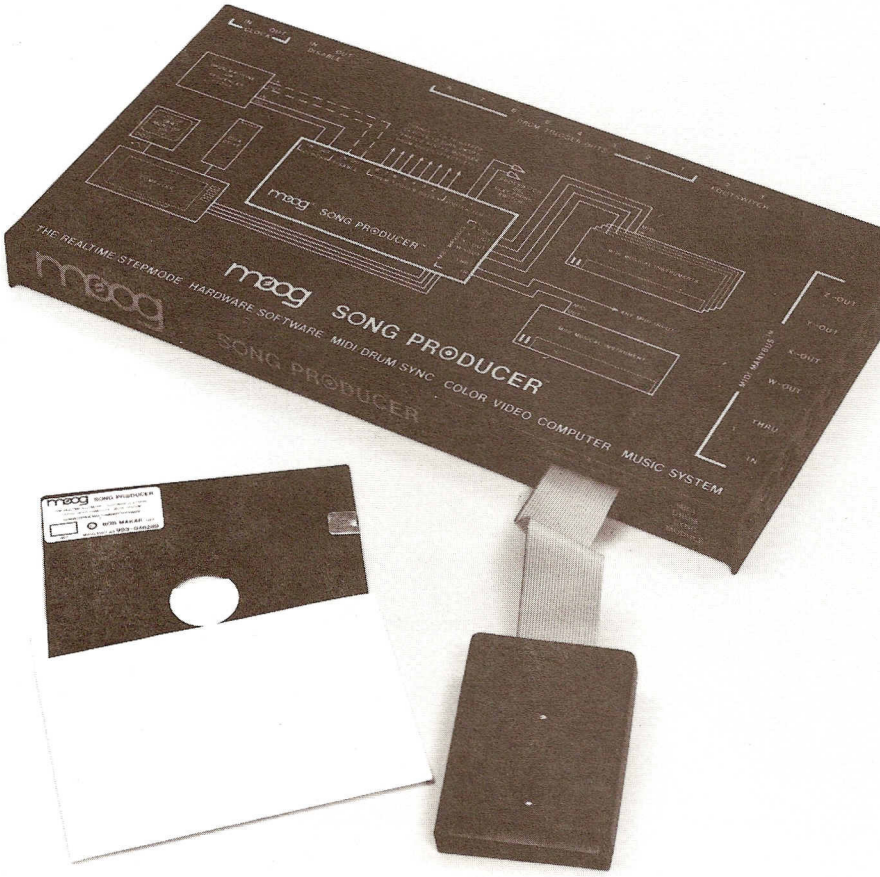

MOOG ELECTRONICS, INC.
2500 Walden Avenue, Buffalo, New York 14225

MOOG ELECTRONICS, INC.
p/a Waalhaven Zuidzijde 48, 3088 H.J. Rotterdam, The Netherlands

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ELECTRICAL SPECIFICATIONS

GENERAL

Operating Temperature Range	15 degrees C to 40 degrees C
Maximum Power Consumption	320 milliamps

MIDI IN/OUT/THRU

Baud Rate and Drive Level	Standard 31.25 K Baud

CLOCK IN

Triggering	Positive edge
Input Impedance	100K shunted by .01uf
Input Threshold Voltage	+1 volt TTL compatible
Minimum Pulse Width	100 microseconds
Clock Rate	1 Hertz to 500 Hertz

CLOCK OUT

Output Drive	LSTTL compatible
Pulse Width	665 microseconds nominal
Clock Rate	1 Hertz to 300 Hertz

CLOCK DISABLE INPUT

Logic	Active Low = Disabled
Input Impedance	100K shunted by .01uf
Input Threshold Voltage	1 volt minimum TTL compatible

CLOCK DISABLE OUTPUT

Logic	Active Low = Disabled
Output Drive	LSTTL compatible

DRUM TRIGGER OUTPUTS

Logic	Active High = Trigger
Output Drive	LSTTL compatible
Pulse width outputs when selected	200 milliseconds nominal. Software selectable for latched or pulsed outputs.

MEMORY MAP

HEX	ADDRESS DECIMAL	READ/WRITE	FUNCTION
DE00	56832	WRITE	U17 "W" CONTROL REGISTER
DE00	56832	READ	U17 "W" STATUS DATA REGISTER
DE01	56833	WRITE	U17 "W" TRANSMIT DATA REGISTER
DE01	56833	READ	U17 "W" RECEIVE DATA REGISTER
DE02	56834	WRITE	U18 "X" CR
DE02	56834	READ	U18 "X" SDR
DE03	56835	WRITE	U18 "X" TDR
DE03	56835	READ	U18 "X" RDR
DE04	56836	WRITE	U19 "Y" CR
DE04	56836	READ	U19 "Y" SDR
DE05	56837	WRITE	U19 "Y" TDR
DE05	56837	READ	U19 "Y" RDR
DE06	56838	WRITE	U20 "Z" CR
DE06	56838	READ	U20 "Z" SDR
DE07	56839	WRITE	U20 "Z" TDR
DE07	56839	READ	U20 "Z" RDR
DE08	56840	WRITE	DRUM TRIGGER LATCH
DE09	56841	WRITE	DRUM TRIGGER LATCH
DE0A	56842	WRITE	CONTROL LATCH
DE0B	56843	WRITE	CONTROL LATCH
DE0C	56844	READ	FOOTSWITCH INPUTS
DE0D	56845	READ	FOOTSWITCH INPUTS

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SONG PRODUCER
TEST/ADJUSTMENT/TROUBLESHOOTING

TEST

Included on the master diskette is a complete menu-driven program for testing the Song Producer hardware module. All that is needed to run the test program are two standard "guitar" cables, one MIDI cable and a footswitch. (Guitar cables may be used to simulate the footswitch.)

To access the test program, insert the Song Producer disk and type the following:

LOAD "TEST*",8 (RETURN).

When the program finishes loading, the computer will prompt "READY".

Next, type RUN (RETURN) and follow the menu-driven instructions displayed on the screen.

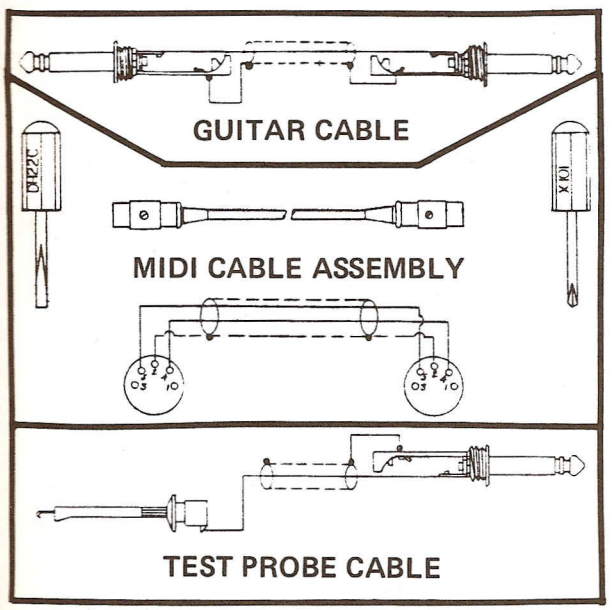
IF THE TEST PROGRAM RUNS SUCCESSFULLY, IT VERIFIES PROPER OPERATION OF THE SONG PRODUCER HARDWARE. Therefore, any problems encountered are probably related to user error and the associated portion of the owner's manual should be reread carefully.

