16K RAM OPERATION

PolyMorphic
Systems

460 Ward Drive Santa Barbara California 93111 (805) 967-2351

This manual is PolyMorphic Systems part no. 810119.

Card
Revision C

The PolyMorphic Systems 16K RAM card provides 16,384 bytes of read/write storage. The card uses proven 4K dynamic RAM chips and provides "transparent" refresh circuitry onboard (no wait states). Each card has been tested for 72 hours before shipment. This includes 48 hours of GALPAT and checkerboard testing at high temperatures with no errors. This card should provide years of trouble-free service in your 8080-based S-100 system.

THEORY OF OPERATION

Refresh cycles are inserted during the T4 state of the M1 cycle of the 8080 central processor or during a hold or halt state of more than 15 cycles. Memory read cycles are initiated by the coincidence of the phase 1 clock, PSYNC, and DO7 (MREAD staus). Write cycles are initiated by the leading edge of MWRITE.
If the card is used with systems using DMA (Direct Memory Access), the DMA controller must provide the proper status bits on the DO bus during SYNC time. The bus timing must match that of an 8080 processor. Contact the manufacturer or distributor of the DMA controller before attempting to use the 16K RAM card with a DMA device.

ADDRESSING

Consult the user's manual for your computer to determine the correct address for this memory card. For POLY 88 or System 88 computers, the card should be addressed just above the present top of memory. If your system uses only 16K cards, the first card should be addressed at 2000H, the second card at 6000H, and the third card at A000H.

The 16K RAM card may be addressed to any 4K boundary within the 64K address space of the S-100 bus and will occupy the next 16K bytes of storage space. (If addressed at 2000H, the RAM will occupy 2000-5FFFH.) The address switches are located in the lower left corner of the card. Up to seven switches may be present, but only the top four are used. These switches are numbered 1 through 4 from the top of the card. The switch settings for various addresses are given below. Rocker switches are ON when the on or plus side of the rocker switch is pressed down. For purposes of reference, note the numbers down one side of the card and across the top. These numbers indicate the addresses of the memory chips within the 16K block. Numbers down the side indicate byte address; row 0 on the card is addressed in the first 4K of the block, row 1 in the next, and so on. Numbers across the top correspond to the bits in each byte. Column 0 contains the first bit in every byte, column 1 the second, etc.

Switch Settings
(X=on, blank=off)

Address	1	2	3	4
0000				
1000	X			
2000		X		
3000	X	X		
4000			X	
5000	X		X	
6000		X	X	
7000	X	X	X	
8000				X
9000	X			X
A000		X		X
B000	X	X		X
C000			X	X
D000	X		X	X
E000		X	X	X
F000	X	X	X	X

If addressed higher than C000H, the memory above FFFFH will appear in the lower end of the address space. (If set at E000 it will appear at E000-FFFFH and 0000-1FFFH.)

The RAM card may now be plugged into your system backplane. Consult the user`s manual for your computer for card insertion instructions.

SPECIFICATIONS

Memory Size:	16,384 Bytes
Access Time:	375 nS (from 01)
Cycle Time:	525 nS
Wait States:	0
Power Consumption:	+16 to 20V @ 200 mA max. (active)
	+16 to 20V @ 90 mA max. (standby)
	+8 to 10V @ 600 mA max.
	-16 to 20V @ 24 mA max.
Card Size:	5.5" x 10"

POLYMORPHIC SYSTEMS 8081A

SCHEMATIC - CPU

SIZE E | DRAWING NO. 90014 | REV B

SCALE — | WEIGHT — | SHEET —

DESIGN APPROVED

DRAWN

CHECKED

ENGR APPROVED

MFG APPROVED

QC APPROVED

TOLERANCES UNLESS OTHERWISE SPECIFIED

DO NOT SCALE

MATERIAL

FINISH

APPLICATION

USED ON

NEXT ASSEMBLY

PARTS LIST

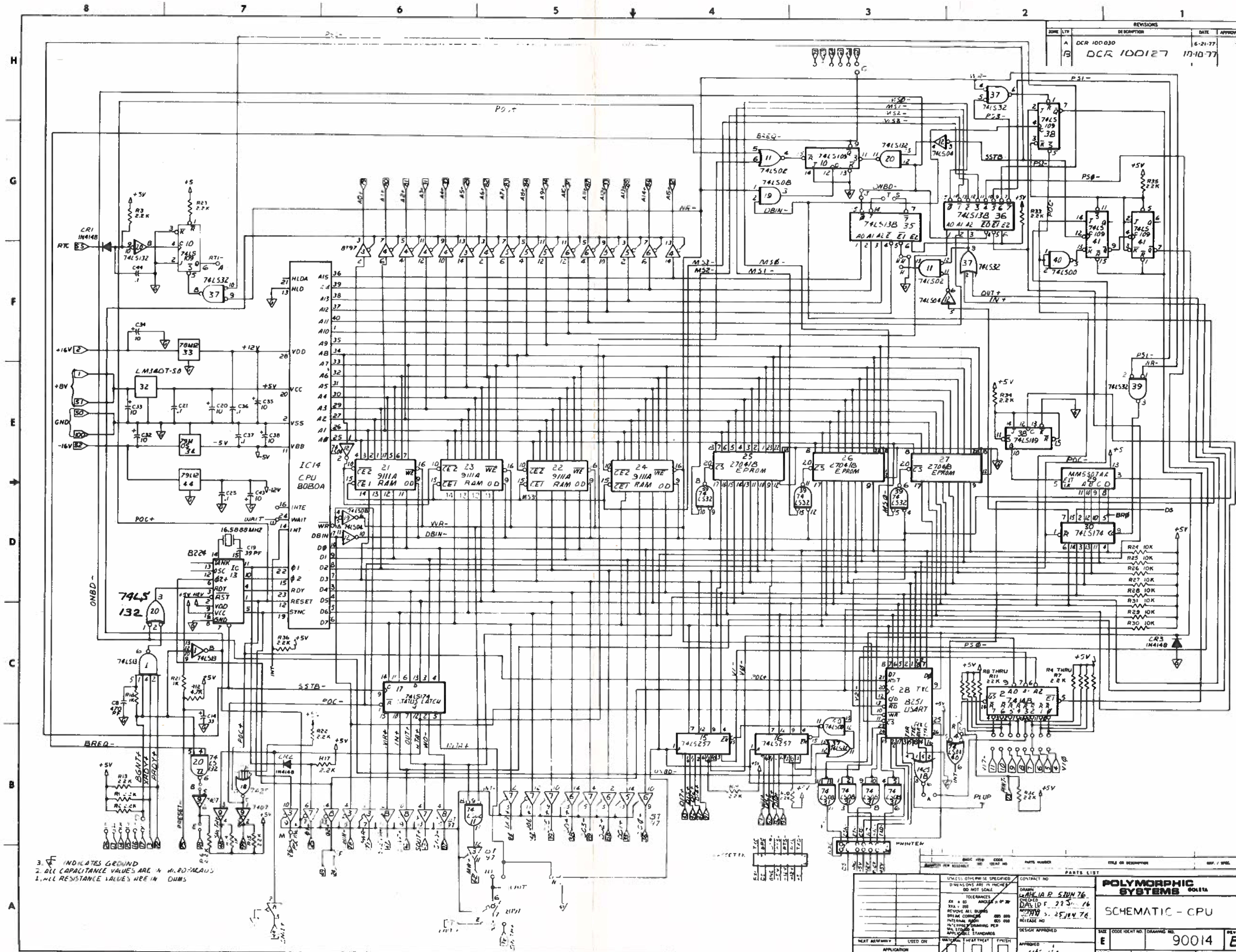
QUANTITY REQ. | PART OR IDENTIFYING NO. | DESCRIPTION | VENDOR | MAT'L

NOTES:

