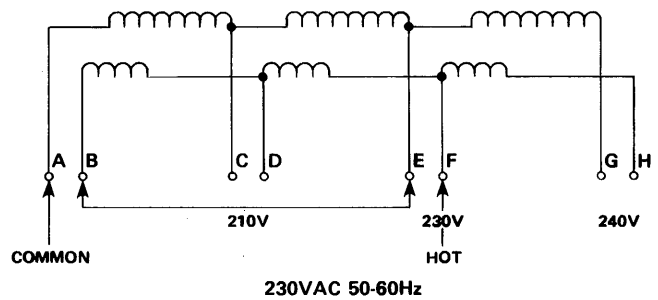
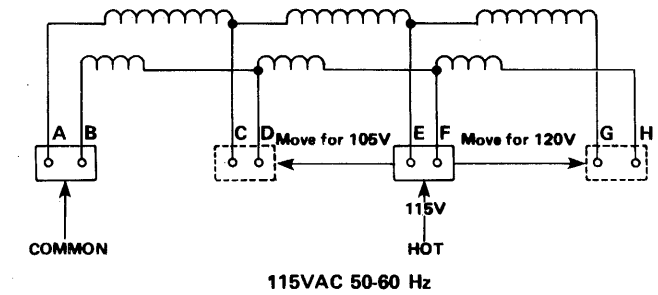
By use of an optional rack adapter kit, one or two power supplies may be installed in a standard 19-inch [482.6 mm] rack. Depending on which way the kit is installed, the power supply slides out to either the front or the rear of the rack, but not both. Although all normally serviced parts are accessible regardless of the power supply mounting, rear opening facilitates access to the DC output terminals and the output line fuses, and is the recommended method of mounting. Front opening facilitates access to the AC line fuse(s) and the transformer tap terminals. Figure 2-2 shows the method of installing a typical rack adapter kit for rear opening.

## 2.3 INPUT VOLTAGE

Unless specified otherwise, the power supply will be adaptable to 115 volts, 60 Hertz, AC. If the unit is to operate at another line voltage within the range of the transformer, the primary tap(s) must be changed. The following procedure should be followed to change the transformer taps. See Figure 2-3.

**NOTE** Transformer leads are not identification coded other than by their location on the terminal board. When changing locations, insure that transformer leads remain on the proper terminal.

1. Remove the top cover of the unit by removing the two bolts on the DC output end, loosening the two bolts on the side,



REMOVE ALL JUMPERS

AC INPUT:

- 210V - JUMPER B TO C, CONNECT LINE TO A & D.
- 230V - JUMPER B TO E, CONNECT LINE TO A & F.
- 240V - JUMPER B TO G, CONNECT LINE TO A & H.

**Figure 2-3**  
**POWER TRANSFORMER CONNECTIONS**

and loosening the two bolts on the AC input end of the cover.

2. Observe the layout terminal board mounted on the transformer. There are two primary windings, both marked with the same notation. Note the AC line fuse mounted on the printed circuit board at the AC input end of the unit.
3. For operation in the range of 105 to 120 volts AC the two primary windings are connected in parallel and the input line is fused at 7 Amperes.
4. For operation in the range of 210 to 240 volts AC the two primary windings are connected in series and the input line is fused at 5 Amperes.

### CAUTION

If neither of the two input lines is grounded, as commonly found where one phase of a 3-phase system is used, two fuses must be used.

5. To add the second fuse, cut the trace on the back of the input circuit board and place the same value fuse in each fuseholder. Mark the label on the power supply to indicate the fuse must be removed and the trace resoldered prior to adapting the supply to the more commonly found single phase system with one line grounded.

#### **2.4 OUTPUT VOLTAGES**

Output DC voltages are available on *Jones* type terminals. These terminals are located at the end of the power supply opposite the AC input. There are two +15 volt connectors and a ground on one side of the supply, and two -15 volt and a ground on the other side of the supply. The voltage and ground connections are internally connected. Each DC voltage has its own 15 Ampere fuse. These

fuses are located on the heatsink assembly.