ADJUSTMENT

If calibration becomes necessary the program will prompt the necessary adjustments. Use a 1/8" (3 mm) flat blade screwdriver for the only two Song Producer adjustments - CLOCK PULSE WIDTH and DRUM PULSE WIDTH.

TROUBLESHOOTING

If troubleshooting becomes necessary, the program will prompt appropriately. The cover must then be removed using a #1 Phillips screwdriver and a 1/4" phone plug-to-test probe cable used to complete the procedure. Troubleshooting is best left to qualified service personnel. Please consult the authorized service center list or factory service department for assistance.



SONG PRODUCER
CIRCUIT DESCRIPTION

THE SONG PRODUCER CONSISTS OF SEVEN HARDWARE CIRCUITS:

1. The Data and Address Bus Buffer
2. Address Decoder
3. Control Latch Driver
4. Drum Output Circuit
5. Clock In and Clock In Disable Circuit
6. Clock Out and Clock Out Disable Circuit
7. Footswitch Inputs
8. MIDI Input and Output Circuits
9. Interrupt Disable Circuit

NOTE: ALL ADDRESSES ARE IN HEX AND ARE FOLLOWED PARENTHETICALLY BY THEIR DECIMAL EQUIVALENT.

DATA AND ADDRESS BUS BUFFERS:

The bus buffers consist of U8 and U9. U8 is a bi-directional bus transceiver connected to the data bus to buffer outgoing and incoming data signals to and from the Commodore 64. The enable and data direction on U8 is controlled from the I/01 line and the R/W line from the Commodore 64. The I/01 line sets the memory map boundaries to DE00 (56832) to DEFF (57087). U9 buffers the I/01 line and R/WQ line, the Ø2 clock and the first three address lines from the Commodore 64.

THE ADDRESS DECODER:

The address decoder consists of U11 and U3 and decodes addresses in the range of DE00 (56832) to DE0F (56847). U11 selects one of eight lines by pulling that line low. Since the least significant address bit is A1, U11 decodes every second address. For example, DE00 will stay low for both DE00 (56832) and DE01 (56833). U3 inhibits any address decoding above DE0F (56848). The decoded address for each one of the subsections may be found on the schematic.

CONTROL LATCH DRIVER

The Control Latch Driver consists of U7 and U2B and is memory mapped at DE0A (56842). A memory write to this address causes a logic "1" to appear at U7 Pin 3. This signal is "NANDED" by U2B to provide a control latch clock which results in data bus transfer to the appropriate latches on the falling edge of the Ø2 clock.

D0 = Clock Disable Output (U4B)
"0" = Disable

D1 = Clock Out (U4A)

D2 = Clock Disable Input (U5B)
"1" = Disable

D3 = Interrupt Disable (U5A)
"0" = Disable

D4 = Drum Trigger Pulse/Latch Select
"0" = Latch. "1" = Pulse

D5 - D7 = Not Used

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DRUM OUTPUT CIRCUIT:

The drum output circuit consists of latches U12 and U13, buffers U6 and U16. pulse timer U14A and R50 and drum mode latches U15B. The drum output latches can operate in either a pulse mode or a latch mode depending on the status of flip flop U15B. In the latch mode, the output of U15B is "0", disabling reset circuit U14B. Data from the buffered data bus is latched by U13 and U12 D0 = DRUM TRIGGER 1, D7 = DRUM TRIGGER 8.

The outputs from U13 and U12 are buffered by U6 and U16 and sent to the Drum Trigger outputs 1 through 8. When Pin 13 of U15B is high, the drum output operates in a pulse mode. Whenever a "1" is written to any output of U13 or U12, diodes CR5 through CR12 couple that "1" to the input of U14A. U14A charges C26 through R50. When the voltage on C26 equals 2.5 volts, the output of U14B goes negative resetting latches U12 and U13 back to zero. C26 and R50, a drum pulse width trim, sets the time constant and thereby adjusts the pulse width.

CLOCK IN AND CLOCK IN DISABLE CIRCUIT:

The CLOCK IN (CI) and CLOCK IN DISABLE (CID) circuits consist of U1, U3A, U2A, U10 and U5B. The CI and CID circuits allow external instruments, such as drum machines, to be used as a time base for the Song Producer. When enabled, clock pulses on CI generate a non-maskable interrupt that is fed back to the Commodore 64 and used as a timing signal. The CID, in conjunction with latch U5B, can be used to inhibit the action of CI. Either a "1" on U5B or a "0" on CID will inhibit U2A from passing the clock signal to U10D, thereby disabling it. If U2A generates an interrupt, the signal is inverted by U10D and again by U10C and sent to the NMI line. Since it is imperative that non-maskable interrupts do not occur until the software sets the Commodore up to receive them, the A section of U5 is used to inhibit the interrupts upon power up. This is described fully in the INTERRUPT DISABLE section.

CLOCK OUT/CLOCK OUT DISABLE:

U4 provides both a CLOCK OUT (CO) and CLOCK OUT DISABLE (COD) for driving external drum machines. Whenever a "1" is written to BD1 of U4A, U4A charges C9 through R16 and R17. When the voltage on C9 exceeds the threshold voltage on the reset input, U4A resets to "0" producing a pulse. R16, R17 and C9 set the pulse width to 665 microseconds. This is buffered by U6B and fed to CO. The COD is latched by U4B from BD0.

FOOTSWITCH 1 AND 2:

U7 is a tri-state buffer used to feed Footswitch IN 1 and 2 to the data bus. Whenever memory location DE0C (56844) is read, the data on Footswitch IN 1 and 2 is transferred to the data bus on bits 7 and 6. "0" = switch depressed. All other data bits are unused and set to "1" by resistors R30 through R37.

To receive information, the serial data stream is fed to MIDI IN through J20. It is optically isolated by U22 and fed through buffer U21D to the receive data input on U17. When the receive data buffer receives all 8 data bits, an interrupt request is generated which is fed to the computer through U10 and a "1" is set in bit 7 of it's own status register. The Commodore 64 reads the status register of each ACIA and when it finds a "1" in bit 7 of the status data register, it then reads the receive data. Then it is ready to receive the next serial data transmission. The receive data stream is also fed to U21 and out the MIDI THROUGH jack to drive other MIDI based instruments.

Since U17 through U20 all transmit in the same fashion, we'll only look at U17. Whenever the computer wants to send a MIDI command, it first writes into the transmit data register of U17. When the data word is latched, U17 adds 1 start bit, then feeds the data out in a serial stream to output "W". At the end of the 8 data bits, it adds one stop bit. When the word is successfuly transmitted, U17 generates an interrupt, telling the microprocessor that it is ready to receive the next word for transmission. U18, U19 and U20 operate in exactly the same matter as U17.

