

NSCL-ELECTRONIC

**OPERATING AND
SERVICE INSTRUCTIONS
NIM POWER SUPPLY MODEL 1002A
NIM CRATE MODEL 1403**

May, 1983

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A T T E N T I O N

SEE POCKET IN BACK OF MANUAL FOR SCHEMATICS,
PARTS LIST AND ADDITIONAL ADDENDA WITH ANY
CHANGES TO MANUAL.

NIM MODULES SHOULD NOT BE INSERTED OR REMOVED
WHILE POWER IS ON. DAMAGE MAY BE CAUSED BY
MOMENTARY MISALIGNMENT OF CONTACTS.

A T T E N T I O N

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SECTION 1
SPECIFICATIONS

1.1 Introduction

Model 1002A NIM Power Supply provides ± 12 volts at 6 amperes, ± 6 volts at 10 amperes, and ± 24 volts at 2 amperes for use by modules plugged into the 1403 NIM crate. Total power capability is 200 watts, which is available for any combination of the 6 voltage outputs.

These NIM Power Supplies are implemented using three regulator boards: the ± 24 volt board, the ± 12 volt board, and the ± 6 volt board. The regulators are independent - i.e., no output voltage is a function of the condition of any other output voltage.

All voltages incorporate overcurrent protection and no damage to the supply will result in the event of a continuous short circuit condition. A thermal warning and thermal cut-off switch is provided to protect the power supply should the internal temperature exceed safe limits. Overvoltage protection is also provided for all six outputs. Note that the NIM specification states that the voltage limiting circuits should prevent the 6, 12 and 24 volt outputs from exceeding 7.5, 24 and 48 volts respectively. The 1002A has been designed to meet or exceed these specifications by providing over voltage crowbars which are set to operate before the outputs pass 7.5, 16 and 33 volts.

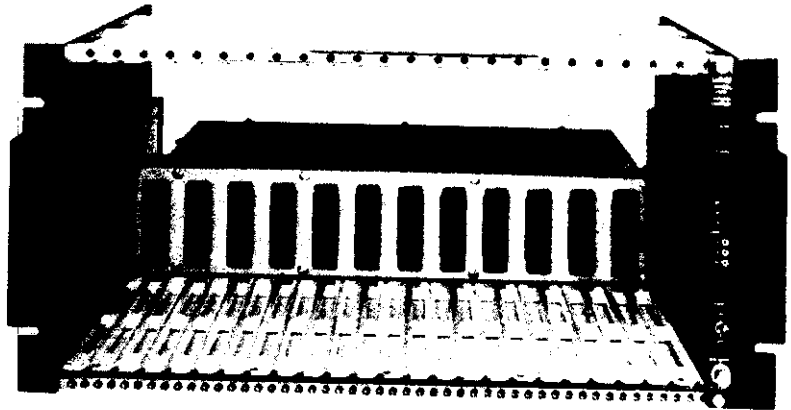
LED indicators for each output are located on the regulator board. The LED's are lighted when the output voltage is present. Lights on the front panel of the 1403 indicate "Power On" and "Over Temperature" conditions. Test points for each voltage are also available on the 1403 front panel.

TECHNICIAN

LeCroy

Model 1403 High Power NIM Chassis Model 1002A Super NIM Supply

- 200 W maximum power output
- Bus bar power distribution
- 1 mV rms ripple
- Thermal protection
- Short circuit proof
- Overvoltage protection on all supplies
- Heavy duty chassis

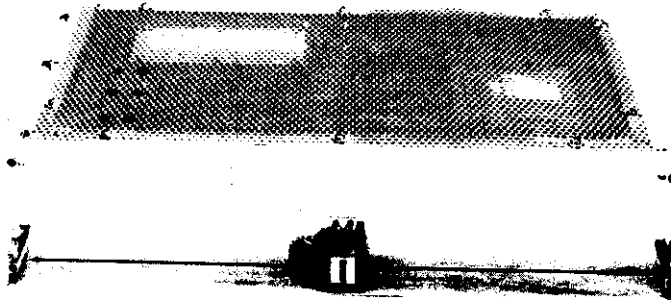


Model 1403 NIM Chassis

Modern experiments place ever increasing demands on the power capabilities of the NIM chassis. The LeCroy Model 1403 is a high power NIM chassis utilizing the LeCroy Model 1002A Super NIM Supply. The package provides high current versions of all voltages specified by the NIM standard: ± 6 V, ± 12 V and ± 24 V. The Model 1002A can supply up to 200 W in contrast to the 96 W specified by the NIM standard. Over voltage protection has been provided for all six supplies at levels which meet or exceed NIM standards.

The heavy duty NIM chassis employs cast metal rails, an improved mounting for the power supply, and printed power buses for distribution of all six supply voltages and ground. This minimizes resistive drops in the chassis which could lead to rate effects in analog circuits. Front panel test points are provided to monitor all six voltages.

Cool reliable operation of the Model 1002A power supply is assured by forced air cooling, integral to the unit. In the event of an over temperature condition, the supply shuts down. A warning of over temperature conditions is indicated by a pilot light on the front panel of the NIM chassis which is illuminated when the operating temperature comes within 30° F of the shut down point.



Model 1002A Supply

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SPECIFICATIONS

MODEL 1403 HIGH POWER NIM CHASSIS

MODEL 1002A SUPER NIM SUPPLY

OUTPUTS

Maximum Power: 200 W total of ± 6 V, ± 12 V, ± 24 V and 115 VAC.
Maximum Current: 10 A, + 6 V
10 A, - 6 V
6 A, + 12 V
6 A, - 12 V
2 A, + 24 V
2 A, - 24 V
1 A, 115 VAC

PERFORMANCE

Ripple: 250 μ V rms (10 KHz bandwidth), 3 mV peak-to-peak (50 MHz bandwidth).
Regulation: \pm (0.01% + 0.5 mV) line or load (measured at the voltage sense leads).
Temperature Coefficient: <100 ppm/ $^{\circ}$ C.
Long Term Stability: <0.1 %/24 hours at constant load temperature. Measured after 1 hour warm-up.
Response Time: Settles to within 0.1% of final value in less than 50 μ sec for 10% to 50% load change.

GENERAL

Over Current Protection: Protected against overload by current limit circuit; short circuit proof.
Over Voltage Protection: The 6, 12 and 24 volt supplies will not exceed 7.5, 16 or 33 volts (respectively) for longer than 100 msec.
Thermal Protection: Thermal sensor in Model 1002A shuts down supply in the event of thermal overload. Front panel thermal overload light indicates warning of an over temperature condition. Warning light operates at $210^{\circ} \pm 10^{\circ}$ F. Shutdown occurs at $240 \pm 10^{\circ}$ F.
Operating Range: 5° C to 60° C. Derate output current 2%/ $^{\circ}$ C from 50° C to 60° C.
Input Voltage: 115/230 VAC \pm 12%.
47 to 65 Hz.

SPECIFICATIONS SUBJECT TO CHANGE

SECTION 2

OPERATING INSTRUCTIONS

2.1 Installation

After removing the Model 1002A or 1403 from its package, it is ready for use. No electrical or mechanical adjustments are necessary. A parts list and assembly drawing of the 1403 are in the back of this manual. The remainder of the manual is devoted to operation of the 1002A power supply.

2.1.1 Electrical

The NIM Power Supply is furnished with a bin interface connector which mates with the NIM Bin Connector. This connection can be made before the power supply is mechanically mounted on the bin. The connectors can be reached by removing the power supply top cover. A keying plug is inserted in position 23 of the connector which mates with the NIM bin. If the bin is also keyed, then the user should remove one plug in order for the connectors to mate properly.

2.1.2 Mechanical

Captive hardware located at either end of the unit permit the power supply to be mounted at the rear of the Nuclear Instrument Module Bin.

2.2 Overvoltage Protection

The overvoltage circuits will normally be activated by connecting or disconnecting loads when the power supply is "ON". Although no damage will result to the power supply, one of the 'crowbar' SCR's will short circuit its supply and it will be necessary to turn the AC power "OFF" for approximately 10 seconds to reset the overvoltage circuits.

Connecting D.C. power and the inserting and removal of modules from the Bin should be done only when the AC Power Switch is "OFF".

The overvoltage protective circuits include an SCR which will activate before the voltages exceed the specified crowbar points. The SCR's protect the circuitry to which power is being supplied from excessive voltage due to power supply failure, wiring error, or high voltage transients.

If the SCR or 'crowbar' is activated because of power supply failure, and the current limiting circuitry is inoperative, excessive current will be drawn through the SCR and the A.C. fuse will blow.

2.3 Overload and Short Circuit Protection

Overload protection is provided by a current limiting circuit which operates when the current exceeds the normal rating of the supply. The current limiting circuit has a foldback characteristic which causes the current limit to be reduced when the output is shorted. The initial value for current limit is approximately 12 amps for the +6 volt power supplies, 7.5 amps for the +12 volt power supplies and 3 amps for the +24 volt power supplies.

2.4 Voltage Adjustment

Voltage adjustment potentiometers are located under the top cover to permit a minimum adjustment of +5% of the supply's nominal value.

Power supply regulation and ripple voltages should be measured at the voltage sense leads available at the power supply connector.

2.5 Thermal Overload

Two thermostats are mounted on the power transistor heat sink to protect the NIM Power Supply against thermal over-load. The warning thermostat will close at 200+8°F and the breaker thermostat will open at 250+6°F. The warning thermostat is used to indicate the thermal condition and if not corrected the breaker thermostat will disconnect the A.C. input power to the NIM Power Supply.