#### **2.5 DC POWER CABLE**

Diablo offers, as an option, a five-foot long DC power cable. The cable has 5 lugs to attach to the power supply on one end, and a 14 pin MRAC Winchester type plug at the other end. This power cable is designed for use with Diablo's Series 30 Disk Drives.

#### **2.6 OPERATING INSTRUCTIONS**

If the power supply has been adjusted and installed properly, operation simply consists of first connecting it to the unit to which it supplies power, and then plugging it into the AC source.

**NOTE** There is no ON/OFF switch or other front panel control or indicator.

## SECTION 3

### PRINCIPLES OF OPERATION

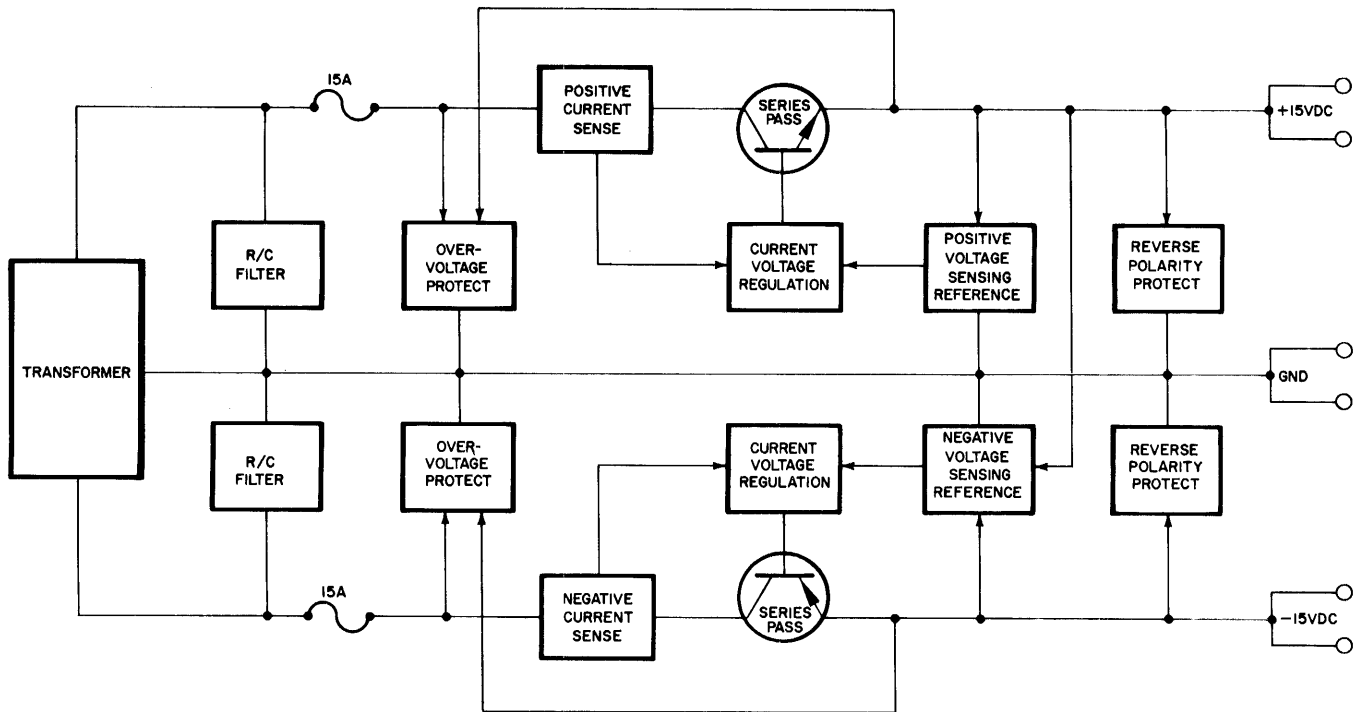


Figure 3-1 BLOCK DIAGRAM OF MODEL 029

#### 3.1 GENERAL

This section contains circuit descriptions of the features within the Model 029 Power Supply. These features are shown in the block diagram in Figure 3-1. Components referenced in these circuit descriptions can be located in the schematic diagram, Figure 3-2.