INTERRUPT DISABLE CIRCUIT:

It is imperative that no interrupts, either interrupt requests or non-maskable interrupts are generated by the Song Producer before the software has programmed the Commodore 64 to handle them. Therefore, U5A is configured to disable both the NMI via U10C and IRQ via U10B from the Song Producer upon power up. When power is supplied to the Song Producer, C18 holds the reset pin of U5A high for approximately 1 second. This causes the "Q" output to go low, disabling U10 which disables both interrupt lines. To enable both, a "1" is written to U5A which enables U10B and C. Therefore, the clock input can then generate a NON-MASKABLE INTERRUPT (NMI) or the ACIA's can generate an INTERRUPT REQUEST (IRQ).

MIDI INPUT/THROUGH AND OUTPUT:

MIDI stands for Musical Instrument Digital Interface. MIDI is a digital serial communicaion channel (similar to RS232) that allows similarly equipped instruments to communicate with each other at the lowest level they both understand. In the case of the Song Producer, MIDI allows the Commodore 64 to communicate and control synthesizers and drum machines. It communicates with 10 bit words consisting of one start bit, 8 data bits and 1 stop bit at a 31.25 kHz bit rate. To reduce ground loops, the MIDI input is optically isolated.

The MIDI serial data stream is both transmitted and received by asynchronous communication interface adaptors (ACIA) U17 through U20. The ACIA's are programmable devices which can select different data rates, word sizes and other parameters. The system clock 02 is divided by U15A to 500 kHz. Each of the ACIA's is programmed to divide this clock by 16 to generate the 31.25 kHz timing signals used for MIDI transmission or reception.

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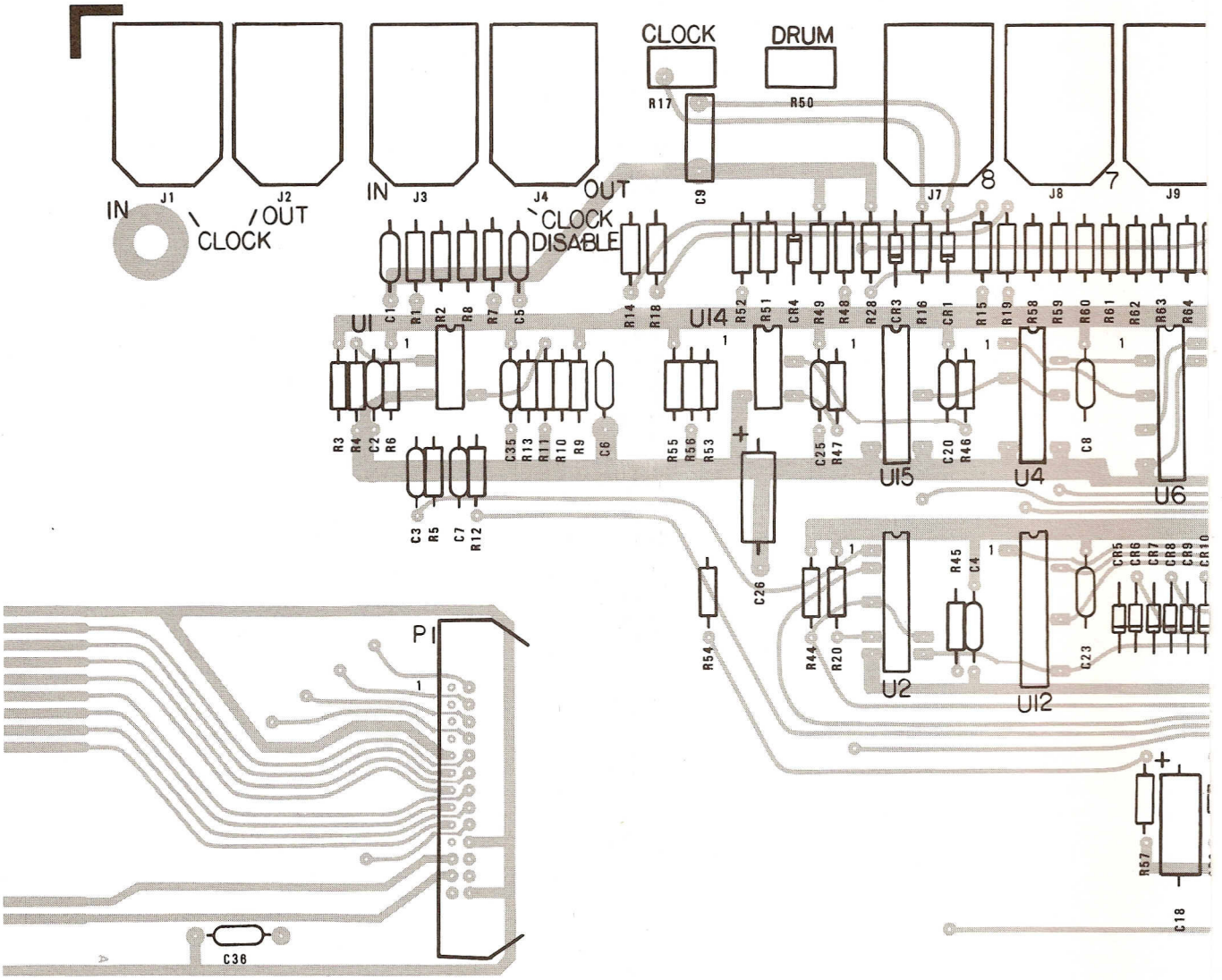