SECTION 3

TECHNICAL DESCRIPTION

3.1 General Principles of Operation

The schematic diagram (see rear pocket of manual) shows the interconnections between the NIM Bin and NIM Power Supply Model 1002A. In addition, interconnections between the power input, the transformer, rectifier, filters and regulator circuitry are shown. The AC input is fed via a three wire AC cord, through two slow blow fuses, F1 and F2. A capacitor C1 wired to the AC fuses is used to reduce high frequency transients that might be fed via external equipment through the power line.

Transformer T1 is used to provide power for all six power supplies. In each case, a full wave rectifier is used with filtering which provides a maximum of 10% ripple at the input to the power transistors and regulator circuits. The rectifier for the +24 volt supply is an epoxy bridge assembly and is located on the regulator printed circuit board. The filter capacitors used for each power supply are mounted on the regulator board, with its associated regulating circuitry. The +6 and +12 volt bridge rectifiers, capacitors C2 and C3, and C6 and C7 are located on the main chassis. The unregulated DC voltages available from C2+ and C3- are fed to the +6 volt regulator board PC1 and the associated power transistors.

All power transistors - Q3, Q4, Q5, Q6, Q7, and Q8 - are mounted on the heat sink at the rear of the power supply. The current passing through each of these power transistors is fed via a current sensing resistor also located on the heat sink. The information from the power transistor and current sensing resistors is fed to the individual regulator boards for appropriate control of the output voltage and current limit conditions.

The current limiting circuit provided in each of the regulators is of the foldback type. These circuits will limit at currents in excess of the nominal current rating of the supply and then foldback and reduce the amount of current drawn. There will be a further reduction in the current limiting if the power supply is short circuited. The power supply can operate indefinitely under short circuit conditions.

As shown in the system schematic diagram (1002-04), both 12 and 24 volt boards must be installed in the equipment to obtain voltage from either the 24 volt or the 12 volt circuits. The return power lines are interconnected through both boards and then to the output connector. Also, the return sense lines are interconnected through both boards and then to the output connector. Therefore, both J8 and J9 must be connected to the PC boards to obtain appropriate operation of either regulator. These connectors are located on the side of the PC boards away from the power transformer. Connectors J5 and J6 need not be engaged unless the particular power output is required - that is, J5 should be engaged if 12 volt output is required and J6 should be

engaged if the +24 volt output is required. +6 volts can be obtained by installing PC1 and connecting J4 and J7.

3.2 +24 Volt Regulator - Diagram 1002-02

The +24 volt regulator consists of U1 and Q2 which provide approximately 90 db of gain and buffering to the power transistor located on the heat sink. The output of U1 is taken from Pin 6 and fed via a 12 volt zener diode to Q2 which is an emitter follower used to provide buffering to the power transistor. The diode CR5 permits current to be fed to the U1 in only one direction.

Q3 is used a current source to provide current to emitter follower Q2 and the power transistor. Diode CR1 acts as a regulator and permits approximately 0.7 volts to exist across resistor R3. Since the voltage at the input diode CR1 and the voltage at the base of Q3 contain approximately the same amount of ripple, the average difference between these voltages, will be essentially zero and therefore the current provided by Q3 will be relatively stable.

The reference voltages supplied to the regulator are generated by zener VR2 which is chosen for its low temperature coefficient. The voltage at Pin 2 of integrated circuit U1 will be approximately 18 volts, and the voltage at Pin 3 will also be 18 volts. Voltage divider R18, R19, and R17 will provide 18 Volts at Pin 3 when the output is at +24 volts. Potentiometer R19 permits adjustment of the output voltage of approximately 3.0 volts. Since the inputs to the buffer stage Q2 will be at a level of approximately +26.5 volts and zener VR1 is a 12 volt zener, the output voltage at Pin 6 of U1 will be at 14.5 volts at full load.

The current limit circuitry is activated by voltage developed by the current sensing transistor Q5 which turns on when the voltage across the current sensing resistor exceeds 1.5 volts. When this current exceeds 1.56 amps, Q5 turns on and sinks the current provided by the current source Q3. As less current is provided to the buffer Q2, the output voltage reduces. This voltage is fed across the voltage divider - R42 and R12 - in such a way as to reduce the cut-off bias supplied to the base of Q5. The current limit point therefore reduces and the current drawn by the supply is reduced. If the output is shorted, the voltage across R42 and R12 is further reduced, and the current limit folds back.

Diode CR7 is used to eliminate the possibility of reverse voltages damaging the power transistor and buffer transistor. This diode will provide a low impedance path for negative voltages applied to the +24 volt power supply.

All comments made previously apply to the -24 volt supply, except that the NPN transistors become PNP transistors. For example, the current sensing transistor Q12 is now PNP, whereas it was an NPN transistor in the +24 volt supply and the current source, Q9, is an NPN transistor in the -24 volt supply, whereas it was a PNP transistor in the +24 volt supply. In addition, the buffer transistor is

operated as an inverter, since the power transistor which it drives is also operated as an inverter. The combination of transistor Q10 and its power transistor can be considered to be a unity gain zero degree phase shift amplifier.

Diode CR10 is used to provide an additional 0.7 volts bias for the current limit transistor Q12. CR10 provides a voltage similar to that provided by the base emitter connection of the power transistor in the +24 volt supply. Capacitor C11 is used to reduce the impedance across the diode at high frequencies and the 22 ohm resistor, R28 in provides sufficient start-up current to eliminate look-out in the -24 volt power supply.

3.3 +12 Volt Regulator - Diagram 1002-01

The +12 volt regulator circuits are similar to those used in the +24 volt regulators. These regulators are independent of each other and of the +24 volt outputs. Therefore they can be operated and current limited independently. The connections within the system, however, between both regulator boards and the output connectors are such that both regulators must be installed for proper operation of the regulator circuitry. The return sense and return connections are interconnected via both regulators so that both J8 and J9 must be connected within the system for proper operation.

3.4 +6 Volt Regulator - Diagram 1002-03

The +6 volt regulator operates independently of the + volt and +24 volt regulated outputs. The unregulated +24 volts - i.e., +35 volts is used to supply the control voltages necessary to activate the operational amplifier U1 and the reference zener VR3. The +35 volts is applied to Q8 and its associated circuit to provide a constant current of 15 milliamperes to VR2, R23, VR3, and R24. The anode of VR2 is connected to +6s, and since VR2 is a 10 volt zener, the voltage at U1-7 relative to U1-4 is normally 16 volts. VR3 provides 6.2 volts referenced to +6S. Since U1-2 and U1-3 must be at the same voltage during normal operation, the voltage across R24 is 6.2 volts. Therefore, 2 milliamperes feeds R25 and R26, providing a 6 volt output when R25 + R26 is 3000 ohms. The output at U1-6 is approximately +8 volts when 10 amperes is being drawn from the +6 volt supply.

When Q5 turns on, the current available from Q8 to VR2 is reduced, causing the reference voltage of VR3 to decline and the output voltage to be reduced. CR5 provides a voltage drop which compensates for the Base-Emitter voltage at Q5. Since R3 (see 1002-01-201), the current sense resistor, is 0.05 ohms, 12 amperes is required to initiate the fold-back current limiting.

The overvoltage control circuit uses VR1 as the reference for comparison with the +6 volts. The voltage at VR1 is 7.5 volts and the voltage at Q4-Base is 6.7 volts. When the voltage at Q4-Emitter (+6 volts) exceeds 7.2 volts, Q4 turns on, providing a positive voltage at the SCR gate (Q2). When this voltage exceeds 1 volt, the SCR

fires, reducing the +6volt output to +1 volts. After the SCR fires, the over-voltage condition must be removed and the AC power turned off for at least 10 seconds to restore normal operation.

The -6 volt circuits are similar except that an additional inverter stage, Q13, is necessary to activate the -6 volt SCR.

SECTION 4

MAINTENANCE

4.1 Location of Parts

The parts list contained in the rear pocket of this manual has a list of all electronic and mechanical parts. Each subassembly has its own parts list to facilitate identification. All parts may be ordered from the factory using the nine digit LRS part number.

4.2 Adjustments

The only adjustments are those provided on the printed circuit board and consist of potentiometers used to adjust the voltage output of each of the six supplies over a range of +5% about their normal value.

Reference Designation

R	resistor, potentiometer
C	capacitor
CR	diode
U	integrated circuit
Q	transistor, SCR, FET
VR	zener
S	switch
F	fuse
B	fan
TK	thermostat
T	transformer
DS	lamp assembly
M	meter
K	relay

Component Location

Location designation will be '0' for Main Chassis, '1' for the 12 volt regulator board, and '2' for the 24 volt regulator board, and '3' for the 6 volt regulator board.