#### 3.2 AC INPUT

The AC line voltage is applied to the transformer's appropriate primary windings from the terminals on the input printed circuit board.

The secondary of the transformer connects to the MDA990-2 fullwave bridge rectifier. The output of the rectifier is filtered by an R/C network to provide unregulated 15 volts DC to the remaining circuitry.

#### 3.3 HEATSINK ASSEMBLY AND SERIES PASS TRANSISTORS

The series pass power transistors are mounted on

the heatsink assembly. The base current drive of these transistors is adjusted by regulation circuits, to maintain evenly regulated outputs.

#### 3.4 VOLTAGE REGULATION

The positive 15 volt DC regulation circuit uses a 6.2 volt zener diode for an internal voltage reference. This diode is located at coordinates A6 on the positive voltage printed circuit board. This reference voltage is tied to the base of the 2N3643 transistor at location D12. The emitter of D12 is tied to the emitter of a 2N3643 at B12 through capacitor D16. This arrangement allows the potential at the collector of D12 to change by electronically controlling the current flow through B12.

The +15VDC output is scaled through a voltage divider comprised of a 1.74K 1% resistor at D10, and a 1.33K 1% resistor at A16. The voltage at the junction of these two resistors has been trimmed at the factory to provide the correct current flow



through B12 to provide an output of +15 volts  $\pm$ .06 volt.

If the output voltage of the supply drops below +15 volts, the potential at the base of B12 will also drop, causing emitter collector current to decrease. This, in turn, will cause the transistors at D26 and D34 to increase conduction. The increased conduction will cause the base potential of the series pass transistor to decrease, which in turn will lower the output voltage back to its nominal +15 volts.

The voltage regulation circuit for -15VDC operates in the same manner as the positive circuit. The differences are in component locations and in the means of developing the reference voltage. In the +15 volt circuit a 6.2 volt zener diode is used as the reference whereas in the -15 volt circuit the +15 volt output is used as the reference.

### **3.5 CURRENT LIMITING**

A .05 Ohm 25 watt current sensing resistor is located in the collector circuit of each series pass transistor. If current flow through the series pass transistor should reach a nominal 18 Amperes, the voltage drop across the current sensing resistor will cause a control transistor at B48 to increase conduction. This increased conduction will shut

off transistors D34 in the positive circuit and D31 in the negative circuit. When these transistors shut off, the series pass transistors will also be shut off. The output voltage is thus dropped to a very low potential and will remain there until the reason for the overcurrent condition is removed.

### **3.6 OVERVOLTAGE PROTECTION**

Overvoltage protection is used to insure that the output voltage levels will not injure the load if the power supply circuits should malfunction.

In the +15 volt supply, a 16 volt zener diode at location D60 will conduct if the output voltage exceeds a nominal 16.5 volts. The SCR at location D73 will be turned on causing the 15 Ampere fuse to open, disabling the supply.

In the negative supply, the 16 volt zener diode at location D50 going into conduction will cause the transistor at D61 to conduct. The SCR at D73 will be turned on causing the 15 Ampere fuse to open, disabling the supply.

### **3.7 REVERSE POLARITY PROTECTION**

If a voltage of an opposite polarity is connected to either the positive or negative output of the Model 029, it will be tied to ground through a diode at location A24.



## SECTION 4

### MAINTENANCE AND SPARE PARTS

#### 4.1 ROUTINE MAINTENANCE

The Model 029 Power Supply requires maintenance only in the event of failure. Scheduled or routine maintenance is not required.

#### 4.2 RECOMMENDED SPARE PARTS

The following list of components are the items recommended for supporting the Model 029. No special tools or test equipment are required.