980-046269-001

ASSEMBLY
996-046270-001

TOP VIEW

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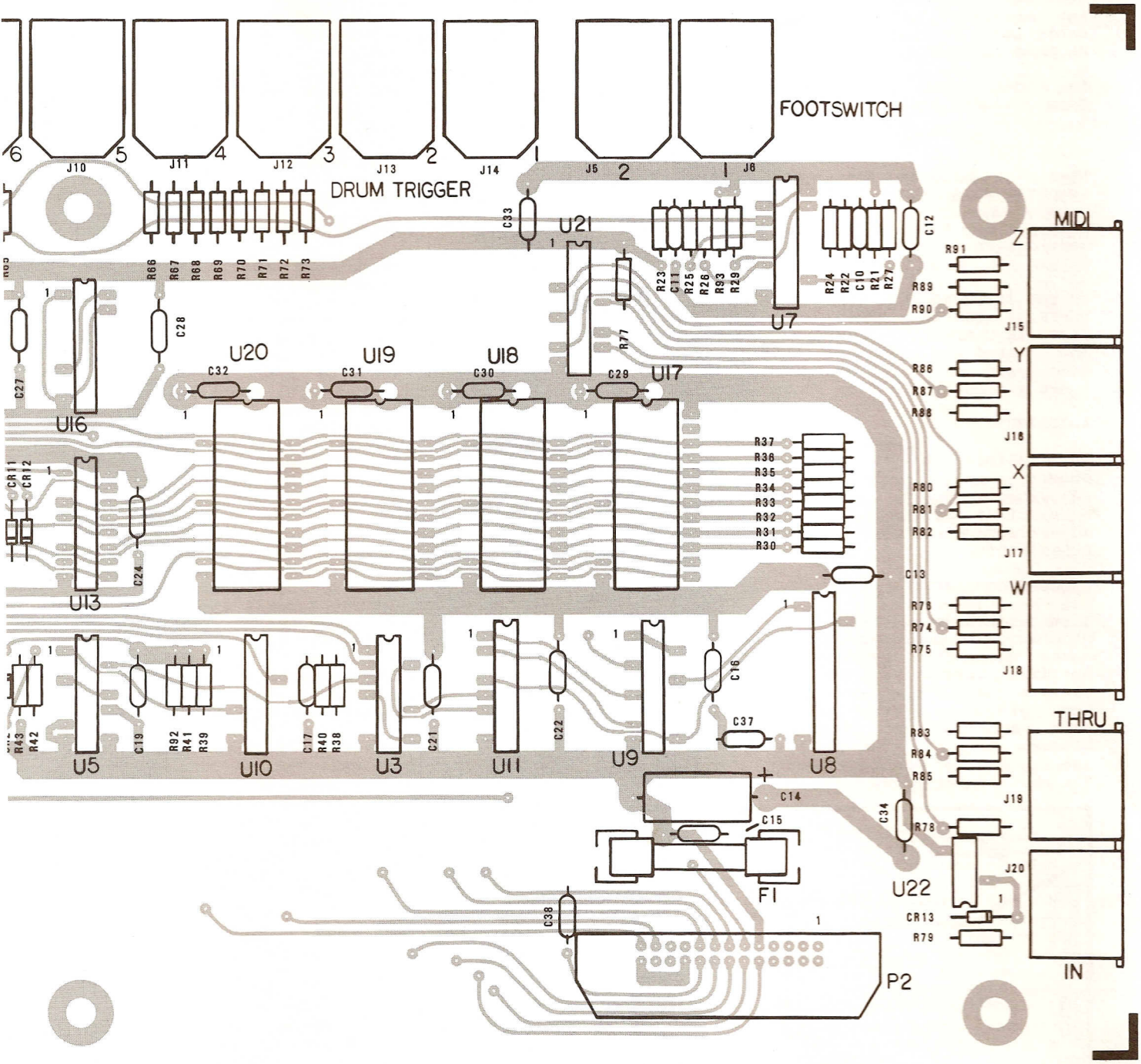

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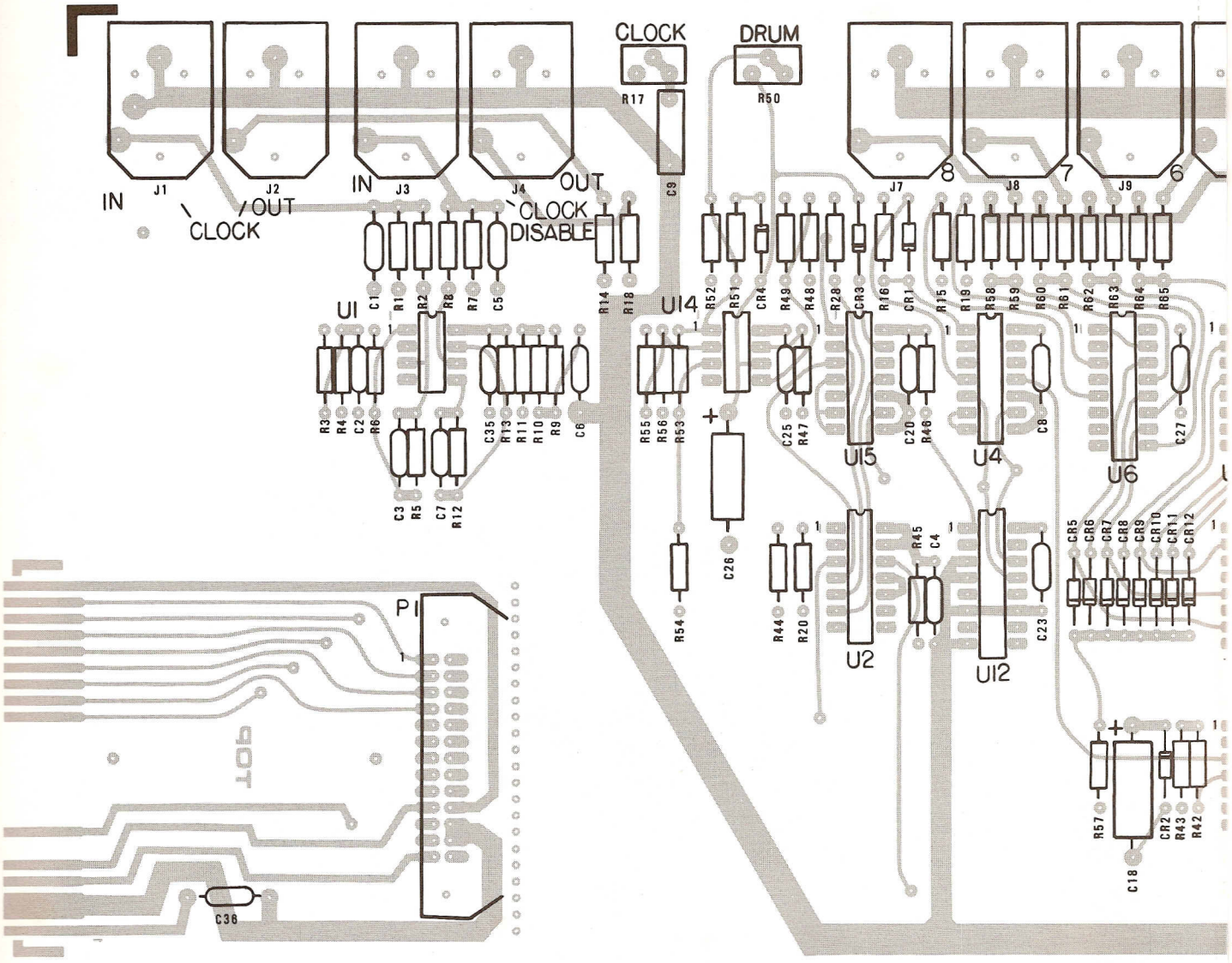