<u>Designation</u>	<u>Description</u>	<u>Drawing No.</u>
'0'	System Parts Location 1002	1002-00-001
'1'	12 Volt Parts Location	1002-01-102
'2'	24 Volt Parts Location	1002-01-102
'3'	6 Volt Parts Location	1002-01-302

Parts List (continued)

<u>Reference Designation</u>	<u>Description</u>	<u>Location</u>	<u>Ref. No. and/or Man.</u>
OPC1	Power Module 6V/10A	0	BLP 1002/6
OPC2	Power Module 12V/2A	0	BLP 1002/12
OPC3	Power Module 24V/1A	0	BLP 1002/24
OB1	Fan	0	Pamotor 8500C
OC1	Cap, 0.04UF, 600V	0	CRL DD403
OC2	Cap, 20,000 UF, 15V	0	Sprague 602D203G030BM2A
OC3	S/A C2	0	
OC4	Cap, 33UF, 10V	0	1EC-TAD33TD10
OC5	S/A C4	0	
OC6	Cap, 5000 UF, 30V	0	Sprague 36DX502G030AM2A
OC7	S/A C6	0	
OC8	S/A C1	0	
OC9	S/A C1	0	
OF1, F2	Fuse, 3AG, 5 amp, slo/blo		1012H-313003 Littlefuse 313005
OXF1, XF2	Fuseholder, 3AG		Little fuse 342002
OP1	Line Cord	0	Belden 17239
OBR1	Bridge Rectifier	0	Solitron J775-2
OBR2	S/A BR1		
OR1, R2	Res, 200 Ohm, 1W, 5%		RC32GF201J
OQ1, Q2	SCR		RCA S6210A
OT1	Power Transformer		BLP 1002TID
OTK1	Thermal Switch, N.C.	0	BLP 1001-01-401-1
OTK2	Thermal Switch, N.O.	0	BLP 1001-01-401-2
OQ3, Q4	Transistor	0	RCA 2N3772
OQ5, Q6	Transistor	0	RCA 2N3055
OPG15	Conn Recept 10 Contact		Amphenol - 1 MS3102A-18-1S
OQ7, Q8	Transistor		RCA 2N3771
OR3, R4	Res, 0.05 Ohm, 10W		RCD 170
OR5, R6	Res, 0.1 Ohm, 5W		IRC PW5
OR7, R8	Res, 0.5Ohm, 5W		IRC PW5
OR9, R10	Res, 1 Ohm, 0.5W		
1PC	P.C. Board 12V	0	BLP 1002-01-301
1BR1	Not Used	1D1	
1DS1	Lamp, LED	1A1	Dialight 521-9214
1DS2	S/A 1DS1	1B1	
1U1	Int Circuit	1A1	TI SN72741P
1U2	S/A 1U1	1A2	
1C1	Cap, 3500 UF, 30V	1C1	Sangamo 057
1C2	S/A C1	1C2	
1C3	Cap, 200 pfd	1A1	DD201
1C4	Not Used		
1C5	Cap, 220UF, 16V	1B1	Capar CRE 220-16
1C6	S/A C3	1A2	
1C7	Not Used		
1C8	Not Used		
1C9	S/A C5	1B2	
1C10	Cap, 0.04 ufd, 600V	1D1	CRL 403
1C11	Cap, 0.1 UF, 50V	1D2	DISC

Parts List (continued)

<u>Reference Designation</u>	<u>Description</u>	<u>Location</u>	<u>Ref. No. and/or Man.</u>
1CR1	Diode	1A2	1N914
1CR2	S/A CR1	1A2	
1CR3	Diode	1D1	1N4004
1CR4	Not Used		
1CR5	S/A CR1	1B1	
1CR6	Not Used		
1CR7	S/A CR3	1B1	
1CR8	S/A CR1	1D2	
1CR9	S/A CR1	1C2	
1CR10	S/A CR3	1D2	
1CR11	S/A CR3	1D2	
1CR12	S/A CR1	1B2	
1CR13	S/A CR3	1B2	
1Q1	Transistor, Not Used		
1Q2	Transistor	1A2	2N5321
1Q3	Transistor	1A1	2N2907
1Q4	Not Used		
1Q5	Transistor	1B1	2N2222
1Q6	Not Used		
1Q7	Not Used		
1Q8	Not Used		
1Q9	S/A Q5	1C2	
1Q10	Transistor	1C2	2N4036
1Q11	Not Used		
1Q12	S/A Q3	1C2	
1Q13	Not Used		
1Q14	Not Used		
1R1	Resistor, Not Used		
1R2	Res, Not Used		
1R3	Res, 100 Ohm, $\frac{1}{4}$ W, 5%	1A2	RC07GF101J
1R4	Not Used		
1R5	Not Used		
1R6	Res, S/A R3	1B2	
1R7	Res, 4.7K, $\frac{1}{4}$ W, 5%	1A1	RC07GF472J
1R8	Not Used		
1R9	Not Used		
1R10	Not Used		
1R11	S/A R3	1B2	
1R12	Res, 3K, $\frac{1}{4}$ W, 5%	1B1	RC07GF302J
1R13	Not Used		
1R14	Not Used		
1R15	Res, 1K, $\frac{1}{4}$ W, 5%	1A1	RC07GF102J
1R16	Res, 825, 1/8W, 1%	1A1	RN60C
1R17	Res, 2.00K, 1/8W, 1%	1A1	RN60C2001F
1R18	Res, 1.62K, 1/8W, 1%	1A1	RN60C1621F
1R19	Pot, 500 Ohm, $\frac{1}{2}$ W, 20%	1A1	Beckman 72XR500
1R20	Res, 560 Ohm, $\frac{1}{4}$ W, 5%	1A1	RC07GF561J

Parts List (continued)

<u>Reference Designation</u>	<u>Description</u>	<u>Location</u>	<u>Ref. N. and/or Man.</u>
1R21	Res, Not Used		
1R22	Res, Not Used		
1R23	Res, 1K, $\frac{1}{2}W$, 5%	1B1	RC20GF102J
1R24	S/A R3	1C2	
1R25	Res, 47 Ohm, $\frac{1}{4}W$, 5%	1C2	RC07GF470J
1R26	S/A R7	1C2	
1R27	S/A R3	1C2	
1R28	Res, 22 Ohm, $\frac{1}{4}W$, 5%	1D2	RC07GF220J
1R29	Res, 470 Ohm, $\frac{1}{4}W$, 5%	1C2	RC07GF470J
1R30	Not Used		
1R31	S/A R12	1C2	
1R32	S/A R15	1A2	
1R33	Not Used		
1R34	Pot, S/A R19	1A1	
1R35	Res, S/A R18	1A2	
1R36	Res, S/A R17	1A2	
1R37	Res, S/A R20	1A2	
1R38	Not Used		
1R39	Not Used		
1R40	Res, S/A R23	1B2	
1R41	Not Used		
1R42	Res, S/A R29	1B1	
1R43	Res, S/A R16	1A2	
1R44	Res, 56 Ohm, $\frac{1}{4}W$, 5%	1A1	
1R45	Res, S/A R44	1A1	
1R46	Res, S/A R44	1A2	
1VR1	Zener Diode	1B1	1N958B
1VR2	Zener Diode	1A1	1N821
1VR3	Zener Diode, Not Used		
1VR4	S/A VR1	1B2	
1VR5	Not Used		
1VR6	S/A VR2	1A2	
2PC	P.C. Board 24 Volts	0	BLP 1002-01-301
2BR1	Bridge Rectifier	2D1	PCI A138-2
2DS1	Lamp, LED	2A1	Dialight 521-9214
2DS2	S/A DS1	2B1	
2U1	Int Circuit	2A1	TI SN72741P
2U2	S/A U1	2A2	
2C1	Cap, 1900 UF, 50V	2C1	Sangamo 057
2C2	Cap, S/A C1	2C2	
2C3	Cap, 200pfd	2A1	DD201
2C4	Not Used		
2C5	Cap, 100 UF, 35V	2B1	Capar CRE 100-35
2C6	S/A C3	2A2	
2C7	Not Used		
2C8	Not Used		
2C9	S/A C5	2B2	
2C10	Cap, 0.04 ufd, 600V	2D1	CRL DD401

Parts List (continued)

<u>Reference Designation</u>	<u>Description</u>	<u>Location</u>	<u>Ref. No. and/or Man.</u>
2C11	Cap, 0.1 UF, 50V	2D2	DISC
2CR1	Diode	2A2	1N914
2CR2	S/A CR1	2A2	
2CR3	Diode	2D1	1N4004
2CR4	Not Used		
2CR5	S/A CR1	2B1	
2CR6	Not Used		
2CR7	S/A CR3	2B1	
2CR8	S/A CR1	2D2	
2CR9	S/A CR1	2C2	
2CR10	S/A CR3	2D2	
2CR11	S/A CR3	2D2	
2CR12	S/A CR1	2B2	
2CR13	S/A CR3	2B2	
2Q1	Transistor, Not Used		
2Q2	Transistor	2A2	2N5321
2Q3	Transistor		
2Q4	Not Used		
2Q5	Transistor	2B1	2N2222
2Q6	Not Used		
2Q7	Not Used		
2Q8	Not Used		
2Q9	S/A Q5	2C2	
2Q10	Transistor	2C2	2N4036
2Q11	Not Used		
2Q12	S/A Q3	2C2	
2Q13	Not Used		
2Q14	Not Used		
2R1	Res, Not Used		
2R2	Not Used		
2R3	Res, 150 Ohm, $\frac{1}{4}$ W, 5%	2A2	RC07GF151J
2R4	Not Used		
2R5	Res, 2.70hm, $\frac{1}{4}$ W, 5%	2B2	RC07GF2R7J
2R6	Res, 100 Ohm, $\frac{1}{4}$ W, 5%	2B2	RC07GF101J
2R7	Res, 4.7 Ohm, $\frac{1}{4}$ W, 5%	2A1	RC07GF472J
2R8	Not Used		
2R9	Not Used		
2R10	Not Used		
2R11	S/A R6	2B2	
2R12	Res, 6.8K, $\frac{1}{4}$ W, 5%	2B1	RC07GF682J
2R13	Not Used		
2R14	Not Used		
2R15	Res, 1K, $\frac{1}{4}$ W, 5%	2A1	RC07GF102J
2R16	Res, 2.55K, $\frac{1}{8}$ W, 1%	2A1	RN60C2551F
2R17	Res, 2.00K, $\frac{1}{8}$ W, 1%	2A1	RN60C2001F
2R18	Res, 5.23K, $\frac{1}{8}$ W, 1%	2A1	RN60C5231F
2R19	Pot, 1K, $\frac{1}{2}$ W, 20%	2A1	Beckman 72XR1K
2R20	Res, 1.2K, $\frac{1}{4}$ W, 5%	2A1	RC07GF122J