1. ALL RESISTANCE VALUES ARE IN OHMS
2. ALL CAPACITANCE VALUES ARE IN MFD
3. INDICATES GROUND

REVISIONS

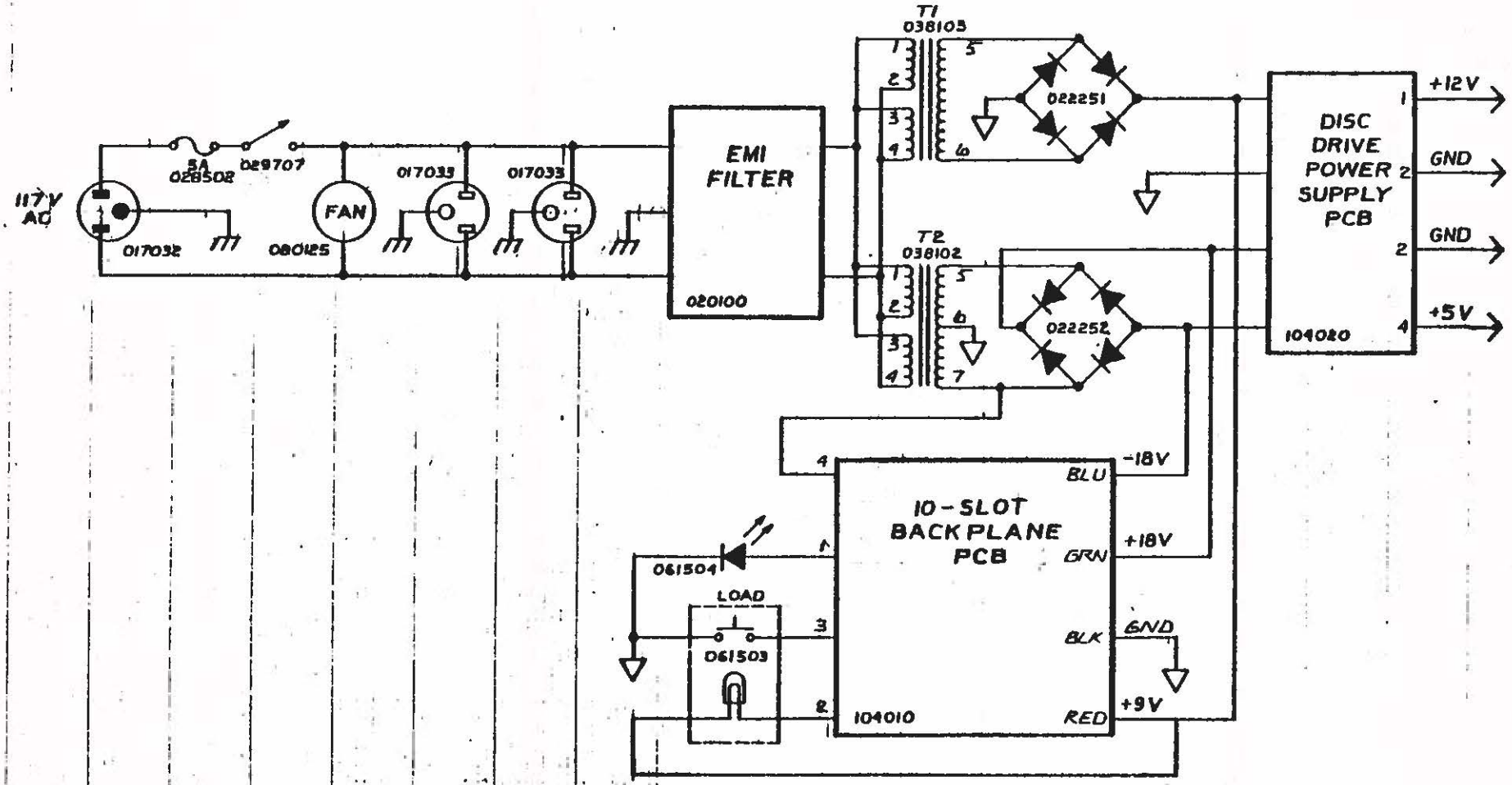
ZONE	LTR	DESCRIPTION	DATE	APPROVED
	A	ECR 100230	6-27-77	
	B	ECR 100127	10-10-77	



REVISIONS
A DCR 100030 6-21-77
B DCR 100127 10-10-77
POLYMORPHIC SYSTEMS GOLETA
SCHEMATIC - CPU
90014
B
IC14
CPU
8080A
16.5888MHZ
74LS174 STATUS LATCH
8251 USART
9111A RAM
2704/8 EPROM
MM5307AA
74LS138
74LS109
74LS257
LM340T-5.0
78M12
79M05
79L12
3. INDICATES GROUND
2. ALL CAPACITANCE VALUES ARE IN MICROFARADS
1. ALL RESISTANCE VALUES ARE IN OHMS

104402
DRAWING NO. REV.

REVISIONS			
REV.	DESCRIPTION	DATE	APPR



UNLESS OTHERWISE SPECIFIED:
INTERPRET DRAWING PER ANSI Y14.5
DIMENSIONS ARE IN INCHES AND APPLY AFTER PLATING
BREAK SHARP EDGES
XX ± .X
XXX ± .XX
MATERIAL
FINISH

DWN.	ARAKI, L.	DATE 6-22-77
CHECK		
PROJ. ENG.		
APPR.	J.H.S.	7-6-77

NEXT ASSY | USED ON

POLYMORPHIC SYSTEMS GOLETA

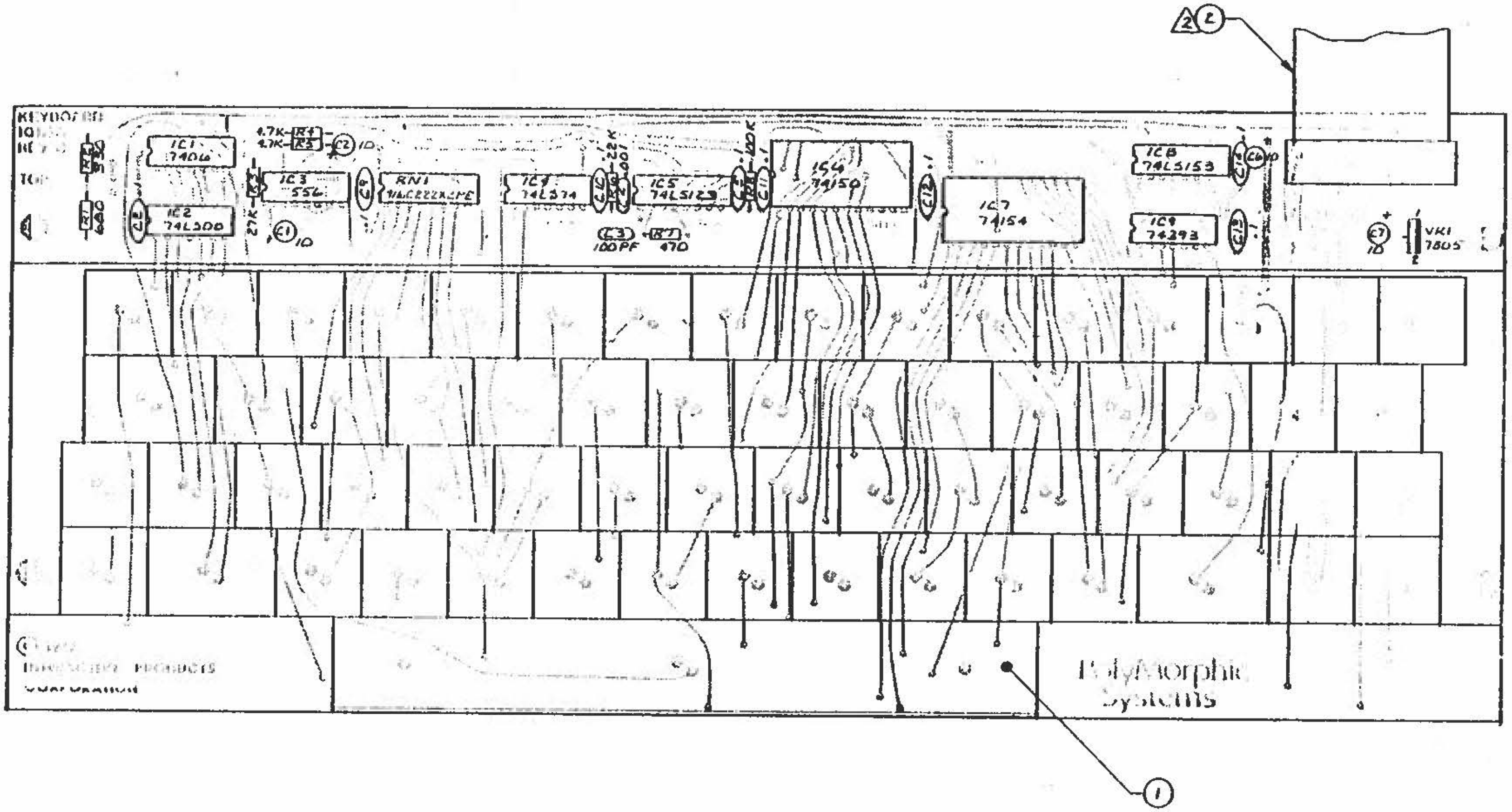
SCHEMATIC - SYSTEM 8813 INTERCONNECT

SIZE	DRAWING NUMBER	REV
C	104402	

NOTES: UNLESS OTHERWISE SPECIFIED

D09011 REV B

REV	DESCRIPTION	DATE	APPR
—	RELEASED DCR 1000161		
A	DCR 100166		
B	DCR 100117		



△ TO BE INSTALLED AFTER FLAT SOLDER OPERATION.