Part #	Description
10602-15	15A Fuse, GBB15
10604-01	7A Fuse [115VAC]
10604-02	5A Fuse [230VAC]
10115-00	Transistor, MJE3055
10114-00	Transistor, MJE2955
10109-00	Transistor, 2N3643
10162-01	Rectifier Bridge
10163-01	SCR, 2N5168
10161-02	Diode, 1N3492R
10116-01	Transistor, 2N5883
10116-02	Transistor, 2N5885

#### 4.3 PARTS LIST

##### 4.3.1 Rack Adaptor Kit, #11215

Part #	Description	Qty
10615-01	Slides [Left & Right]	1 set
11206	Support, Single Chassis	1
11207	Support, Rack Mount	2
17148	Extension, Slide	2
70031-07	Screw, P.H., 8-32 x .437"	14
70168-08	Lockwasher, #8	14
70169-08	Flatwasher, #8	14

##### 4.3.2 Power Supply Assembly, #11200-XX

Part #	Description	Qty
10060-05	Resistor, .05 Ohm 25W	2
10069-30	Capacitor, 30K 40V	2
10116-01	Transistor, 2N5883	1
10116-02	Transistor, 2N5885	1
10162-01	Rectifier, Bridge	1
10512-01	Ring Lug	2
10514-11	Terminal Lug	18
10515-02	Washer, Phenolic, #6	4

10528-11	Bushing	4
10528-12	Bushing	4
10563-02	Wire, #14, Black	A/R
10567-43	Shrink Tubing	A/R
10592	Jack, Closed Entry	4
10601	Block, Fuse	2
10602-15	Fuse, 15A	2
10603-02	Spacer, Hex	4
10604-01	Fuse, 7A, [115VAC]	1
10604-02	Fuse, 5A, [230VAC]	1
10605	Clip, Fuse	4
10608-01	Grommet	1
10612-02	Insulator, Transistor	2
10613-11	Tab, Receptacle	2
10618-01	Bracket, Right Angle	2
10631	Ring Lug	4
11004-03	Braid Assembly, 4.375"	1
11004-04	Braid Assembly, 10.75"	1
11190	PCB, AC In	1
11194	PCB Assembly, -15V	1
11196	Heatsink, Right	1
11197	Heatsink, Left	1
11199	Strap, Capacitor	4
11201	Chassis	1
11202	Cover, Top	1
11205	Transformer, 18V 16A	1
11208	Pivot	2
11210	Pad, Rubber	4
11212	PCB, Primary	1
11213	PCB, Secondary	1
11218	Clamp, Heatsink	1
11232	PCB, Transistor Socket	2
11234	PCB Assembly, +15V	1
11235	Strap, Ground	1
11526-01	Wire Assembly, Red, 6"	1
11526-02	Wire Assembly, Blue, 6"	1
11527-01	Wire Assembly, Red, 3.750"	1
11527-02	Wire Assembly, Blue, 3.750"	1
11528-01	Braid Assembly, 7"	2
11528-02	Braid Assembly, 3"	2
11530	Resistor Assembly, 680 Ohm	2
11531-01	Wire Assembly, Red, 3.875"	2
11531-02	Wire Assembly, Blue, 3.875"	2
11585	AC Line Cord Assy [115VAC]	1
15248-01	Spacer, Connector Bracket	1
15550	Insulator, Cover	1

41235	Fan Assembly	1	10161-01	1N3492	A24
41236	AC Filter Assembly	1	10163-01	SCR, 2N5168	D73
42518-01	AC Line Cord Assy [230VAC]	1			
70029-05	Screw, P.H., 4-40 x .312"	14		<b>TRANSISTORS</b>	
70029-08	Screw, P.H., 4-40 x .500"	8	10105	2N3644	B12,D12,D26,D61
70030-08	Screw, P.H., 6-32 x .500"	4	10109	2N3643	B48
70030-14	Screw, P.H., 6-32 x .875"	4	10115	MJE3055	D31
70031-05	Screw, P.H., 8-32 x .312"	8			
70032-08	Screw, P.H., 10-32 x .500"	4		<b>MISCELLANEOUS</b>	
70038-12	Screw, F.H. 4-40 x .750"	1	11214	Heatsink, Diode	—
70039-05	Screw, F.H. 6-32 x .312"	2	10606-01	Terminal, Perimeter	—
70038-12	Screw, F.H., 4-40 x .750"	1	10506	Terminal, Pin	TP1, TP2, TP3
70039-05	Screw, F.H., 6-32 x .312"	2	70029-08	Screw, P.H., 4-40 x .500"	—
70041-10	Screw, F.H., 10-32 x .625"	1	70168-04	Lockwasher, #4	—
70057-04	Screw, H.H., 4-40 x .187"	2	70166-04	Nut, 4-40 Hex	—
70166-04	Nut, 4-40 Hex	8	10553	Insulator	—
70166-06	Nut, 6-32 Hex	14	10617-08	Terminal	—
70168-04	Lockwasher, #4	22	70030-06	Screw, P.H., 6-32 x .375"	—
70168-06	Lockwasher, #6	8	70169-04	Flatwasher, #4	—
70168-08	Lockwasher, #8	8	10564-20	Bus Wire, #20	—
70168-10	Lockwasher, #10	4	10564-18	Bus Wire, #18	—
70169-04	Flatwasher, #4	22	10568-18	Sleeving, #18	—
70169-06	Flatwasher, #6	8			
70227-02	Retaining Ring	2			