Parts List (continued)

<u>Reference Designation</u>	<u>Description</u>	<u>Location</u>	<u>Ref. No. and/or Man.</u>
2R21	Res, Not Used		
2R22	Not Used		
2R23	Res, 2K, $\frac{1}{2}W$, 5%	2B1	RC20GF202J
2R24	S/A R3	2C2	
2R25	Res, 47 Ohm, $\frac{1}{4}W$, 5%	2C2	
2R26	S/A R7	2C2	
2R27	S/A R6	2C2	
2R28	Res, 220hm, $\frac{1}{4}W$, 5%	2D2	RC07GF220J
2R29	Res, 470 Ohm, $\frac{1}{4}W$, 5%	2C2	RC07GF470J
2R30	Not Used		
2R31	S/A R12	2C2	
2R32	S/A R15	2A2	
2R33	Not Used		
2R34	Pot, S/A R19	2A1	
2R35	Res, S/A R18	2A2	
2R36	Res, S/A R17	2A2	
2R37	Res, S/A R20	2A2	
2R38	Not Used		
2R39	Not Used		
2R40	Res, S/A R23	2B2	
2R41	Not Used		
2R42	Res, S/A R29	2B1	
2R43	Res, S/A R16	2A2	
2R44	Res, 56 Ohm, $\frac{1}{4}W$, 5%	2A1	RC07GF560J
2R45	S/A R44	2A2	
2R46	S/A R44	2A2	
2VR1	Zener Diode	2B1	1N963B
2VR2	Zener Diode	2A1	1N821
2VR3	Not Used		
2VR4	S/A VR 1	2B2	
2VR5	Not Used		
2VR6	S/A VR2	2A2	
3PC	PC Board 6 Volts	0	BLP 1002-01-302B
3DS1	Lamp, LED	3A1	Dialight 521-9214
3DS2	S/A 3DS1	3A1	
3U1	Int Ckt 0.741 OP Amp	3B1	TI SN72741P
3U2	S/A 3U1	3A2	
3C1	Cap, Not Used		
3C2	Not Used		
3C3	Not Used		
3C4	Not Used		
3C5	Cap, 0.1 UF, 50V	3C1	CRL CK104
3C6	Cap, 0.01 UF, 50V	3B1	CRL CK103
3C7	Cap, 10 UF, 50V	3A1	Capar CRE 10-50
3C8	Cap, 470 UF, 10V	3B2	Capar CRE 470-10
3C9	Not Used		
3C10	S/A C6	3A2	

Parts List (continued)

<u>Reference Designation</u>	<u>Description</u>	<u>Location</u>	<u>Ref. No. and/or Man.</u>
3C11	Cap, S/A C7	3A2	
3C12	S/A C8	3B2	
3C13	S/A C5	3A2	
3C14	Not Used		
3CR1	Diode, Not Used		
3CR2	Not Used		
3CR3	Not Used		
3CR4	Not Used		
3CR5	Diode	3C2	IN914
3CR6	Diode	3B2	IN4001
3CR7	S/A CR5	3C2	
3CR8	S/A CR5	3C2	
3CR9	S/A CR5	3B2	
3CR10	S/A CR5	3B2	
3CR11	S/A CR5	3B2	
3CR12	S/A CR6	3B2	
3Q1	Transistor, Not Used		
3Q2	Transistor	3C2	RCA 2N3055
3Q3	Transistor	3B2	RCA 2N5321
3Q4	Transistor	3B2	2N2907
3Q5	Transistor	3C2	2N2222
3Q6	Transistor, Not Used		
3Q7	Not Used		
3Q8	Transistor	3C2	RCA 2N4036
3Q9	Not Used		
3Q10	Not Used		
3Q11	S/A Q3	3A2	
3Q12	S/A Q5	3A2	
3Q13	S/A Q4	3A2	
3Q14	S/A Q3	3B2	
3Q15	S/A Q4	3B2	
3Q16	Not Used		
3Q17	Not Used		
3R1	Res, Not Used		
3R2	Not Used		
3R3	Not Used		
3R4	Not Used		
3R5	Res, 4.7K, $\frac{1}{2}$ W, 5%	3B1	RC20GF472J
3R6	Res, 100 Ohm, 2W, 5%	3B1	RC42GF101J
3R7	Res, 1K, $\frac{1}{4}$ W, 5%	3B1	RC07GF102J
3R8	Res, 8.2K, $\frac{1}{4}$ W, 5%	3B1	RC07GF822J
3R9	Res, 39 Ohm, $\frac{1}{4}$ W, 5%	3B1	RC07GF390J
3R10	Res, 6.8K, $\frac{1}{4}$ W, 5%	3C1	RC07GF682J
3R11	Not Used		
3R12	Res, 4.7K, $\frac{1}{4}$ W, 5%	3B1	RC07GF472J
3R13	Not Used		
3R14	S/A R11		
3R15	Res, 300 Ohm, $\frac{1}{4}$ W, 5%	3C2	RC07GF301J

Parts List (continued)

<u>Reference Designation</u>	<u>Description</u>	<u>Location</u>	<u>Ref. No. and/or Man.</u>
3R16	Res, S/A R11	3B1	
3R17	Res, 470 Ohm, $\frac{1}{2}W$, 5%	3C1	RC07GF471J
3R18	Res, 10 Ohm, $\frac{1}{4}W$, 5%	3C1	RC07GF100J
3R19	S/A R12		
3R20	Not Used		
3R21	S/A R7	3A1	
3R22	S/A R7	3A1	
3R23	Res, 422 Ohm, $\frac{1}{8}W$, 1%	3A1	RN60C4220F
3R24	Res, 3.16K, $\frac{1}{8}W$, 1%	3A1	RN60C3161F
3R25	Res, 2.74K, $\frac{1}{8}W$, 1%	3A1	RN60C2741F
3R26	Pot, 500 Ohm, $\frac{1}{2}W$, 20%	3A1	Beckman 72XR500
3R27	Res, 100 Ohm, $\frac{1}{2}W$, 5%	3B2	RC20GF101J
3R28	Res, 220 Ohm, $\frac{1}{4}W$, 5%	3A1	RC07GF221J
3R29	Res, 56 Ohm, $\frac{1}{4}W$, 5%	3B1	RC07GF560J
3R30	Not Used		
3R31	Res 68 Ohm, $\frac{1}{2}W$, 5%	3C2	RC20GF680J
3R32	S/A R6	3B1	
3R33	S/A R17	3B2	
3R34	S/A R7	3A2	
3R35	S/A R9	3B2	
3R36	S/A R8	3A2	
3R37	S/A R15	3A2	
3R38	Not Used		
3R39	S/A R10	3B2	
3R40	S/A R15	3C2	
3R41	S/A R11	3A2	
3R42	Not Used		
3R43	S/A R12	3A2	
3R44	S/A R7	3A2	
3R45	S/A R17	3B2	
3R46	S/A R18	3C2	
3R47	S/A R12	3A2	
3R48	Not Used		
3R49	S/A R23	3A2	
3R50	S/A R24	3A2	
3R51	S/A R7	3A2	
3R52	S/A R7	3A2	
3R53	S/A R25	3A2	
3R54	Pot, S/A R26	3A1	
3R55	Res, S/A R27	3B2	
3R56	Res, S/A R28	3A1	
3R57	Res, S/A R29	3A2	
3VR1	Zener Diode	3B1	IN958B
3VR2	Zener Diode	3A1	IN961B
3VR3	Zener Diode	3A1	IN821
3VR4	Zener Diode, S/A VR1	3B2	
3VR5	S/A VR2	3A2	
3VR6	S/A VR3	3A2	