1. SOCKET NOT REQUIRED FOR RN1

NOTES: UNLESS OTHERWISE SPECIFIED

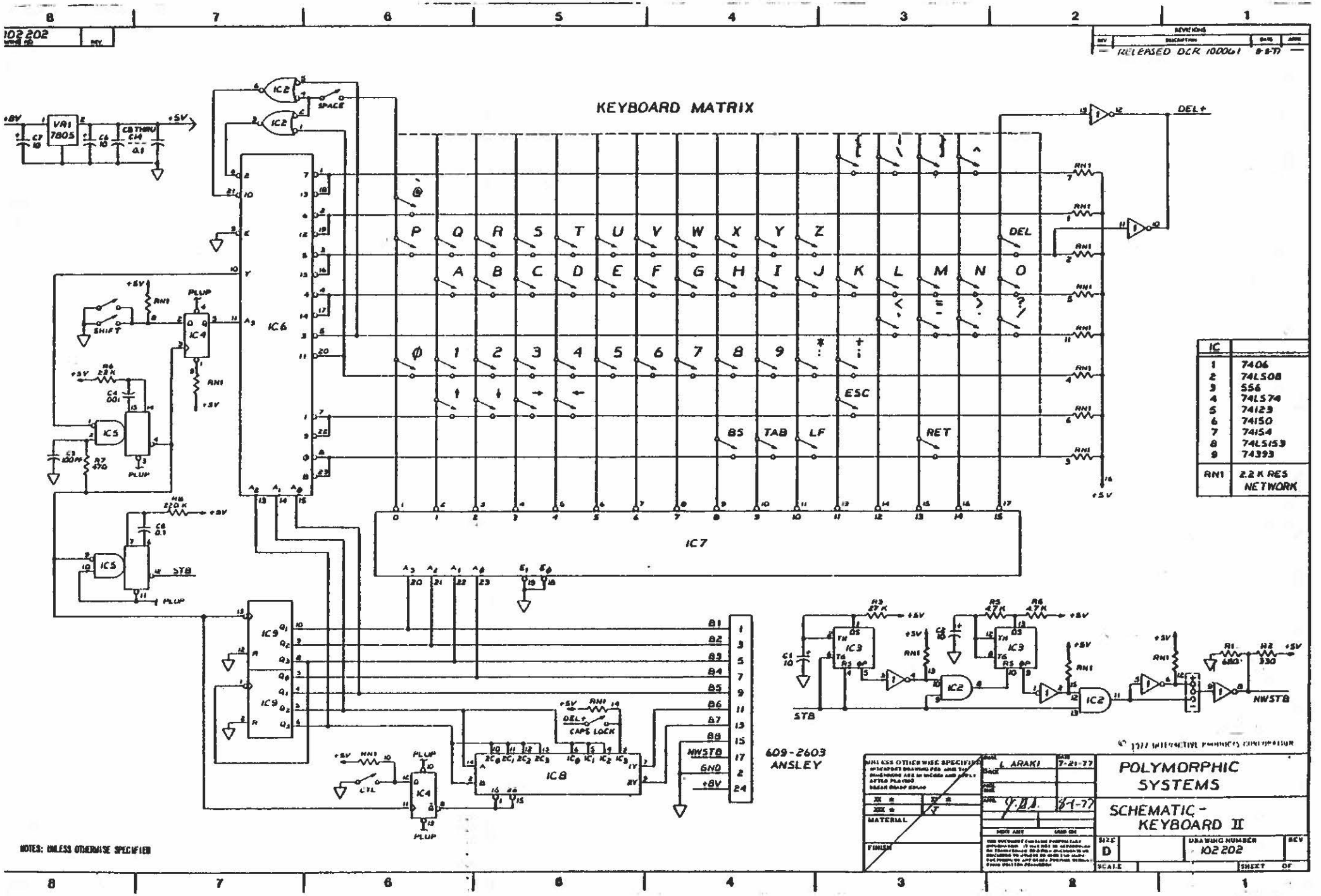
SEE PARTS LIST D09011

POLYMORPHIC SYSTEMS

ASSY-KEYBOARD II

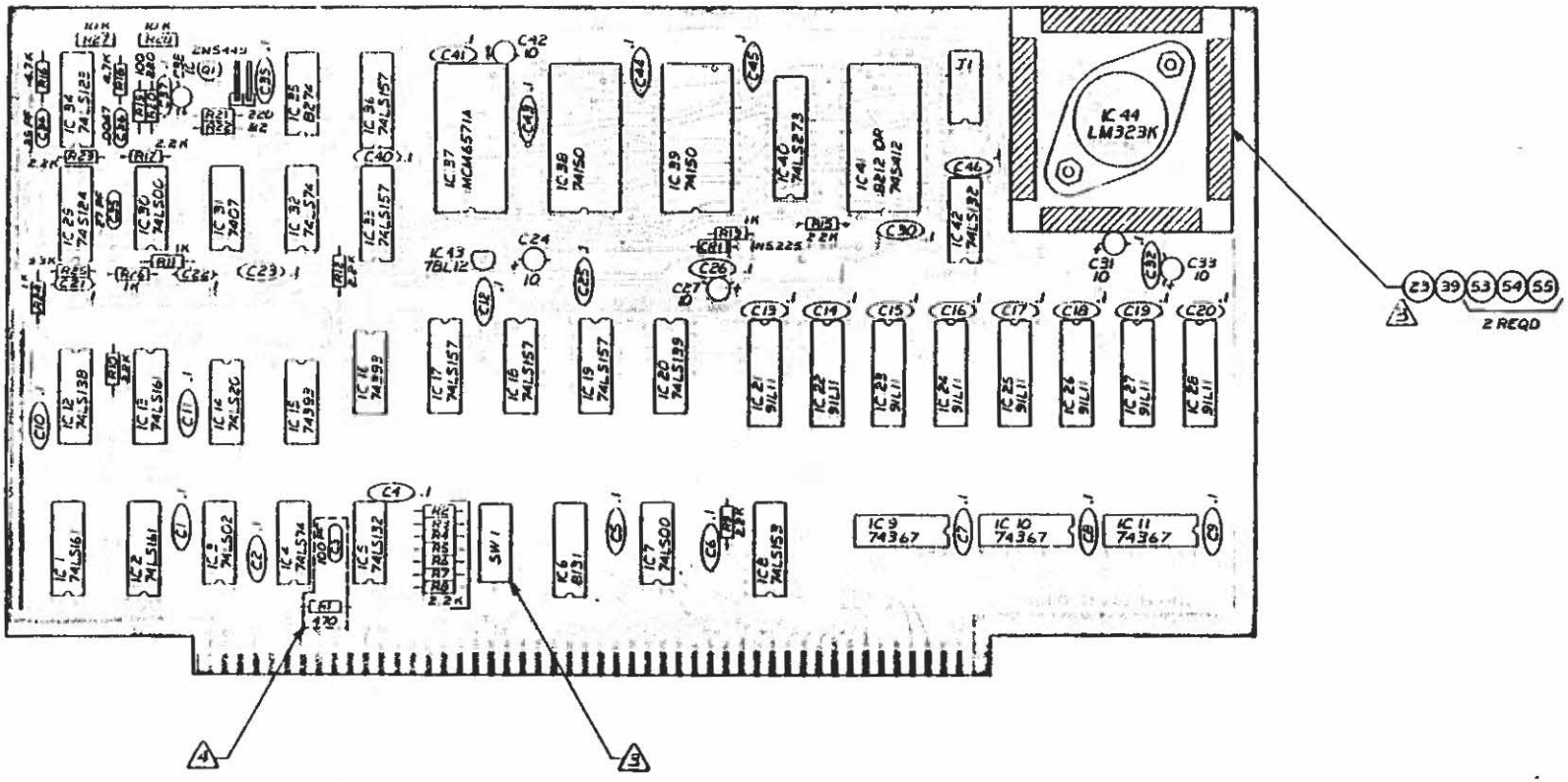
SIZE D | DRAWING NUMBER D09011 | REV B

DATE 7-22-77 | 7-27-77


KEYBOARD MATRIX
IC7
IC6
IC5
IC4
IC3
IC2
IC8
IC9
SHIFT
CAPS LOCK
CTL
SPACE
DEL
ESC
BS
TAB
LF
RET
STB
NWSTB
609-2603
ANSLEY
IC
1 7406
2 74LS08
3 556
4 74LS74
5 74123
6 74150
7 74154
8 74LS153
9 74393
RN1 2.2 K RES NETWORK
RELEASED DCR 10006 1 8-8-77
L. ARAKI 7-21-77
POLYMORPHIC SYSTEMS
SCHEMATIC - KEYBOARD II
DRAWING NUMBER 102 202
SIZE D
SCALE
SHEET OF
NOTES: UNLESS OTHERWISE SPECIFIED

001026 B

REVISIONS			
REV	DESCRIPTION	DATE	APPR
B	DCN 100133	10-4-77	



4. OMIT R1 AND C3 FOR USE WITH DISK SYSTEM
5. TO BE INSTALLED AFTER FLOW SOLDER OPERATION.
2. MODIFY PER DRAWING 105255.
1. TO BE USED ON BOARDS UP TO REV 1.2