ASSEMBLY
996-046270-001

THROUGH VIEW

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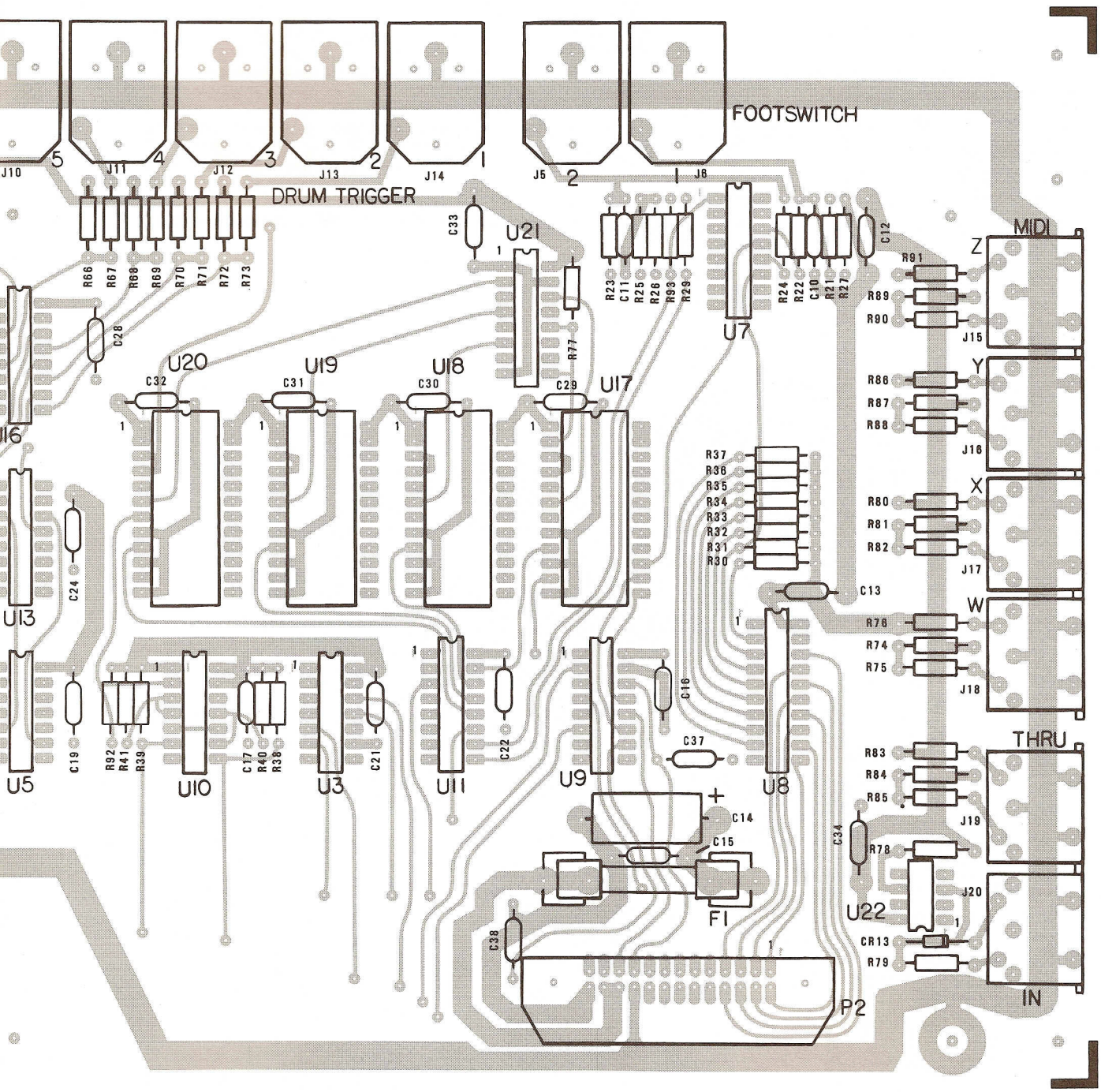

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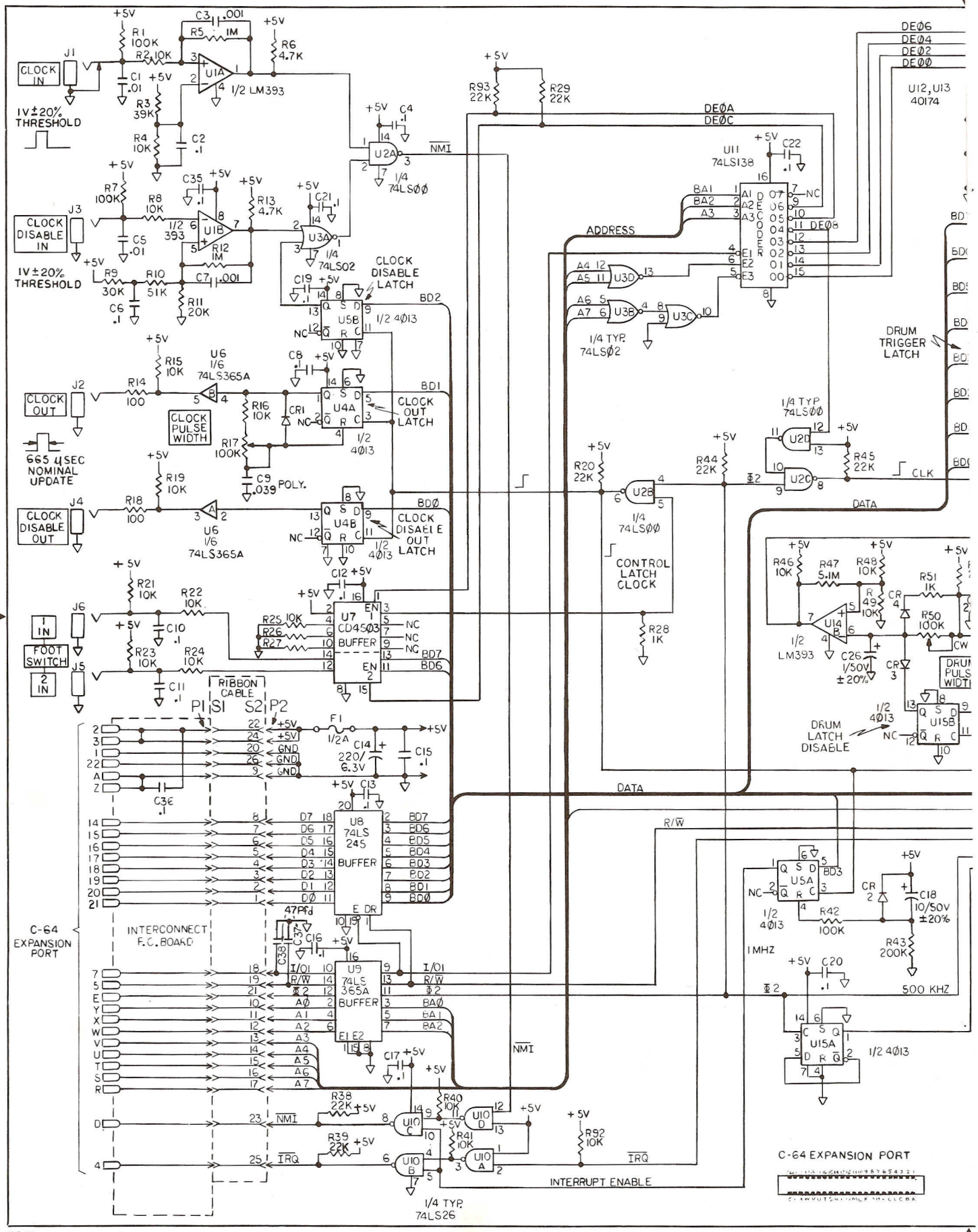