FINAL ASSEMBLY LIST

Company Confidential Information: Unauthorized use or disclosure is prohibited

MODEL: 1403
 FAN 2001
 MCN 2

NJM CRATE W/PWR SU

PRINTED 09-Feb-
 REV DATE 29-Dec-
 MCN DATE

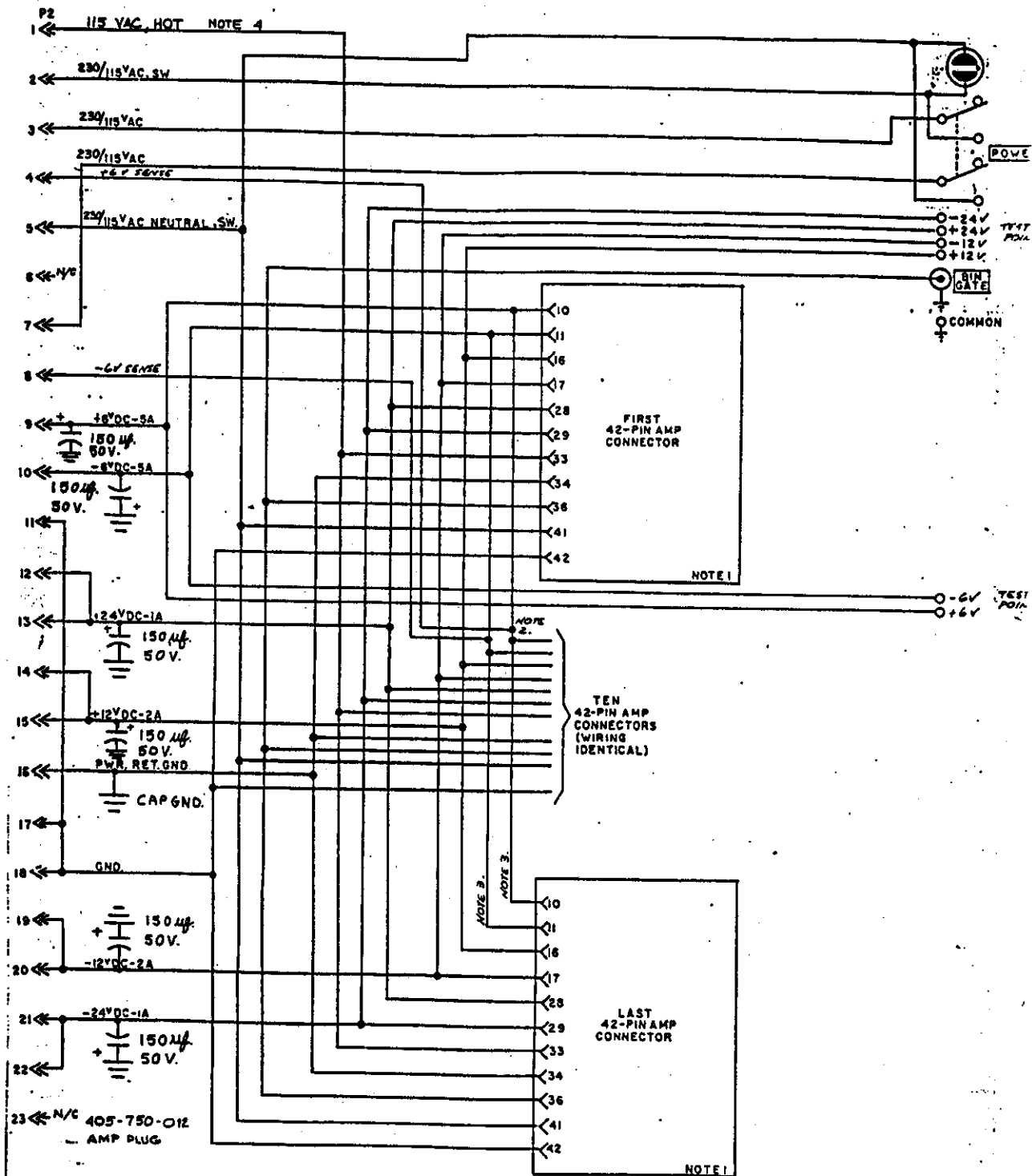
LeCroy P.N.	DESCRIPTION	MCN #	ECON #	FECH	QT
861 002 010	SUBASS'YS PWR SPLY 1002A 1002A POWER SUPPLY	0	1000	--4	
... 861 002 001	COMPLETED BOARD 1002-1 1002-1 12 VOLT MODULE	1	1003	2001	
... 861 002 002	COMPLETED BOARD 1002-2 1002-2 24 VOLT MODULE	0	1002	--4	
... 861 002 003	COMPLETED BOARD 1002-3 1002-3 6 VOLT MODULE	0	1002	--4	
... 861 002 004	PWR SUPPLY SUBASSY 1002-4 1002-4 PWR SUPPLY SUBASSY	1	1001	--1	
... 861 002 005	COMPLETED BOARD 1002-5 1002-5 RESISTOR BD FRONT	0	1000	-1	
... 861 002 006	COMPLETED BOARD 1002-6 1002-6 RESISTOR BD REAR	0	1000	-1	
861 403 001	CHASSIS ASSEMBLY 1403 1403-1 PWR CHASSIS	2	1000	2000	

- NOTE 2
- NOTE 3
- NOTE 4
- NOTE 5
- NOTE 6
- NOTE 7
- NOTE 8
- NOTE 9
- NOTE 10
- NOTE 11
- NOTE 12
- NOTE 13
- NOTE 14
- NOTE 15

MODEL NO 1403-1	PWR CHASSIS	PRINTED 09-Aug-83
ECON 1000		REV DATE 02-Aug-83
MCN 2		MCN DATE 08-Aug-83
FAN HIST. NO -5	FAN HIST. DATE	

LRS PART NO	DESCRIPTION	QTY
147 976 150	CAP ALUM METAL CAN 150 UF 50V -10 +50% .394 X .787	5
320 112 **1	PILOT LIGHT NEON 125V RED CHICAGO MINIATURE LAMP WORKS	2
402 *20 **0	CONNECTOR CO-AXIAL BNC MIL-UG10947U	1
402 *20 **1	GROUND LUG NONLOCKING BNC	1
405 122 **1	CONNECTOR BLOCK (SOCKET) 42 "MIXED"	12
405 182 **1	CONNECTOR BLOCK (PIN) 23 POSITION	1
405 212 **2	GUIDE PIN (MALE) CADMIUM PLATED BRASS	24
405 312 **1	GUIDE PIN (FEMALE) CADMIUM PLATED BRASS	12
405 343 **4	GUIDE PIN (FEMALE)	12
405 410 *16	CONNECTOR PIN (MALE)	21
405 515 *32	CONNECTOR PIN WW (FEMALE) GOLD OVER NICKEL/BRASS POST .576 LG	132
410 222 102	SWITCH TOGGLE DPDT ON-NONE-ON/2 POS LOCKING	1
468 *11 **1	TEST POINT (JACK) BLK	1
468 211 **1	TEST POINT (JACK) RED	3
468 911 **1	TEST POINT (JACK) WHT SKT-14 WHIT	3
530 100 905	POWER BIN WITH METAL RAILS	1*
560 632 *10	SCREW PHILIPS 6-32X5/8	4
701 403 **1	CABLE SHIELD FOR 1403 PER DWG 1403-1-M2	1
701 403 *13	COVER FOR 1403-1 PER DWG 1403-1-M3	1
701 403 *14	MOUNTING BAR FOR 1403-1 PER DWG 1403-1-M4	2
710 108 *63	PC BD PREASS'Y 108P-6	1
721 403 **3	FRONT PNL PREASS'Y 1403 PER DWG 1403-1-M1	1

- NOTE: 1 530 100 905 CONSISTS
- NOTE: 2 OF ONE EACH:
- NOTE: 3 LEFT FRONT BIN POST
- NOTE: 4 RIGHT FRONT BIN POST
- NOTE: 5 UPPER RAIL SET
- NOTE: 6 LOWER RAIL SET
- NOTE: 7 LEFT SIDE
- NOTE: 8 RIGHT SIDE
- NOTE: 9 REAR PLATE
- NOTE: 10
- NOTE: 11
- NOTE: 12 TWO HANDLES
- NOTE: 13
- NOTE: 14
- NOTE: 15 SEE DWG 108P-6 M1



NOTES:

1. UNUSED PINS IN ALL 42-PIN AMP CONNECTORS ARE: 1 THROUGH 9, 12 THROUGH 15, 18 THROUGH 27, 30 THROUGH 32, 35, AND 37 THROUGH 40.
2. CONNECTIONS TO +6V SENSE AND -6V SENSE MADE AT THE 6V CONNECTOR.
3. ADDITIONAL +6V AND -6V BUS CONNECTIONS FROM P2 TO LAST CONNECTOR.
4. WHEN POWER SUPPLY IS SWITCHED FOR 230 V INPUT, PIN 1 COMES FROM THE CENTER TAP OF THE TRANSFORMER.

DRAWING NO. 1403-S1 DATE 4/2/53	LACROY RESEARCH SYSTEMS CORPORATION WEST YARONK, NEW YORK	POWER BIN, NIM, WITH 12 VOLTS (08P-6)
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MODEL NO 1002A
ECON 1000

POWER SUPPLY

PRINTED 18-Apr-83
REV DATE 18-Apr-83

LRS PART NO	DESCRIPTION		QTY
861 **2 **1	COMPLETED BOARD	1002-1 711002013(1)	1
861 **2 **2	COMPLETED BOARD	1002-2 711002013(1)	1
861 **2 **3	COMPLETED BOARD	1002-3 711002033(1)	1
861 **2 **4	PWR SUPPLY SUBASSY	1002-4	1
861 **2 **5	COMPLETED BOARD	1002-5 701002008(1)	1
861 **2 **6	COMPLETED BOARD	1002-6 701002008(1)	1

NOTE: 1
NOTE: 2
NOTE: 3
NOTE: 4
NOTE: 5
NOTE: 6
NOTE: 7
NOTE: 8
NOTE: 9
NOTE: 10
NOTE: 11
NOTE: 12
NOTE: 13
NOTE: 14
NOTE: 15