#### 4.3.3 PCB Assembly, -15V, #11194

Part #	Description	Location(s)
<b>RESISTORS</b>		
10013-24	1.74K 1/2W 1%	B10
10033-13	1.3K 1/2W 5%	A12,A14,D22, D24
10013-26	1.82K 1/2W 1%	A16
10033-47	4.7K 1/2W 5%	D17
10032-56	560Ω 1/2W 5%	D20
10032-15	150Ω 1/2W 5%	B39
10034-30	30K 1/2W 5%	B42
10033-10	1K 1/2W 5%	A42
10002-01	100Ω 1/8W 1%	A44
10032-51	510Ω 1/2W 5%	A51
10032-10	100Ω 1/2W 5%	B67,D48,D52,D54
10032-43	430Ω 1/2W 5%	B65
10002-53	348Ω 1/8W 1%	A48
<b>CAPACITORS</b>		
10068-10	100μF 25V	B2
10077-12	12μF 20V	A70,B5,D56
10094-10	.01μF 25V	A73,B16,D59
10071-47	.047μF 200V	A40
<b>DIODES</b>		
10160	1N4454	D44
10473	Zener,16V 1/2W 2%	A53,D50

#### 4.3.4 PCB Assembly, +15V, #11234

Part #	Description	Location(s)
<b>RESISTORS</b>		
10032-43	430Ω 1/2W 5%	D6
10013-24	1.74K 1/2W 1%	D10
10032-27	270Ω 1/2W 5%	A12, D20
10013-13	1.33K 1/2W 1%	A16
10032-30	300Ω 1/2W 5%	D22
10032-15	150Ω 1/2W 5%	D39
10033-10	1K 1/2W 5%	A42
10034-30	30K 1/2W 5%	B42
10002-01	100Ω 1/8W 1%	A44
10032-51	510Ω 1/2W 5%	D56
10032-10	100Ω 1/2W 5%	B64, D48
10002-53	348Ω 1/8W 1%	A48
10033-47	4.7K 1/2W 5%	D17
<b>CAPACITORS</b>		
10068-10	100μF 25V	D2
10077-12	12μF 20V	B66, D5
10062-51	510pF 500V	A8
10094-10	.01μF 25V	D16, D68
10071-47	.047μF 200V	A40



**DIODES**

10103-02	Zener, 6.2V 1/2W 2%	A6
10160	1N4454	D43
10473	Zener, 16V 1/2W 2%	D58, D60
10161-02	1N3492R	A24
10163-01	SCR, 2N5168	D73

**TRANSISTORS**

10109	2N3643	B12, D12, D26
10105	2N3644	B48
10114	MJE2955	D34

**MISCELLANEOUS**

11214	Heatsink, Diode	—
10606-01	Terminal, Perimeter	—
10506	Terminal, Pin	TP1, TP2, TP3
10617-01	Terminal	—
10553	Insulator	—
70029-08	Screw, P.H., 4-40 x .500"	—
70168-04	Lockwasher, #4	—
70166-04	Nut, 4-40 Hex	—
10564-20	Bus Wire, #20	—
10564-18	Bus Wire, #18	—
10568-18	Sleeving, #18	—