NOTES: UNLESS OTHERWISE SPECIFIED

L. ARAKI 8-3-77

POLYMORPHIC SYSTEMS

ASSY - VIDEO BOARD, 1.2

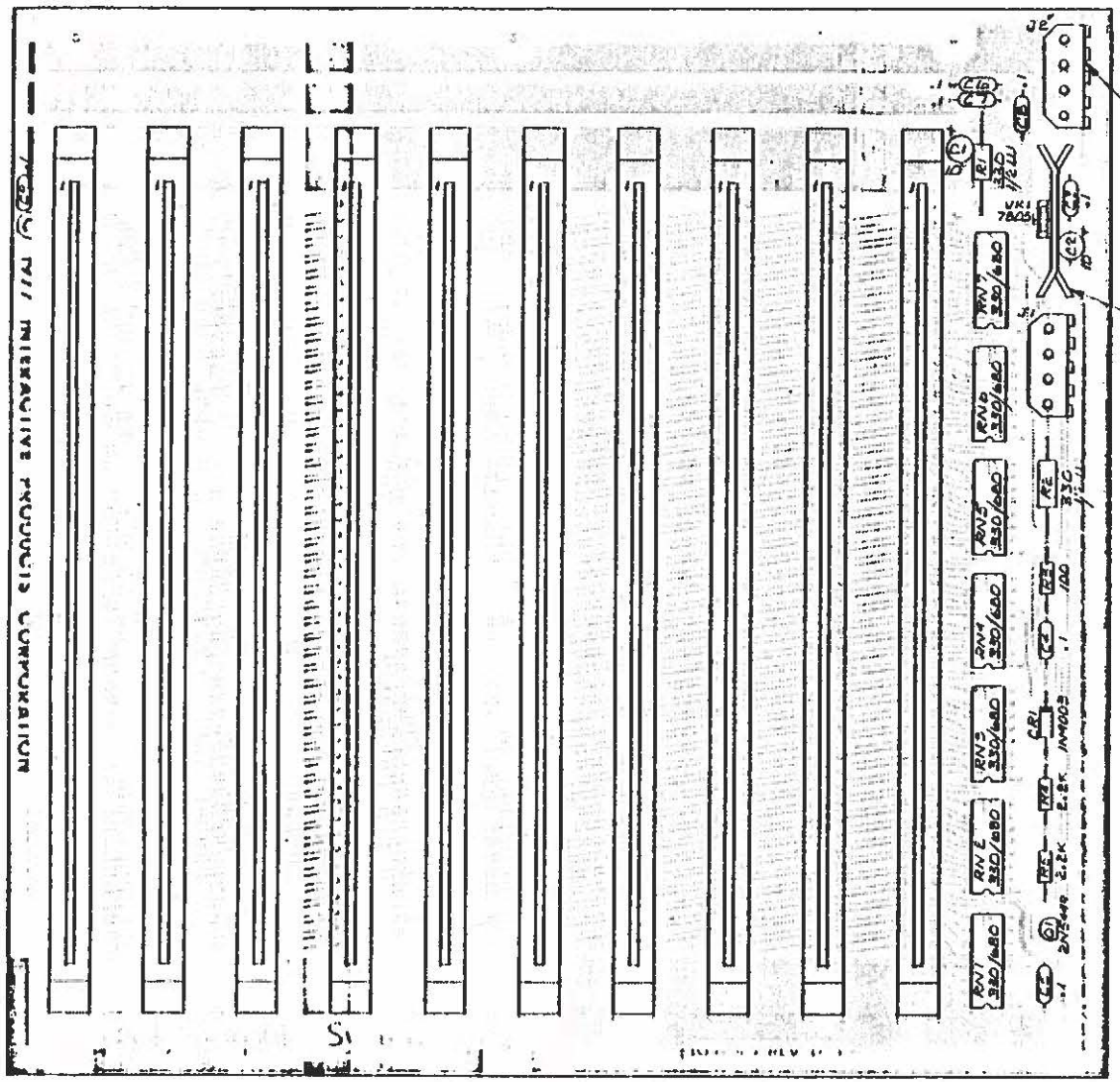
SIZE D | DRAWING NUMBER 001026 | REV B

SCALE 1 | SHEET 1 OF 1

8	7	6	5	4	3	2	1

DD4010 | B

REVISIONS			
REV	DESCRIPTION	DATE	APPD
A	DCR 100057	6-1477	
B	DCR 100039 100113 100180	9-26-77	



1. TO BE INSTALLED AFTER FLOW SOLDER OPERATION.
2. MODIFY PER 104445.
3. RESISTOR NETWORKS (RN1 THRU RN7) TO BE INSTALLED AFTER BACKPLANE TEST.

NOTES: UNLESS OTHERWISE SPECIFIED

SEE PARTS LIST DD4010

UNLESS OTHERWISE SPECIFIED

DRAWN	R. Stickley	6/1477
CHECKED	F.E.A	6-30-77
ENG APPR.	F.E.A	6-30-77
MFG APPR.		

MATERIAL

FINISH

POLYMORPHIC SYSTEMS

ASSY- SYS 8813 BACKPLANE

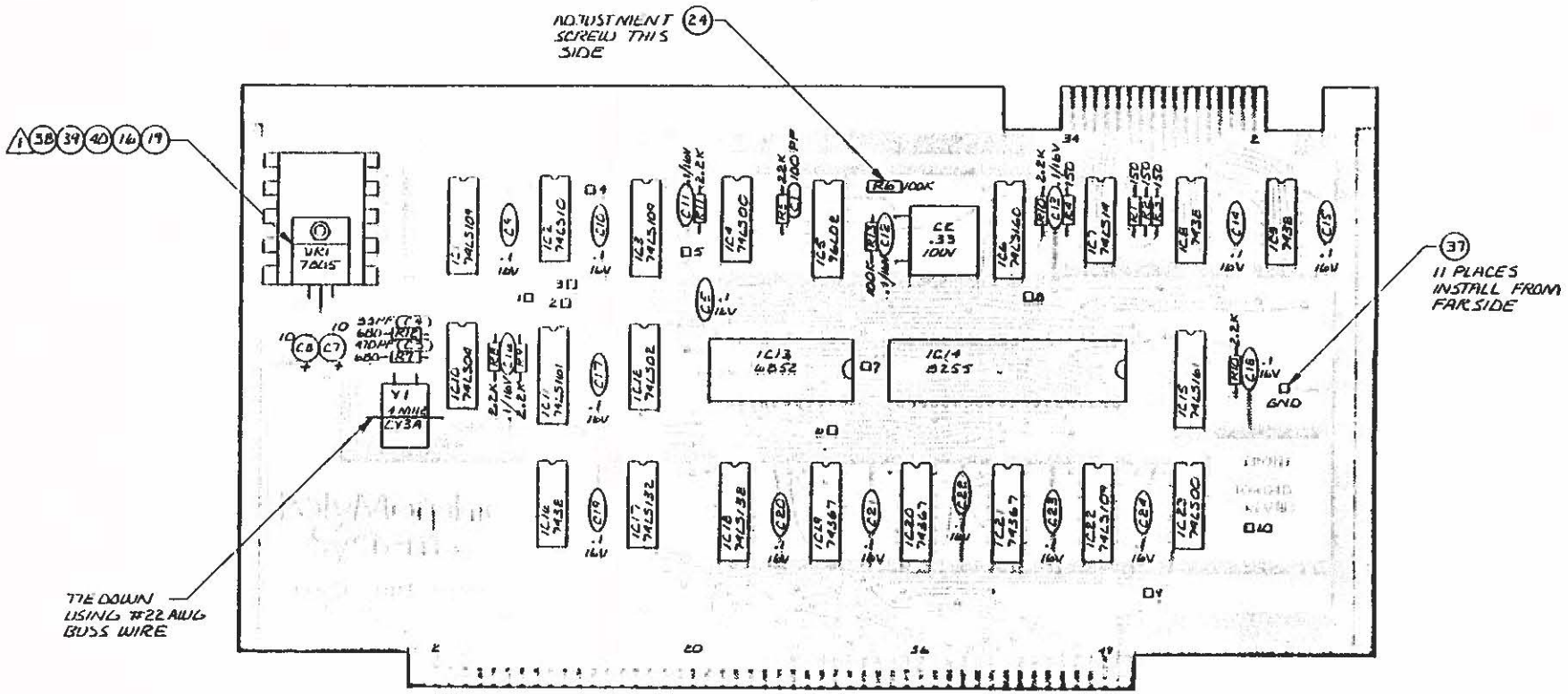
SIZE	DRAWING NUMBER	REV
D	DD4010	B

SCALE 1/4 | SHEET 1 OF 1

8	7	6	5	4	3	2	1

REVISIONS

REV	DESCRIPTION	DATE	APPD
	RELEASED DCR 100022	4-77	



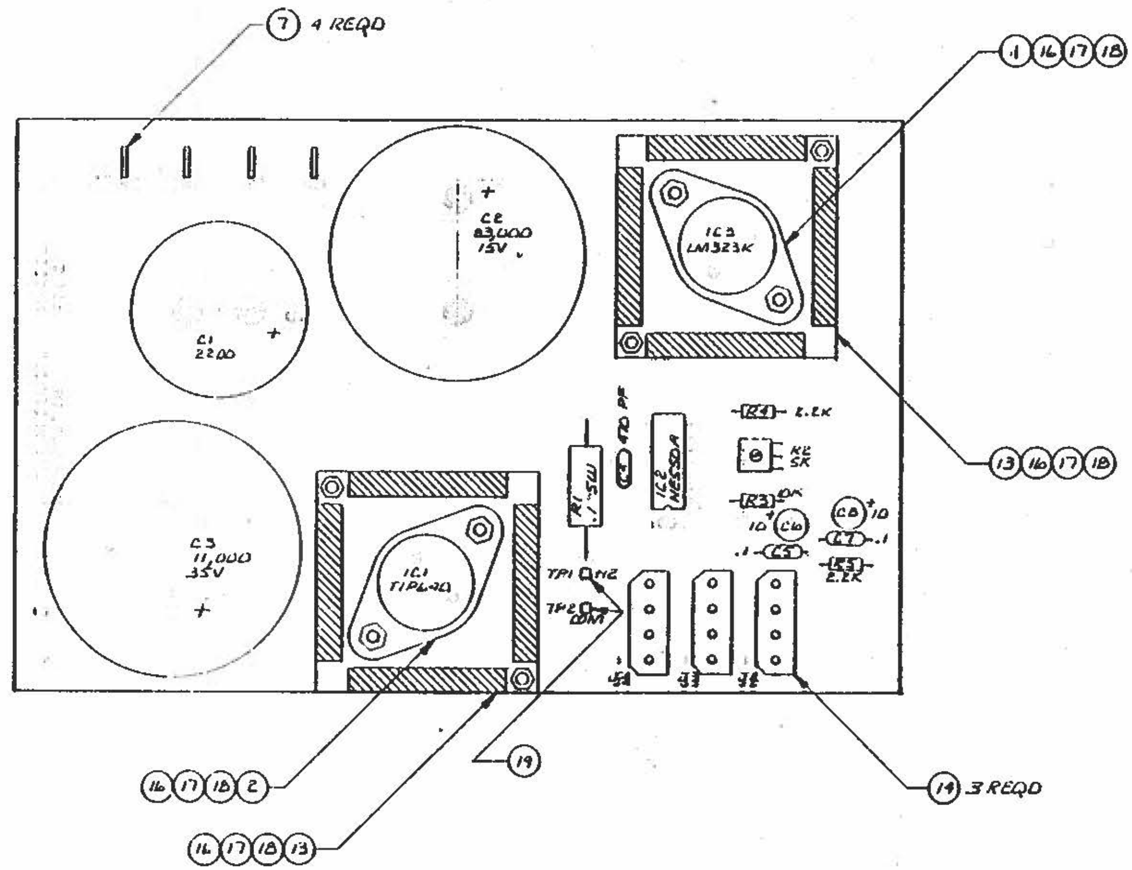
2. MODIFY PER DWG 104941.