MODEL NO 1002-1
 ECDN 1003
 MCN 1

12 VOLT MODULE

PRINTED 09-Feb-84
 REV DATE 29-Dec-83
 MCN DATE 29-Dec-83

LRS PART NO	DESCRIPTION	QTY
102 335 104	CAP CERA CK05 .1 UF 50V 20% TC:15% -55C TO +125C	
102 944 201	CAP CERA DISC 1KV 200 PF 10% S3N	
142 724 335	CAP TANT DIP CASE 3.3 UF 25V 20% .177 X .295	
147 436 221	CAP ALU METAL CAN 220 UF 16V -10 +50% RADIAL .394 X .492	
148 267 352	CAL ALUM METAL CAN 3500UF 30V AXIAL -10 +75% 1.000X3.125	
161 335 101	RES CARBON FILM 100 OHMS 1/4W 5%	
161 335 102	RES CARBON FILM 1 K 1/4W 5%	
161 335 122	RES CARBON FILM 1.2 K 1/4W 5%	
161 335 220	RES CARBON FILM 22 OHMS 1/4W 5%	
161 335 470	RES CARBON FILM 47 OHMS 1/4W 5%	
161 335 471	RES CARBON FILM 470 OHMS 1/4W 5%	
161 335 472	RES CARBON FILM 4.7 K 1/4W 5%	
161 335 560	RES CARBON FILM 56 OHMS 1/4W 5%	
161 335 561	RES CARBON FILM 560 OHMS 1/4W 5%	
161 335 562	RES CARBON FILM 5.6 K 1/4W 5%	
161 335 622	RES CARBON FILM 6.2 K 1/4W 5%	
161 445 102	RES CARBON FILM 1 K 1/2W 5%	
168 351 413	RES PREC RN60C 1.62 K	
168 651 385	RES PREC RN60D 825 OHMS	
168 651 422	RES PREC RN60D 2.00 K	
180 487 501	RES VARI CERMET 500 OHMS 1/2W 10% SINGLE TURN/SIDE ADJUST	
208 *11 *1	IC SINGLE OP AMP UA741C DIP-8 741	
230 110 *15	DIODE SWITCHING 1N4448	
235 *10 *15	DIODE RECTIFIER 1N4005	
240 413 821	DIODE ZENER 6.2V 1N821 400MW/DO-35 CASE/5%	
240 423 958	DIODE ZENER 7.5V 1N958B 400MW/DO-7/5%	
255 *30 *61	DIODE SCR 4-A TYPE S2061A TO-220AB/PWR SWITCHING & CONTROL	
256 *10 102	DIODE LED (RED) DIFF LENS WIREWRAP LEADS	
270 110 *13	TRANSISTOR NPN 2N2222A TO-18	
270 150 321	TRANSISTOR NPN 2N5321 TO-5/HIGH POWER	
275 110 *11	TRANSISTOR PNP 2N2907A TO-18	
275 150 *36	TRANSISTOR PWR PNP 2N4036 TO-5	
400 *10 *18	SOCKET IC ST DIP-8 .300 SEP/TIN CONT/COPP-NICKEL PINS	
500 120 *12	TRANSIPAD "LARGE"	
505 *70 *13	HEAT SINK FOR TO-220 BLK ANODIZED/WITH CLAMP	
511 100 211	BRACKET 12V/24V BD 1002 PER DWG 1002-M11/ALUMINUM/CLR ANODIZ	
560 632 *16	SCREW PHILIPS 6-32X3/8	
580 632 *11	NUT HEX 6-32	
594 120 *11	TIEWRAP	
711 *12 *13	PC BD PRESS'Y 1002-1 FOR BUNDLE 1/16 - 5/8	

NOTE: 1 P.C. ARTWORK
 NOTE: 2 FAB. DRAWING
 NOTE: 3
 NOTE: 4

MODEL NO 1002-2
ECON 1002

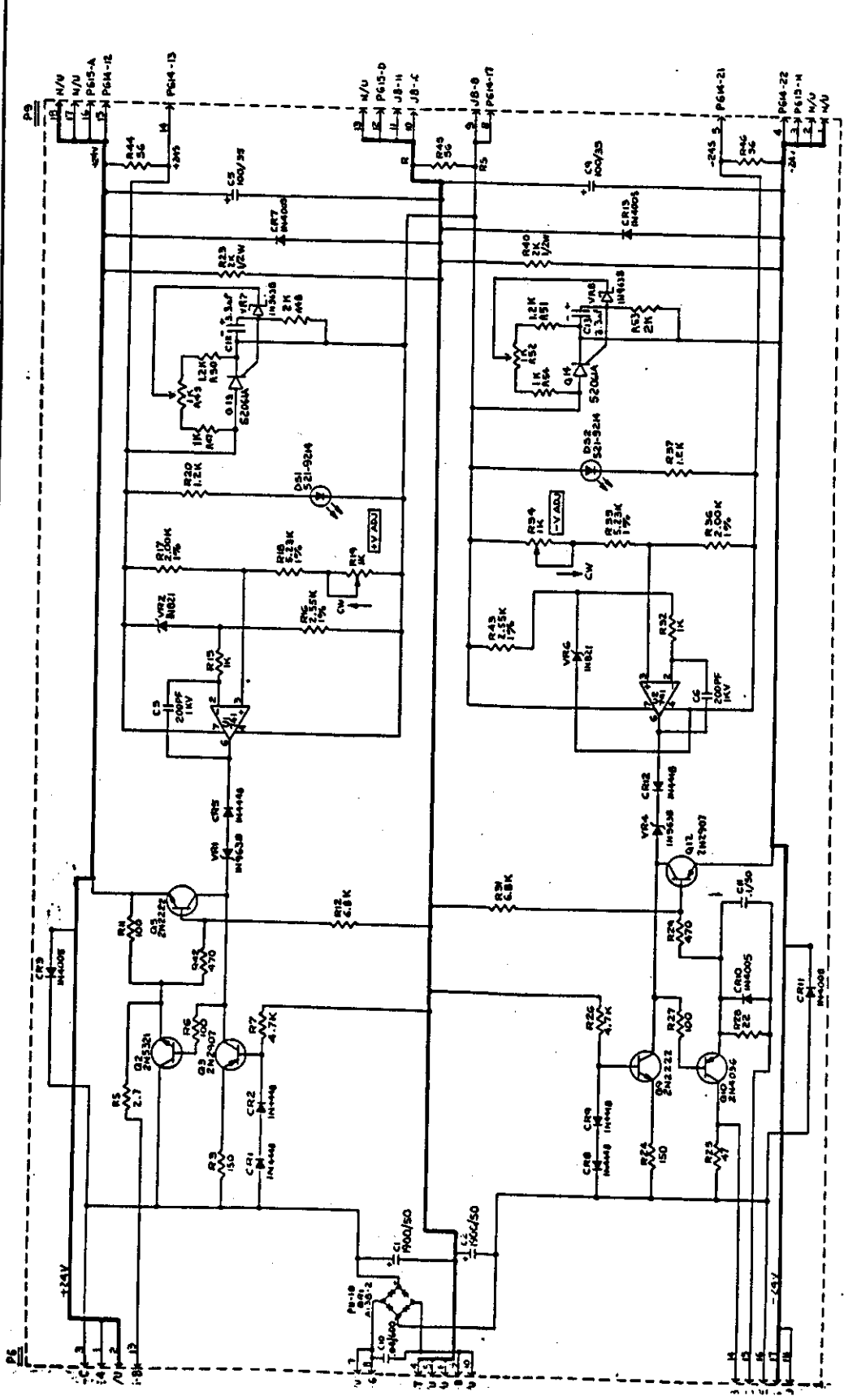
24 VOLT MODULE

PRINTED 19-Apr-83
REV DATE 12-Apr-83

LRS	PART NO	DESCRIPTION	QTY
102	335 104	CAP CERA CK05 .1 UF 50V 20% TC:15% -55C TO +125C	1
102	857 403	CAP CERA DISC 600V .04 UF 250/+80 -20%	1
102	944 201	CAP CERA DISC 1KV 200 PF 10% S3N	1
142	724 335	CAP TANT DIP CASE 3.3 UF 25V 20% .177 X .295	2
147	737 100	CAP ALUM METAL CAN 100 UF 35V -10 +75% RADIAL .394 X .630	2
148	567 192	CAP ALUM METAL CAN 1900UF 50V AXIAL -10 +75% 1.000 X 3.125	2
161	335 *27	RES COMP 1/4W 5% 2.7 OHMS	2
161	335 101	RES COMP 1/4W 5% 100 OHMS	1
161	335 102	RES COMP 1/4W 5% 1 K	3
161	335 122	RES COMP 1/4W 5% 1.2 K	4
161	335 151	RES COMP 1/4W 5% 150 OHMS	4
161	335 220	RES COMP 1/4W 5% 22 OHMS	2
161	335 470	RES COMP 1/4W 5% 47 OHMS	1
161	335 471	RES COMP 1/4W 5% 470 OHMS	1
161	335 472	RES COMP 1/4W 5% 4.7 K	2
161	335 560	RES COMP 1/4W 5% 56 OHMS	2
161	335 682	RES COMP 1/4W 5% 6.8 K	3
161	445 202	RES COMP 1/2W 5% 2 K	2
168	351 432	RES PREC RN60C 2.55 K	4
168	351 462	RES PREC RN60C 5.23 K	2
168	651 422	RES PREC RN60D 2.00 K	2
180	487 102	RES VARI CERMET 1 K 1/2W 10% SINGLE TURN/SIDE ADJUST	2
208	*11 **1	IC SINGLE OP AMP UA741C DIP-8 741	4
230	110 **5	DIODE SWITCHING 1N4448	2
235	*10 **5	DIODE RECTIFIER 1N4005	6
236	140 *10	RECTIFIER BRIDGE PH-10 5A/100V/MODIFIED PE-10/CASE #2	5
240	413 821	DIODE ZENER 6.2V 1N821 400MW/DO-35 CASE/5%	1
240	423 963	DIODE ZENER 12V 1N963B 400MW/DO-7/5%	2
255	*30 *61	DIODE SCR 4-A TYPE S2061A TO-220AB/PWR SWITCHING & CONTROL	4
256	*10 102	DIODE LED (RED) DIFF LENS WIREWRAP LEADS	2
270	110 **3	TRANSISTOR NPN 2N2222A TO-18	2
270	150 321	TRANSISTOR NPN 2N5321 TO-5/HIGH POWER	2
275	110 **1	TRANSISTOR PNP 2N2907A TO-18	1
275	150 *36	TRANSISTOR PWR PNP 2N4036 TO-5	2
400	*10 **8	SOCKET IC ST DIP-8 .300 SEP/TIN CONT/COPP-NICKEL PINS	1
500	120 **2	TRANSIPAD "LARGE"	2
505	*70 **3	HEAT SINK FOR TO-220 BLK ANODIZED/WITH CLAMP	2
511	100 211	BRACKET 12V/24V BD 1002 PER DWG 1002-M11/ALUMINUM/CLR ANODIZ	2
560	632 **6	SCREW PHILIPS 6-32X3/8	1
580	632 **1	NUT HEX 6-32	2
594	120 **1	TIEWRAP	2
711	**2 *13	PC BD PREASS'Y 1002-1	1