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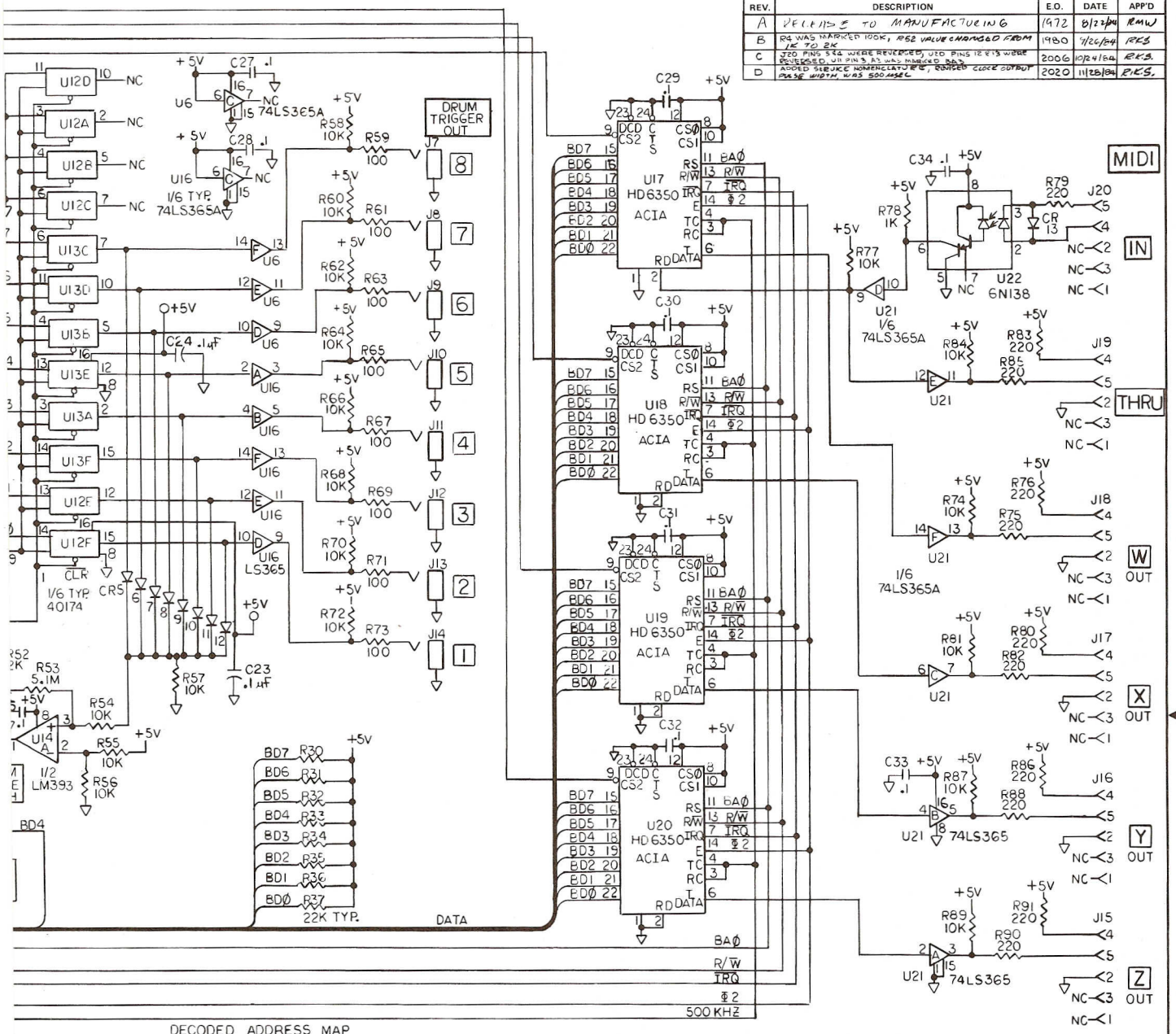
IATIC

REVISIONS				
REV.	DESCRIPTION	E.O.	DATE	APP'D
A	RELEASE TO MANUFACTURING	1972	8/22/84	RMW
B	R4 WAS MARKED 100K, R62 VALUE CHANGED FROM 1K TO 2K	1980	9/26/84	RKS
C	J20 PINS 5&6 WERE REVERSED, U20 PINS 12 & 13 WERE REVERSED, U11 PIN 3 A3 WAS MARKED BD3	2006	10/24/84	RKS
D	ADDED SERVICE NOMENCLATURE, CHANGED CLOCK OUTPUT PULSE WIDTH, WAS 500 nSEC	2020	11/28/84	R.K.S.



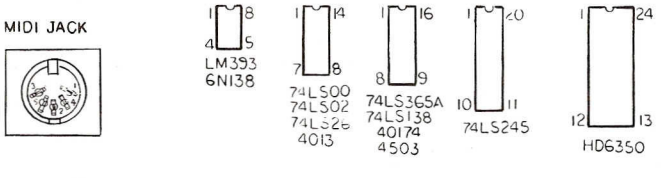
DECODED ADDRESS MAP

HEX	DECIMAL	DEVICE	TYPE
DE00 - DE01	56832 - 56833	U17	ACIA
DE02 - DE03	56834 - 56835	U18	ACIA
DE04 - DE05	56836 - 56837	U19	ACIA
DE06 - DE07	56838 - 56839	U20	ACIA
DE08	56840	U12, U13	DRUM OUTPUT LATCH
DE0A	56842	U4, U5, U15	CONTROL LATCH
DE0C	56844	U7	FOOTSWITCH IN

LAST REF DES USED					
R	C	CR	U	J	P
93	38	13	22	20	2

NOTES:
1. UNLESS OTHERWISE SPECIFIED
ALL RESISTORS ARE IN OHMS, 1/4 W, ±5%
ALL CAPACITORS ARE IN μF
ALL DIODES ARE IN4148

COMPONENT BASING
TOP VIEW



ITEM	PART NUMBER	DESCRIPTION	MATERIAL

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCE FRACTIONS ±1/64
ANGLES ±1/2 DEG.
DECIMALS ±.010
125 √FINISH ON ALL SURFACES
DRILLED HOLE TOLERANCE
.040-.125 DIA. +.002 -.001
.126-.228 DIA. +.003 -.001
.229-.500 DIA. +.004 -.001
.500-.750 DIA. +.005 -.001

DRAWN BY R.K.S. 7/13/84
CHECK
PROJ. ENGR. [illegible] 8/21/84
CHIEF ENGR. [illegible] 8/21/84
SUPERVISOR
980-0462-69 | 346
NEXT ASSY | MODEL NO.
APPLICATION

moog BUFFALO, NEW YORK

SONG PRODUCER SCHEMATIC

SIZE D | 993-046268

SCALE ~ | WT. ~ | SHEET 1 OF 1

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REF DES (QTY)	PART NUMBER	HARDWARE	
(2)	967-045420-001	ANGLE BRACKET	
(6)	973-041308-019	STANDOFF, SELF-CLINCHINS,	6-32 X 312"
(6)	806-045039-004	MACHINE SCREW PANHEAD,	6-32 X 1/4" BLACK OXIDE
(4)	902-040500-001	SPEED NUT, TINNERMAN,	#6, U-TYPE
(4)	811-040039-008	SCREW, SELF-TAPPING PANHEAD,	6A X .5" BLACK OXIDE
(6)	904-040495-016	LOCK WASHER, INTERNAL TOOTH,	#6 NICKEL PLATED
(2)	904-041390-005	FLAT WASHER	#6, ZINC PLATED
(2)	906-041345-001	FUSE CLIP	
(2)	903-046272-404	SCREW, SELF-TAPPING HEXHEAD,	4-14 X 1/4" BLACK OXIDE
(2)	905-040498-004	POP RIVET, DOME HEAD,	1/8 X .265 CADMIUM PLATED
(4)	916-045163-002	BUMPER, BLACK	
(1)	967-046275-001	BRACKET, DIN CONNECTOR MOUNTING	
(1)	967-046277-001	TOP CASE, BLACK VINYL COATED	
(1)	967-046278-001	BOTTOM CASE, BLACK VINYL COATED	