1 TO BE INSTALLED AFTER FLOW SOLDER OPERATION.

NOTES: UNLESS OTHERWISE SPECIFIED

SEE PARTS LIST 004010

UNLESS OTHERWISE SPECIFIED	R Smith 5-27-77	POLYMORPHIC SYSTEMS
MATERIAL	J. Hall 7-7	ASSY-DISC CONTROLLER
FINISH	NEXT ASSY	SIZE D · DRAWING NUMBER 004010 · REV
		SCALE 2/1 · SHEET OF



NOTES: UNLESS OTHERWISE SPECIFIED

SEE PARTS LIST 004020

Drawn: R. Suchy	6-13-77
Check: F.E.A.	6-30-77
F.E.A.	6-30-77
Appd: J.D.A.	7-5

POLYMORPHIC SYSTEMS

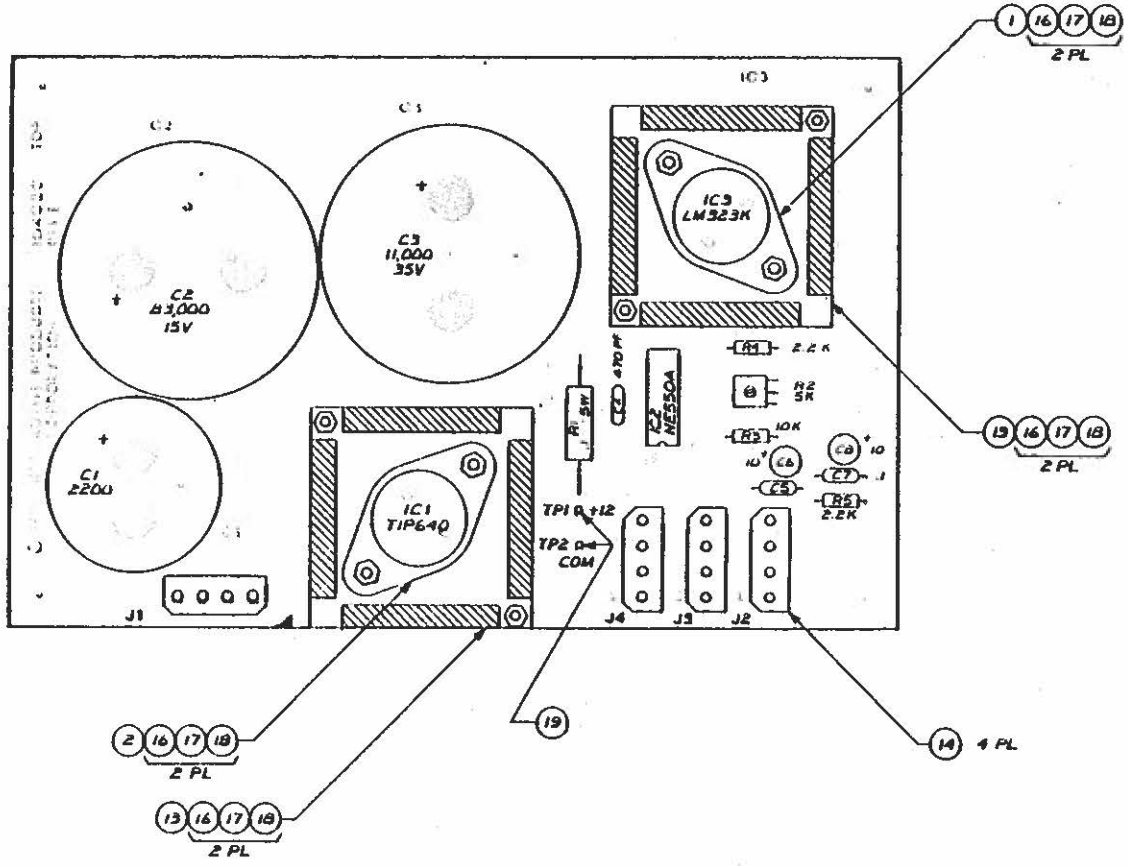
ASSY-SYS 8813 POWER SUPPLY

SIZE D — DRAWING NUMBER 004020 — SCALE 2/1 — SHEET OF — REV

004020

004020 | A

REVISIONS			
REV	DESCRIPTION	DATE	APPD
A	ECN 100158	11-8-77	



NOTES: UNLESS OTHERWISE SPECIFIED

UNLESS OTHERWISE SPECIFIED	DRAWN	L. ARAKI	11-8-77
	CHECK		
	ENGR APPR		
	MFG APPR		11-8
MATERIAL			
FINISH			

POLYMORPHIC SYSTEMS

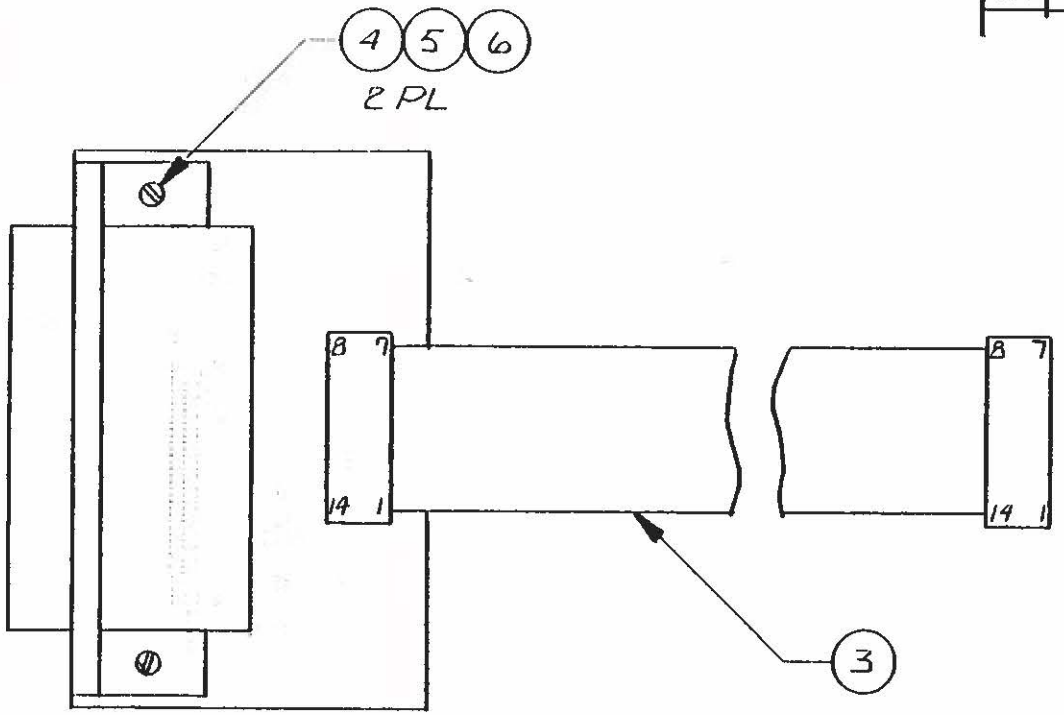
ASSY - SYS 8813 POWER SUPPLY

SIZE	DRAWING NUMBER	REV
D	004020	A

SCALE 2:1 | SHEET | OF

001027 DRAWING NO.	REV.

REVISIONS			
REV	DESCRIPTION	DATE	APPR

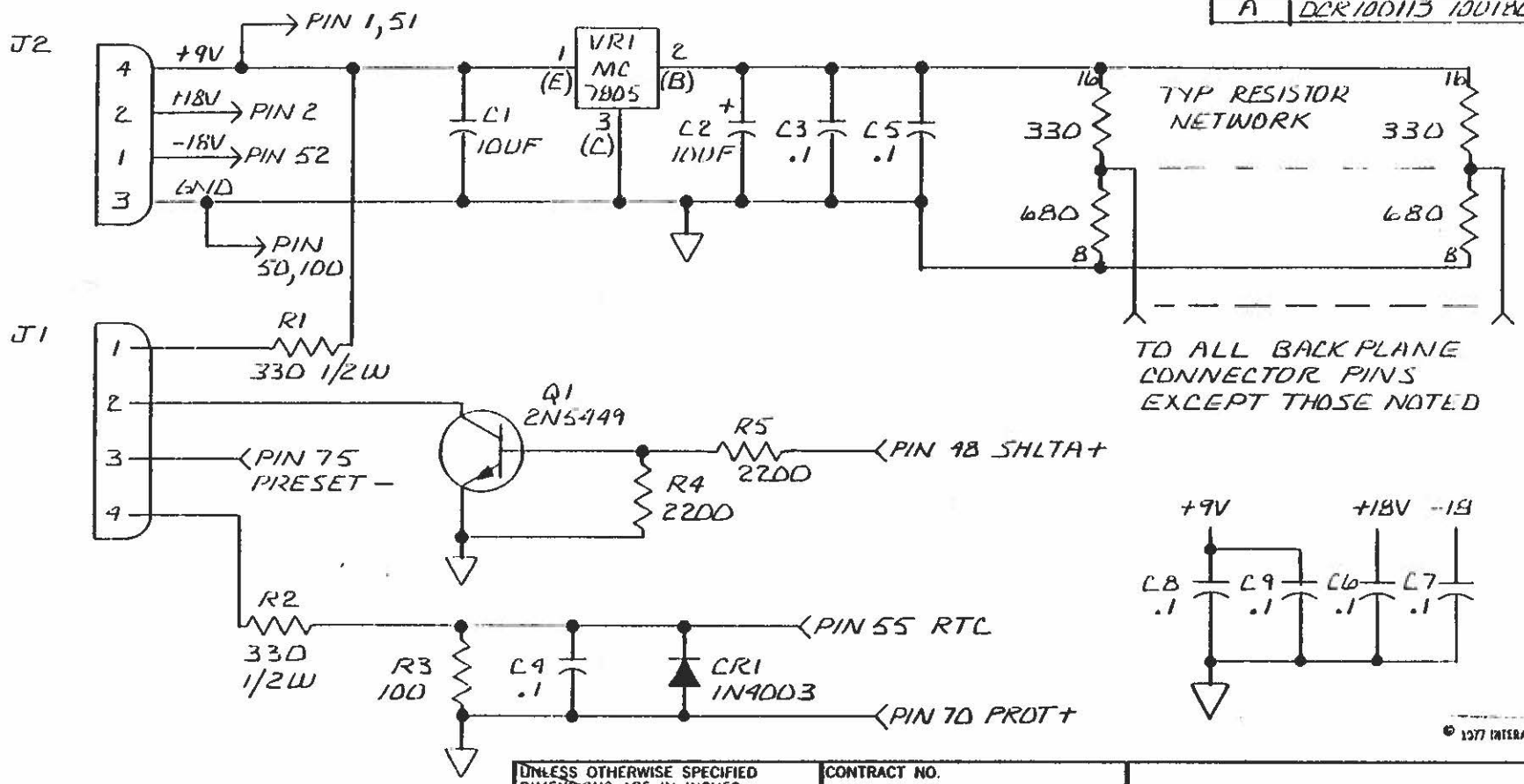


SEE PARTS LIST 001027