NOTE: 1
NOTE: 2
NOTE: 3

REV	DATE	BY	CHK
1	10/12/50	WJ	WJ
2	11/14/50	WJ	WJ
3	11/14/50	WJ	WJ
4	11/14/50	WJ	WJ
5	11/14/50	WJ	WJ
6	11/14/50	WJ	WJ
7	11/14/50	WJ	WJ
8	11/14/50	WJ	WJ
9	11/14/50	WJ	WJ
10	11/14/50	WJ	WJ



UNLESS OTHERWISE SPECIFIED:
 RESISTORS ARE 1/4 W, 5%, SHOWN IN OHMS.
 CAPACITORS ARE SHOWN IN MICROFARADS/VOLTS.
 * DENOTES SELECT AT TEST COMPONENT.
 M.P. MEANES HEAT SINK COMPONENT.
 USE P.C. BOARD (1002-01-30).

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MODEL NO 1002-3
ECON 1002

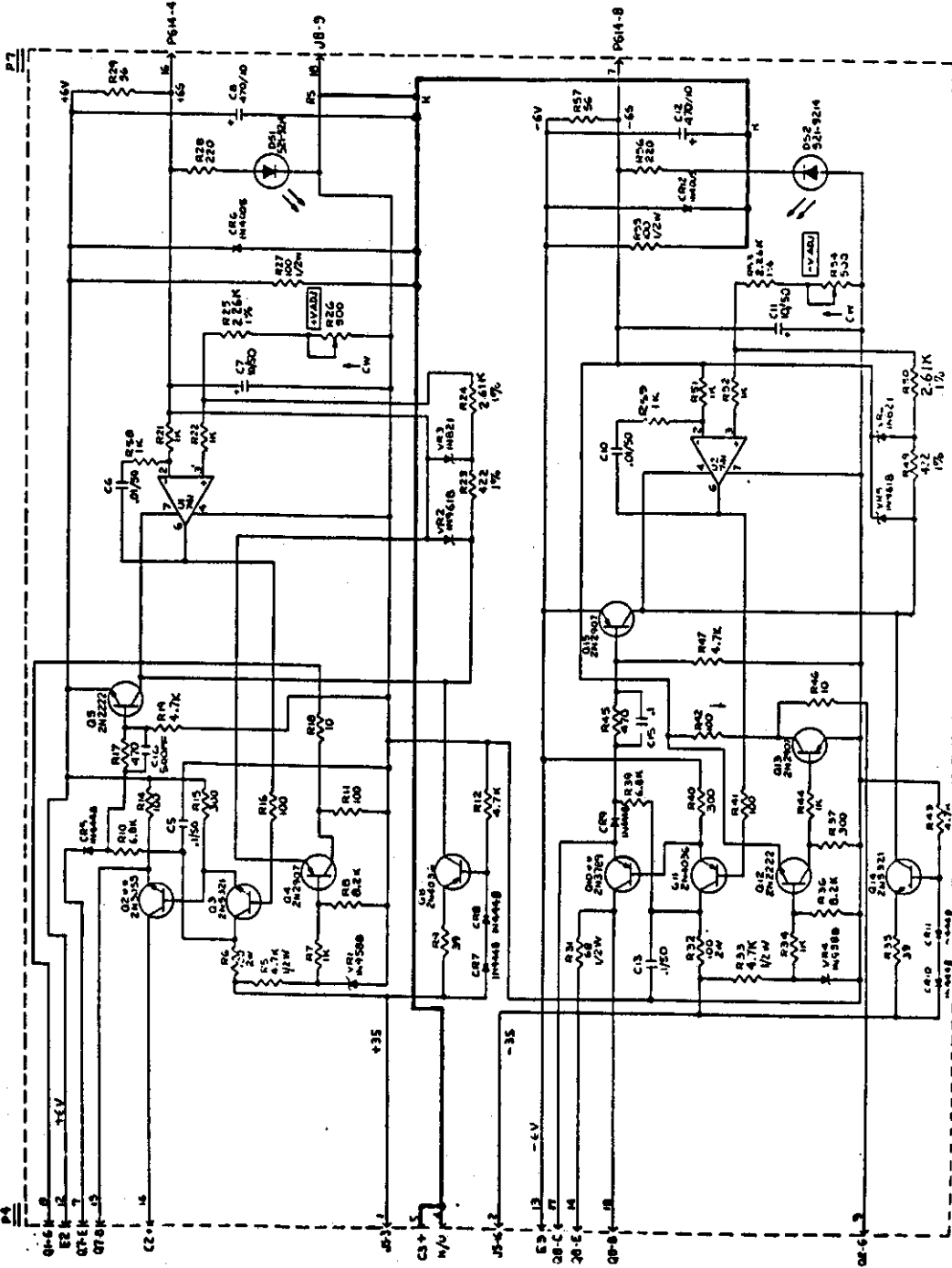
6 VOLT MODULE

PRINTED 19-APR-83
REV DATE 12-APR-83

LKS	PART NO	DESCRIPTION	QTY
102	335 104	CAP CERA CK05 .1 UF 50V 20% TC:15% -55C TO +125C	3
102	940 502	CAP CERA DISC 1KV .005 UF GMV	1
103	536 103	CAP CERA MONO 100V .01 UF 10% STABLE X7R .200X.200	† 2
147	236 471	CAP ALUM METAL CAN 470 UF 10V RADIAL LEADS .394 X .630	† 2
147	956 100	CAP ALUM METAL CAN 10 UF 50V RADIAL .315 X .453	† 2
161	335 100	RES COMP 1/4W 5% 10 OHMS	2
161	335 101	RES COMP 1/4W 5% 100 OHMS	2
161	335 102	RES COMP 1/4W 5% 1 K	5
161	335 221	RES COMP 1/4W 5% 220 OHMS	9
161	335 301	RES COMP 1/4W 5% 300 OHMS	2
161	335 390	RES COMP 1/4W 5% 39 OHMS	3
161	335 471	RES COMP 1/4W 5% 470 OHMS	2
161	335 472	RES COMP 1/4W 5% 4.7 K	2
161	335 560	RES COMP 1/4W 5% 56 OHMS	4
161	335 682	RES COMP 1/4W 5% 6.8 K	2
161	335 822	RES COMP 1/4W 5% 8.2 K	2
161	445 101	RES COMP 1/2W 5% 100 OHMS	2
161	445 472	RES COMP 1/2W 5% 4.7 K	2
161	445 680	RES COMP 1/2W 5% 68 OHMS	2
161	665 101	RES COMP 2W 5% 100 OHMS	1
168	351 357	RES PREC RN60C 422 OHMS	2
168	531 427	RES PREC RN55D 2.26 K	2
168	531 433	RES PREC RN55D 2.61 K	2
180	487 501	RES VARI CERMET 500 OHMS 1/2W 10% SINGLE TURN/SIDE ADJUST	2
208	*11 *1	IC SINGLE OP AMP UA741C DIP-8 741	2
230	110 *5	DIODE SWITCHING 1N4448	2
235	*10 *5	DIODE RECTIFIER 1N4005	6
240	413 821	DIODE ZENER 6.2V 1N821 400MW/DO-35 CASE/5%	2
240	423 958	DIODE ZENER 7.5V 1N958B 400MW/DO-7/5%	2
240	423 961	DIODE ZENER 10.0V 1N961B 400MW/DO-7/5%	2
256	*10 102	DIODE LED (RED) DIFF LENS WIREWRAP LEADS	2
270	110 *3	TRANSISTOR NPN 2N2222A TO-18	2
270	150 321	TRANSISTOR NPN 2N5321 TO-5/HIGH POWER	2
270	180 *2	TRANSISTOR NPN PWR 2N3055 TO-3	2
275	110 *1	TRANSISTOR PNP 2N2907A TO-18	1
275	130 789	TRANSISTOR PNP PWR 2N3789 TO-3	3
275	150 *36	TRANSISTOR PWR PNP 2N4036 TO-5	1
400	*10 *8	SOCKET IC ST DIP-8 .300 SEP/TIN CONT/COPP-NICKEL PINS	2
500	120 *2	TRANSIPAD "LARGE"	2
500	860 442	INSULATOR FOR TO-3 1.730 LONG/1.250 WIDE	4
511	100 215	BRACKET - 6V BOARD PER DWG 1002-M15/ALUMINUM/CLR ANODIZ	2
524	632 *8	STANDOFF SWAGED 6-32X.188 BRASS/ROUND/.250 DIA/FOR .062 BOARD	1
574	409 *5	WASHER SHOULDER NYLON #4 PART OF KIT #4880 FOR TO-220	4
711	*2 *33	PC BD PREASS'Y 1002-3	2
			1

NOTE: 1 P.C. ARTWORK

1	RESISTORS	1/4 W 5%
2	CAPACITORS	50V
3	DIODES	1N4001
4	TRANSISTORS	2N3763
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99	TRANSISTORS	2N3763
100	TRANSISTORS	2N3763