REF DES (QTY)	PART NUMBER	PACKING MATERIALS
(1)	711-001000-001	WARRANTY CARD
(1)	711-001001-001	AUTHORIZED SERVICE CENTER LIST
(1)	711-001002-001	ACCESSORIES CATALOG
(1)	993-046282-001	OWNER'S MANUAL
(1)	993-046268-101	SCHEMATIC/SERVICE MANUAL
(1)	993-046289-001	SONG PRODUCER DISKETTE (FLOPPY DISK)
(1)	932-041849-002	SHIPPING CARTON
(1)	932-040764-001	PLASTIC BAG 10 X 12
(2)	964-041896-001	MOLDED FOAM INSERTS

REF DES (QTY)	PART NUMBER	C-64 EXPANSION PORT CONNECTOR ASSEMBLY
(1)	964-046284-001	TOP CASE. PLASTIC, 3-1/2" X 2-3/4"
(1)	964-046285-001	BOTTOM CASE. PLASTIC, 3-1/2" X 2-3/4"
(2)	903-046272-404	HEX HEAD SCREW. BLACK, 4-14 X 1/4"
(2)	905-040498-034	POP RIVETS. DOME HEAD, 1/8 X .328"
(1)	NOT APPLICABLE	INTERCONNECT PC BOARD (BREAK AWAY)
P1	910-046271-026	26 PIN NOVO CONNECTOR, RIGHT ANGLE HEADER
C36	947-045183-104	CAPACITOR .1 uf CERAMIC MONOLITHIC
(2)	910-046271-001	EJECTOR LATCH, NOVO CONNECTOR

REF DES (QTY)	PART NUMBER	RIBBON CABLE ASSEMBLY
(1)	994-046283-001	RIBBON CABLE ASSEMBLY, 6", COMPLETE
X"	986-046273-001	FLAT CABLE, 26 CONDUCTOR
S1	910-046271-126	26 PIN NOVO CONNECTOR RECEPTACLE
S2	910-046271-126	26 PIN NOVO CONNECTOR RECEPTACLE

REF DES (QTY)	PART NUMBER	INTEGRATED CIRCUITS		
U1	991-042388-001	LM393	LINEAR	DUAL. VOLTAGE COMPARATOR
U2	991-045950-000	74LS00	LSTTL	QUAD, 2 IN NAND
U3	991-045950-002	74LS02	LSTTL	QUAD. 2 IN NOR
U4	991-045960-013	4013	CMOS	DUAL FLIP FLOP
U5	991-045960-013	4013	CMOS	DUAL FLIP FLOP
U6	991-045950-365	74LS365A	LSTTL	HEX TRI-STATE BUFFER
U7	991-045960-503	CD4503	CMOS	HEX TRI-STATE BUFFER
U8	991-045950-245	74LS245	LSTTL	OCTAL BUSS TRANSVC.
U9	991-045950-365	74LS365A	LSTTL	HEX TRI STATE BUFFER
U10	991-045950-026	74LS26	LSTTL	QUAD 2 IN NAND
U11	991-045950-138	74LS138	LSTTL	1 OF 8 DECODER/DMUX
U12	991-045960-174	40174B	CMOS	HEX D FLIP FLOP
U13	991-045960-174	40174B	CMOS	HEX D FLIP FLOP
U14	991-042388-001	LM393	LINEAR	DUAL VOLTAGE COMPARATOR
U15	991-045960-013	4013B	CMOS	DUAL FLIP FLOP
U16	991-045950-365	74LS365A	LSTTL	HEX TRI STATE BUFFER
U17	991-046274-001	HD6350	CMOS	ACIA
U18	991-046274-001	HD6350	CMOS	ACIA
U19	991-046274-001	HD6350	CMOS	ACIA
U20	991-046274-001	HD6350	CMOS	ACIA
U21	991-045950-365	74LS365A	LSTTL	HEX TRI-STATE BUFFER
U22	948-046092-001	6N138	OPTO	ISOLATOR - DARLINGTON

REF DES (QTY)	PART NUMBER	MIDI CABLES	
	712-001900-001	MIDI CABLE - STANDARD	20 FEET (6 METERS)
	712-001900-XXX	MIDI CABLE - SPECIFY LENGTH	MADE TO ORDER
		MAXIMUM PERMISSIBLE LENGTH	40 FEET (12 METERS)

REF DES (QTY)	PART NUMBER
C1	947-045183-
C2	947-045183-
C3	947-045008-
C4	947-045183-
C5	947-045183-
C6	947-045183-
C7	947-045008-
C8	947-045183-
C9	946-041978-
C10	917-045183-
C11	947-045183-
C12	947-045183-
C13	947-045183-
C14	945-044465-
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C36	947-045183-
C37	947-045008-
C38	947-045008-

REF DES (QTY)	PART NUMBER
CR1 - CR13	919-041075-

REF DES (QTY)	PART NUMBER
F1	939-041320-

REF DES (QTY)	PART NUMBER
J1	910-045552-
J2	910-045552-
J3	910-045552-
J4	910-045552-
J5	910-045552-
J6	910-045552-
J7	910-045552-
J8	910-045552-
J9	910-045552-
J10	910-045552-
J11	910-045552-
J12	910-045552-
J13	910-045552-
J14	910-045552-
J15	910-046093-
J16	910-046093-
J17	910-046093-
J18	910-046093-
J19	910-046093-
J20	910-046093-
P1/P2	910-046271-
S1/S2	910-046271-
(4)	910-046271-

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PARTS LIST

CAPACITORS

103	.01	uf	CERAMIC MONOLITHIC
104	.1	uf	CERAMIC MONOLITHIC
102	.001	uf	CERAMIC TUBULAR
104	.1	uf	CERAMIC MONOLITHIC
104	.1	uf	CERAMIC MONOLITHIC
104	.1	uf	CERAMIC MONOLITHIC
102	.001	uf	CERAMIC TUBULAR
104	.1	uf	CERAMIC MONOLITHIC
393	.039	uf	10% 50V POLYESTER
104	.1	uf	CERAMIC MONOLITHIC
104	.1	uf	CERAMIC MONOLITHIC
104	.1	uf	CERAMIC MONOLITHIC
104	.1	uf	CERAMIC MONOLITHIC
006	220	uf	6.3V AL ELECTROLITIC
104	.1	uf	CERAMIC MONOLITHIC
104	.1	uf	CERAMIC MONOLITHIC
104	.1	uf	CERAMIC MONOLITHIC
004	10	uf	50V AL ELECTROLITIC
104	.1	uf	CERAMIC MONOLITHIC
104	.1	uf	CERAMIC MONOLITHIC
104	.1	uf	CERAMIC MONOLITHIC
104	1	uf	CERAMIC MONOLITHIC
104	.1	uf	CERAMIC MONOLITHIC
104	.1	uf	CERAMIC MONOLITHIC
104	.1	uf	CERAMIC MONOLITHIC
002	1	uf	150V AL ELECTROLITIC
104	.1	uf	CERAMIC MONOLITHIC
104	.1	uf	CERAMIC MONOLITHIC
104	.1	uf	CERAMIC MONOLITHIC
104	.1	uf	CERAMIC MONOLITHIC
104	.1	uf	CERAMIC MONOLITHIC
104	.1	uf	CERAMIC MONOLITHIC
104	.1	uf	CERAMIC MONOLITHIC
104	.1	uf	CERAMIC MONOLITHIC
104	.1	uf	CERAMIC MONOLITHIC
104	.1	uf	CERAMIC MONOLITHIC
470	47	pf	CERAMIC TUBULAR
470	47	pf	CERAMIC TUBULAR