UNLESS OTHERWISE SPECIFIED INTERPRET DRAWING PER ANSI Y14 DIMENSIONS ARE IN INCHES AND APPLY AFTER PLATING BREAK SHARP EDGES	DWN. R. Sanchez	DATE 6-17-77	POLYMORPHIC SYSTEMS
XX ± / X° ± XXX ± / √	CHECK F.E.A.	6-30-77	
MATERIAL	PROJ. ENG. F.E.A.	6-30-77	ASSY-PARALLEL BD
	APPR. J.R.A.	7-5-77	
FINISH	NEXT ASSY / USED ON		
THIS DOCUMENT CONTAINS PROPRIETARY INFORMATION. IT MAY NOT BE REPRODUCED OR TRANSFERRED TO OTHER DOCUMENTS OR DISCLOSED TO OTHERS OR USED FOR MANUFACTURING OR ANY OTHER PURPOSE WITHOUT PRIOR WRITTEN PERMISSION.	SIZE B	DRAWING NUMBER 001027	REV
	SCALE 2/1	SHEET OF	

NOTES: UNLESS OTHERWISE SPECIFIED

REV	DESCRIP	DATE	APPR
A	DCR 100113 100180	10-19-77	



UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ARE:
FRACTIONS ± DECIMALS .XX ± .XXX ± ANGLES ±

MATERIAL

FINISH

DO NOT SCALE DRAWING

CONTRACT NO.

APPROVALS	DATE
DRAWN R. Sanchez	3-15-77
CHECKED	
APPR. JBA	10/6

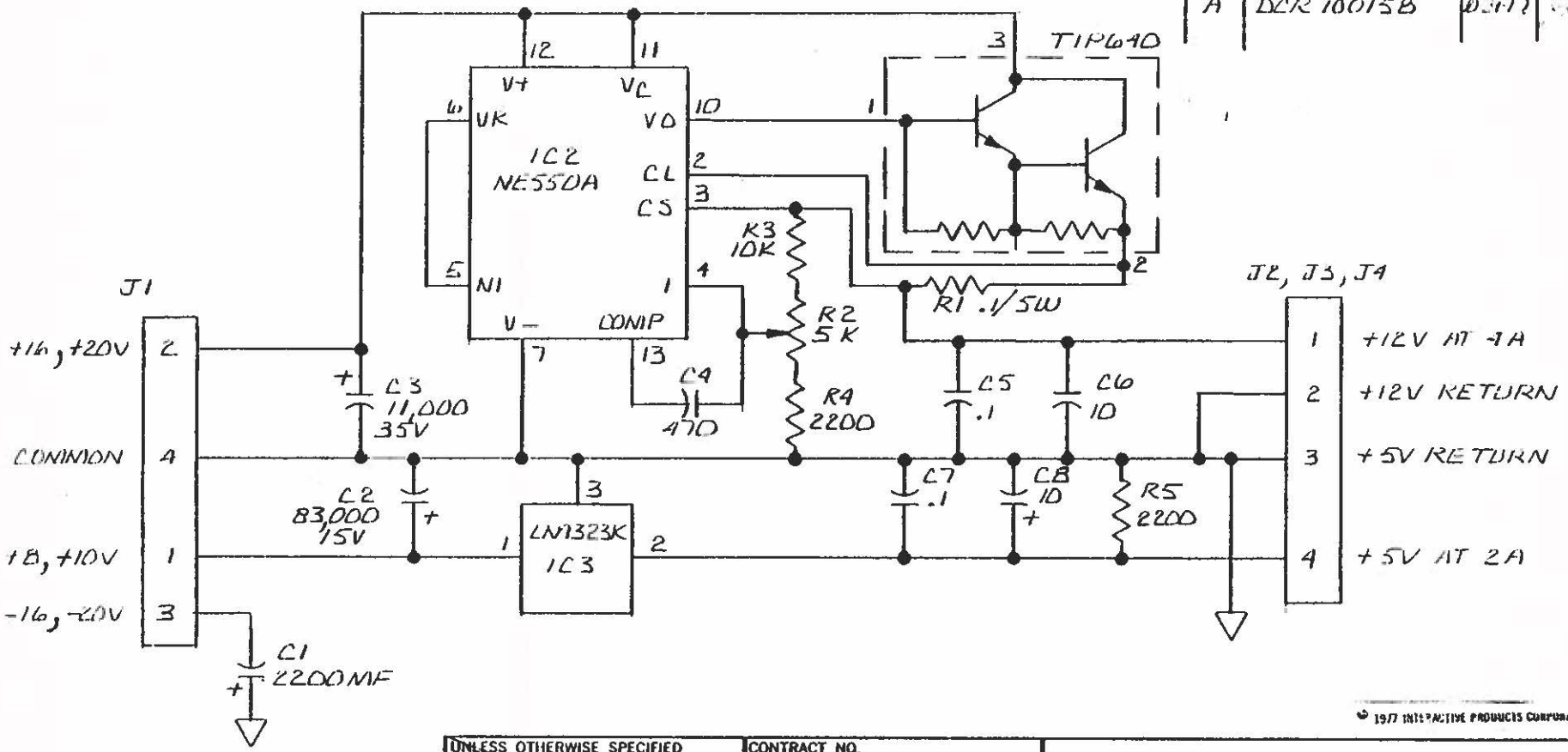
POLYMORPHIC SYSTEMS

SCHEMATIC - 10 SLOT BACKPLANE

SIZE	CODE IDENT NO.	DRAWING NO.	REV
B		104041	A

SCALE —— SHEET OF

REV	DESCRIPTION	DATE	APPD
A	DCR 10015B	9-77	



UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ARE:
FRACTIONS ± DECIMALS .XX ± .XXX ± ANGLES ±

MATERIAL

FINISH

DO NOT SCALE DRAWING

CONTRACT NO.