- NOTES:
1. UNLESS OTHERWISE SPECIFIED: RESISTORS ARE 1/4 W 5%; SHOWN OHMS CAPACITORS ARE 50V; MICROPHONIC.
 2. A NOTES SELECT AT TEST COMPONENT.
 3. P P DENOTES HEAT SINK COMPONENT.
 4. USE P.C. BOARD (4028-01-302)

MODEL NO 1002-4
ECON 1001

PWR SUPPLY SUBASS'Y

PRINTED 11-Feb-83
REV DATE 08-Jan-83

LRS	PART NO	DESCRIPTION	QTY
102	857 403	CAP CERA DISC 600V .04 UF Z5U/+80 -20%	2
147	225 *33	CAP ALUM METAL CAN 33 UF 10V -0 +100% AXIAL LEADS .315X.475	2
148	257 402	CAP ALU METAL CAN 4000 UF 30V LD POST -10 +75% 1.453X2.250	2
148	367 253	CAP ALU METL CAN 25000 UF 15V -10 +75% HI POST 2.000X2.125	2
161	335 101	RES COMP 1/4W 5% 100 OHMS	2
161	555 201	RES COMP 1W 5% 200 OHMS	2
236	230 775	RECTIFIER BRIDGE J-775-2 25 AMP/1.120 SQ METAL PKG .455 HIGH	2
255	*20 210	DIODE SCR S6210A TO-48/20A/100V	2
389	238 *#3	FOAM PRE-CUT 3.0X3.0X.250 PER DWG 1002-M1	2
405	510 *#1	CONNECTOR PIN (FEMALE)	1
405	750 *#12	KEYING PLUG (FOR SOCKETS)	23
405	770 *#9	TERMINAL WIRE END #10 FOR WIRE SIZE 12 THRU 10/RING TONGUE	17
420	262 *#6	SWITCH SLIDE DPDT LOCKING	1
433	115 *#0	FUSE 3AG SLO-BLO 5 AMP	2
434	182 *#1	FUSEHOLDER PANEL MTG RT ANGLE TERMINAL/FLUTED KNOB	2
440	200 *#6	TRANSFORMER PER DWG 1002-M6	1
455	*21 *#9	CONTACT FOR RT ANGLE CONN CRIMP/USE W CONN 09-02-1182/18-24AWG	51
455	120 *#23	BLOCK - CRIMP FEM PINS 23	1
455	160 *#18	BLOC FOR CRIMP SOCKETS 18 WHT NYLON/NO MTG FLANGE/FOR PIN 1799	6
485	941 *#1	GROMMET POLY CATERPILLAR FOR .106-.164" PANELS 5/32 DEEP	1
500	860 661	INSULATOR FOR PWR DIODE SILICONE/THERMAL COND - EL INSUL	4
510	110 *#6	LOCKING TERMINAL LUG #6 GROUND LUG WITH INTERNAL TEETH	1
510	120 *#10	GROUND LUG #10 CLR	4
510	130 *#25	GROUND LUG 1/4" HOLE NON-LOCKING/TIN PLATED COPPER	2
511	100 202	FILTER COVER (FRAME) 1002 PER DWG 1002-M2/ALUM/CLR IRIDITE	1
511	100 203	CAPACITOR MTG PLATE 1002 PER DWG 1002-M3/ALUM/CLR ANODIZE	1
511	100 204	BRACKET FOR SCR'S 1002 PER DWG 1002-M4/ALU/CLR IRIDITE	1
511	100 207	FILTER GUARD 1002 PER DWG 1002-M7/PERF STEEL/ZINC PL	1
511	100 209	HEAT SINK TOP PLATE 1002 PER DWG 1002-M9/ALUMINUM/CLR ANODIZE	1
511	100 216	CHASSIS 1002 PER DWG 1002-M16/ALUMINUM/CLR ANODIZ	1
511	100 217	WELDMENT ASSEMBLY 1002 PER DWG 1002-M17	1
511	100 218	ENCLOSURE COVER 1002 PER DWG 1002-M18	1
511	100 219	CONNECTOR BRACKET COLD ROLLED STEEL/CAD PL + CLR IRID	1
511	100 221	CAPACITOR MOUNTING PLATE ALUMINUM/YEL IRIDIIE FINISH	1
522	632 568	SPACER ROUND 6-32X2+1/8 ALU 3/16 DIA/ENDS TAPPED/CLR IRIDITE	8
530	409 106	FAN AXIAL 50-60 HZ 115V 12W/40 CFM/3250 RPM/3.125 SQ	1
555	712 *#1	CAPTIVE SCREW 10-32 STEEL PER DWG 1002-M5/WITH SHOULDER	1
555	712 *#2	CAPTIVE SCREW 10-32 STAINLESS STEEL 1+3/8 LONG	3
560	632 *#14	SCREW PHILIPS 6-32X7/8	2
564	440 *#4	SCREW ROUND PHIL 4-40X1/4	25
567	*32 *#5	SCREW FLAT PHIL 10-32X5/16	4
567	632 *#6	SCREW FLAT PHIL 6-32X3/8	7
567	632 *#7	SCREW FLAT PHIL 6-32X7/16	A/R
575	110 *#2	WASHER FL 1/4 ID .500 OD THICKNESS APPROX .062	2
575	909 *#19	O-RING 1/4 ID 3/8 OD MATERIAL: *BUNA-N* RUBBER	2
577	100 *#2	WASHER SHAKEPROOF 1/4" INT STAR/STAINLESS STEEL MAGNETIC OK	2
580	128 *#1	NUT HEX 1/4-28 STUD TRANSISTOR MTG	2
589	203 *#18	CORD POWER 3-COND SFT 10A #18 AWG GRAY JACKET	1

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MODEL NO 1002-4
ECON 1001

PWR SUPPLY SUBASS'Y

PRINTED 11-Feb-83
REV DATE 08-Jan-83

LRS PART NO

DESCRIPTION

QTY

594 250 **2 STRAIN RELIEF BUSHING

SNAP-IN/FOR PWR CABLE/BLK

1

- NOTE: 1
- NOTE: 2
- NOTE: 3
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- NOTE: 15

ARTWORK FOR CHASSIS

MODEL NO 1002-5
ECON 1000

RESISTOR BD FRONT 'B'

PRINTED 11-Feb-81
REV DATE 08-Dec-80

LRS PART NO	DESCRIPTION	QTY
172 557 *10	RES PWR WIREWOUND .1 OHMS 5W 10% CERAMIC CASE .380X.880	†
172 557 *50	RES PWR WIREWOUND .5 OHMS 5W 10% CERAMIC CASE .380X.880	†
175 666 **5	RESISTOR PWR WW .05 OHM 10% SILICONE CASE	
270 180 **2	TRANSISTOR NPN PWR 2N3055 TO-3	
270 180 771	TRANSISTOR NPN PWR 2N3771 TO-3	
270 180 772	TRANSISTOR PWR NPN 2N3772 TO-3	
408 110 **7	TERMINAL DOUBLE TURRET	
429 *10 **2	SWITCH THERMAL N.C. OPEN @ 250F RECLOSE 220F	
500 790 **3	SOCKET FOR PWR TRANSISTOR	
500 860 442	INSULATOR FOR TO-3 1.730 LONG/1.250 WIDE	
511 100 214	HEAT SINK SIDE PLATE 1002 PER DWG 1002-M14/ALUMINUM/CLR ANODIZ	
521 400 **6	SPACER ROUND #4 3/16	
555 672 *10	SCREW SELF-TAP SLOT 6X5/8 STAINLESS/ROUND HD/SHARP POINT	
577 600 **1	WASHER SHAKEPROOF SIZE 6 INT STAR/STAINLESS STEEL MAGNETIC OK	
701 **2 **8	RESISTOR BOARD 1002 PER DWG 1002-M8/UNCLAD PC STOCK	

- NOTE: 1
- NOTE: 2
- NOTE: 3
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EL NO 1002-6
1000

RESISTOR BO REAR 'A'

PRINTED 11-Feb-83
REV DATE 08-Dec-82

PART NO	DESCRIPTION	QTY
557 *10	RES PWR WIREWOUND .1 OHMS 5W 10% CERAMIC CASE .380X.880	1
557 *50	RES PWR WIREWOUND .5 OHMS 5W 10% CERAMIC CASE .380X.880	1
666 **5	RESISTOR PWR WW .05 OHM 10% SILICONE CASE	1
180 **2	TRANSISTOR NPN PWR 2N3055 TO-3	1
180 771	TRANSISTOR NPN PWR 2N3771 TO-3	1
180 772	TRANSISTOR PWR NPN 2N3772 TO-3	1
110 **7	TERMINAL DOUBLE TURRET	1
*10 **1	SWITCH THERMAL N.O. CLOSE @ 220F REDPEN @ 190F	6
790 **3	SOCKET FOR PWR TRANSISTOR	1
860 442	INSULATOR FOR TO-3 1.730 LONG/1.250 WIDE	3
100 214	HEAT SINK SIDE PLATE 1002 PER DWG 1002-M14/ALUMINUM/CLR ANODIZ	3
400 **6	SPACER ROUND #4 3/16	1
672 *10	SCREW SELF-TAP SLOT 6X5/8 STAINLESS/ROUND HD/SHARP POINT	2
600 **1	WASHER SHAKEPROOF SIZE 6 INT STAR/STAINLESS STEEL MAGNETIC OK	6
**2 **8	RESISTOR BOARD 1002 PER DWG 1002-M8/UNCLAD PC STOCK	6
		1

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