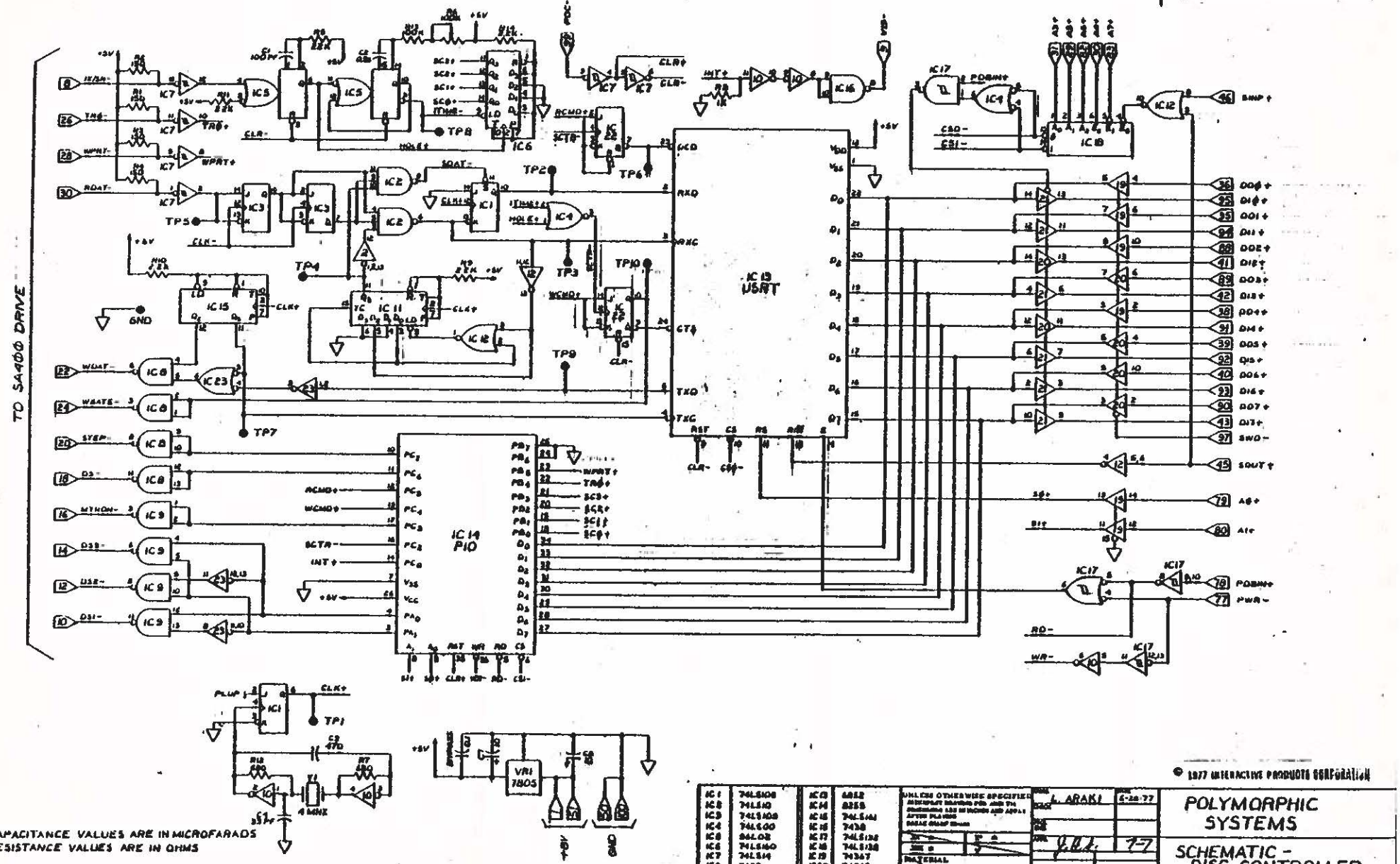
APPROVALS	DATE
DRAWN R. Sanchez	4-5-77
CHECKED	
APPR. JPB	10/6

POLYMORPHIC SYSTEMS

SCHEM - FLOPPY POWER SUPPLY

SIZE	CODE IDENT NO.	DRAWING NO.	REV
B		104021	A

SCALE —— SHEET OF



2. ALL CAPACITANCE VALUES ARE IN MICROFARADS
1. ALL RESISTANCE VALUES ARE IN OHMS

NOTES: UNLESS OTHERWISE SPECIFIED

IC 1	74LS109	IC 13	8251
IC 2	74LS10	IC 14	8255
IC 3	74LS109	IC 15	74LS161
IC 4	74LS00	IC 16	7430
IC 5	8T97	IC 17	74LS125
IC 6	74LS160	IC 18	74LS138
IC 7	74LS14	IC 19	74367
IC 8	7438	IC 20	74367
IC 9	7438	IC 21	74367
IC 10	74LS04	IC 22	74LS109
IC 11	74LS161	IC 23	74LS00
IC 12	74LS02		

UNLESS OTHERWISE SPECIFIED

L. ARAKI 5-26-77

POLYMORPHIC SYSTEMS

SCHEMATIC - DISC CONTROLLER

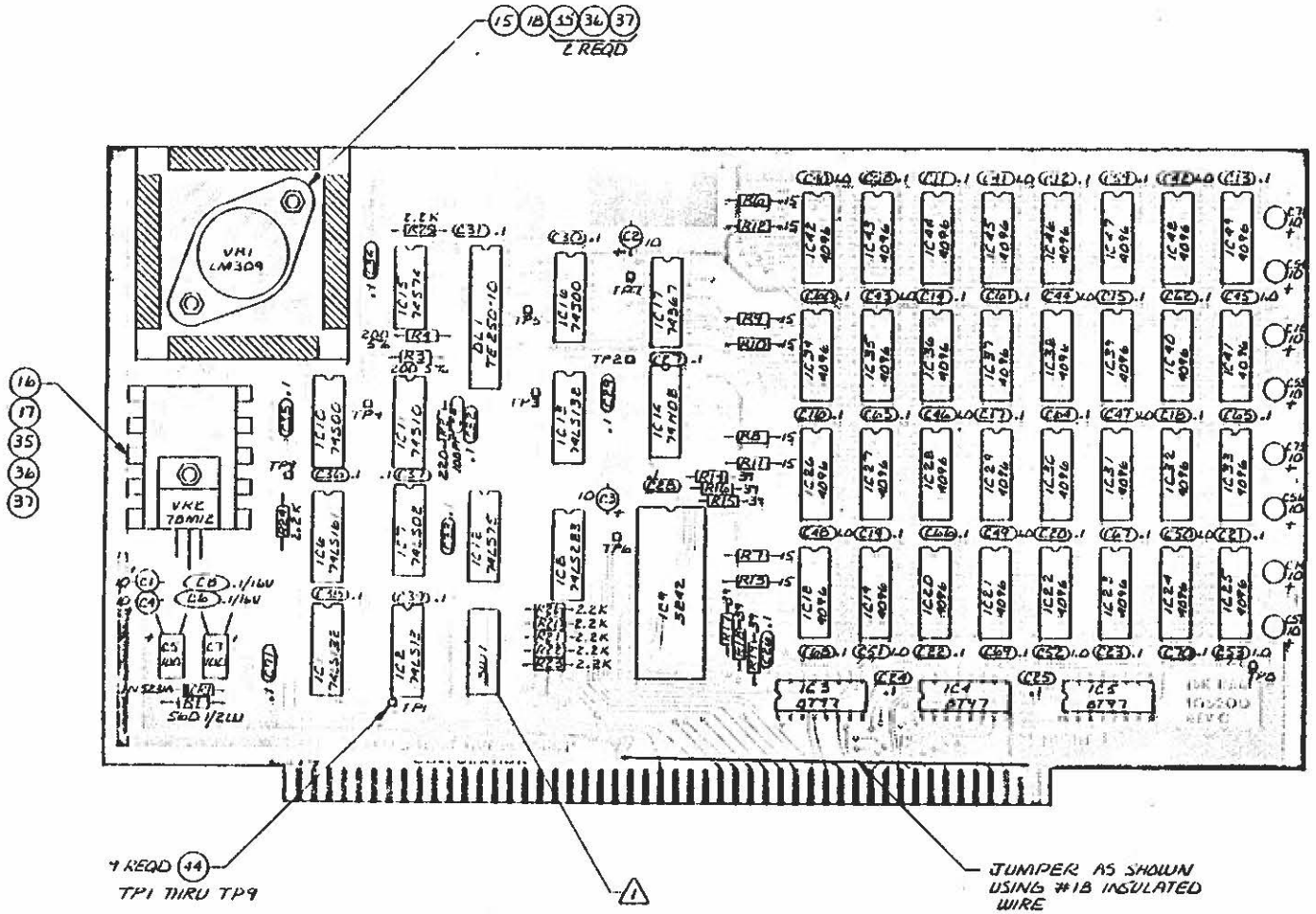
SIZE D | DRAWING NUMBER 104011 | REV

SCALE | SHEET OF

104011

005200 B

REVISIONS			
REV.	DESCRIPTION	DATE	APPR.
—	RELEASED DCR 100042	7-1977	—
A	DCR 100134	10-1977	
B	DCR 100160	4-1978	

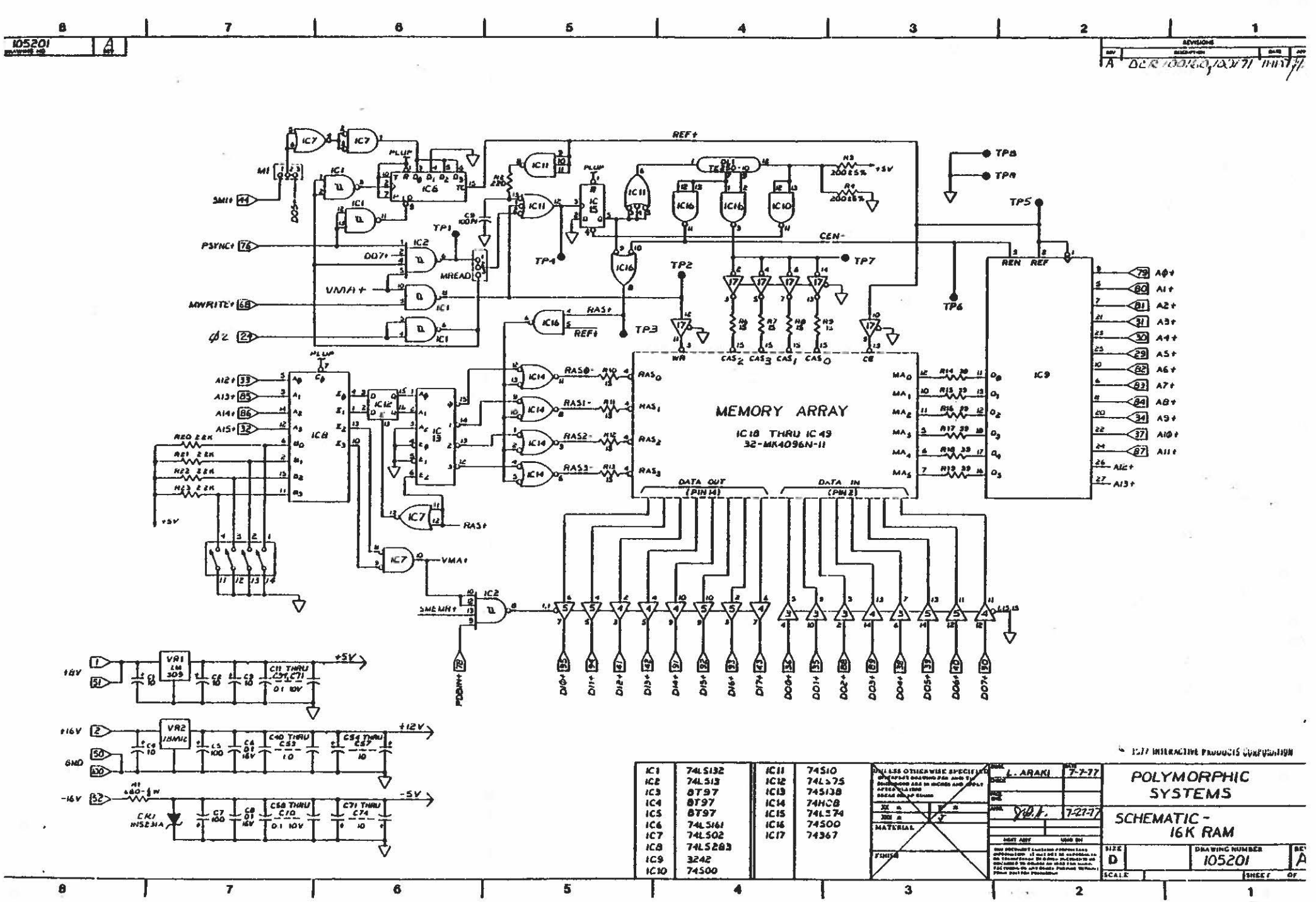


2. MODIFY PER DWG 104490.

⚠1 TO BE INSTALLED AFTER FLOW SOLDER OPERATION.

NOTES: UNLESS OTHERWISE SPECIFIED

UNLESS OTHERWISE SPECIFIED	R. Sumida 7/27/77	POLYMORPHIC SYSTEMS
SPECIAL		ASSY-16K RAM
	SIZE D	DRAWING NUMBER 005200 REV B
	SCALE 2/1	SHEET OF



IC1	74LS132	IC11	74S10
IC2	74LS13	IC12	74LS75
IC3	8T97	IC13	74S138
IC4	8T97	IC14	74HC8
IC5	8T97	IC15	74LS74
IC6	74LS161	IC16	74S00
IC7	74LS02	IC17	74367
IC8	74LS283		
IC9	3242		
IC10	74S00		

DRAWN	L. ARAKI	7-7-77
CHECK		
ENGR		
APPR		7-21-77

POLYMORPHIC SYSTEMS

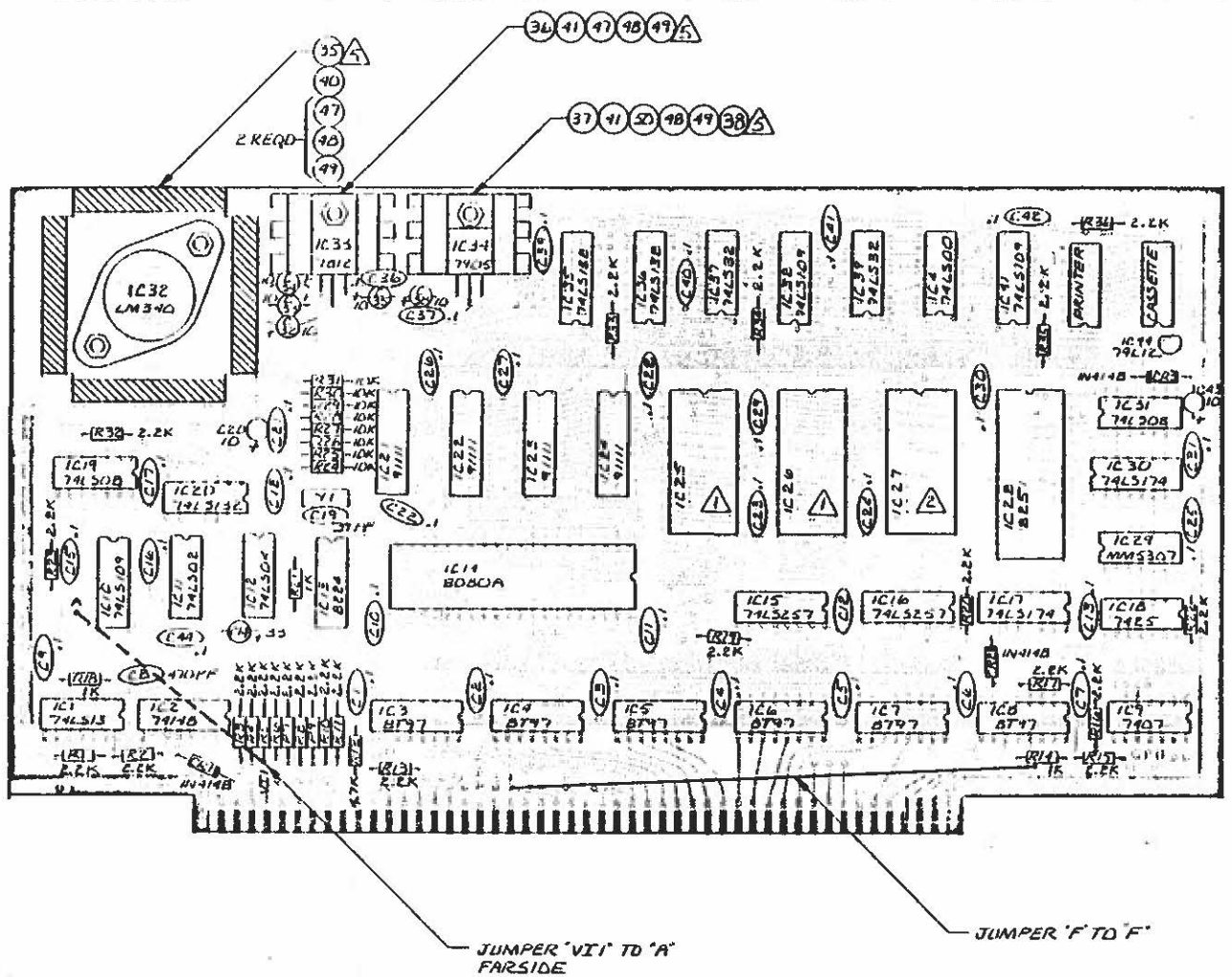
SCHEMATIC - 16K RAM

SIZE D | DRAWING NUMBER 105201 | REV A

SCALE | SHEET | OF

001062 B

REVISIONS			
REV	DESCRIPTION	DATE	APP
A	DCR 100115	9MAY	
B	DCR 100113	9MAY	



5. TO BE INSTALLED AFTER FLOW SOLDER OPERATION
4. MODIFY PER DWG. 104426, 104433, 105252.
3. TO BE USED FOR BOARDS UP TO REV. 0.3L
2. IC27: 4.0 MONITOR P/N 035020.
1. FOR DISC SYSTEM:
   A. IC25 ROOT ROM 400 P/N 035025
   B. IC26 ROOT ROM 800 P/N 035030

NOTES: UNLESS OTHERWISE SPECIFIED

UNLESS OTHERWISE SPECIFIED	R Sachey 12777	POLYMORPHIC SYSTEMS
MATERIAL	J.R.A. 12777	ASSY-CPU BOARD
FINISH		SIZE D · DRAWING NUMBER 001062 · REV B · SCALE 2/1 · SHEET OF