DIODES

001	1N4148 SIGNAL DIODE

FUSE

004	FUSE, FAST BLOW 0.5A 250V

	JACKS AND CONNECTORS	USAGE
002	JACK, PHONE 1/4" 2 CONDUCTOR	CLOCK IN
001	JACK, PHONE 1/4" 2 CONDUCTOR	CLOCK OUT
001	JACK, PHONE 1/4" 2 CONDUCTOR	CLOCK DISABLE IN
001	JACK, PHONE 1/4" 2 CONDUCTOR	CLOCK DISABLE OUT
001	JACK, PHONE 1/4" 2 CONDUCTOR	FOOTSWITCH IN 2
001	JACK, PHONE 1/4" 2 CONDUCTOR	FOOTSWITCH IN 1
001	JACK, PHONE 1/4" 2 CONDUCTOR	DRUM TRIGGER OUT 8
001	JACK, PHONE 1/4" 2 CONDUCTOR	DRUM TRIGGER OUT 7
001	JACK, PHONE 1/4" 2 CONDUCTOR	DRUM TRIGGER OUT 6
001	JACK, PHONE 1/4" 2 CONDUCTOR	DRUM TRIGGER OUT 5
001	JACK, PHONE 1/4" 2 CONDUCTOR	DRUM TRIGGER OUT 4
001	JACK, PHONE 1/4" 2 CONDUCTOR	DRUM TRIGGER OUT 3
001	JACK, PHONE 1/4" 2 CONDUCTOR	DRUM TRIGGER OUT 2
001	JACK, PHONE 1/4" 2 CONDUCTOR	DRUM TRIGGER OUT 1
005	5 PIN DIN CONNECTOR	MIDI Z OUT
005	5 PIN DIN CONNECTOR	MIDI Y OUT
005	5 PIN DIN CONNECTOR	MIDI X OUT
005	5 PIN DIN CONNECTOR	MIDI W OUT
005	5 PIN DIN CONNECTOR	MIDI THRU
005	5 PIN DIN CONNECTOR	MIDI IN
026	26 PIN HEADER NOVO CONNECTOR	RIBBON CABLE
126	26 PIN SOCKET NOVO CONNECTOR	RIBBON CABLE
001	EJECTOR LATCH NOVO CONNECTOR	RIBBON CABLE

REF DES (QTY)	PART NUMBER	RESISTORS	
R1	852-312104-001	100K	1/4W 5% CARBON FILM
R2	852-312103-001	10K	1/4W 5% CARBON FILM
R3	852-312393-001	39K	1/4W 5% CARBON FILM
R4	852-312103-001	10K	1/4W 5% CARBON FILM
R5	852-312105-001	1M	1/4W 5% CARBON FILM
R6	852-312472-001	4.7K	1/4W 5% CARBON FILM
R7	852-312104-001	100K	1/4W 5% CARBON FILM
R8	852-312103-001	10K	1/4W 5% CARBON FILM
R9	852-312303-001	30K	1/4W 5% CARBON FILM
R10	852-312513-001	51K	1/4W 5% CARBON FILM
R11	852-312203-001	20K	1/4W 5% CARBON FILM
R12	852-312105-001	1M	1/4W 5% CARBON FILM
R13	852-312472-001	4.7K	1/4W 5% CARBON FILM
R14	852-312101-001	100 OHM	1/4W 5% CARBON FILM
R15	852-312103-001	10K	1/4W 5% CARBON FILM
R16	852-312103-001	10K	1/4W 5% CARBON FILM
R17	925-042526-005	100K	LINEAR CERMET TRIM CLOCK PULSE WIDTH
R18	852-312101-001	100 OHM	1/4W 5% CARBON FILM
R19	852-312103-001	10K	1/4W 5% CARBON FILM
R20	852-312223-001	22K	1/4W 5% CARBON FILM
R21	852-312103-001	10K	1/4W 5% CARBON FILM
R22	852-312103-001	10K	1/4W 5% CARBON FILM
R23	852-312103-001	10K	1/4W 5% CARBON FILM
R24	852-312103-001	10K	1/4W 5% CARBON FILM
R25	852-312103-001	10K	1/4W 5% CARBON FILM
R26	852-312103-001	10K	1/4W 5% CARBON FILM
R27	852-312103-001	10K	1/4W 5% CARBON FILM
R28	852-312102-001	1K	1/4W 5% CARBON FILM
R29	852-312223-001	22K	1/4W 5% CARBON FILM
R30	852-312223-001	22K	1/4W 5% CARBON FILM
R31	852-312223-001	22K	1/4W 5% CARBON FILM
R32	852-312223-001	22K	1/4W 5% CARBON FILM
R33	852-312223-001	22K	1/4W 5% CARBON FILM
R34	852-312223-001	22K	1/4W 5% CARBON FILM
R35	852-312223-001	22K	1/4W 5% CARBON FILM
R36	852-312223-001	22K	1/4W 5% CARBON FILM
R37	852-312223-001	22K	1/4W 5% CARBON FILM
R38	852-312223-001	22K	1/4W 5% CARBON FILM
R39	852-312223-001	22K	1/4W 5% CARBON FILM
R40	852-312103-001	10K	1/4W 5% CARBON FILM
R41	852-312103-001	10K	1/4W 5% CARBON FILM
R42	852-312104-001	100K	1/4W 5% CARBON FILM
R43	852-312204-001	200K	1/4W 5% CARBON FILM
R44	852-312223-001	22K	1/4W 5% CARBON FILM
R45	852-312223-001	22K	1/4W 5% CARBON FILM
R46	852-312103-001	10K	1/4W 5% CARBON FILM
R47	852-312515-001	5.1M	1/4W 5% CARBON FILM
R48	852-312103-001	10K	1/4W 5% CARBON FILM
R49	852-312103-001	10K	1/4W 5% CARBON FILM
R50	925-042526-005	100K	LINEAR CERMET TRIM DRUM PULSE WIDTH
R51	852-312102-001	1K	1/4W 5% CARBON FILM
R52	852-312202-001	2K	1/4W 5% CARBON FILM
R53	852-312515-001	5.1M	1/4W 5% CARBON FILM
R54	852-312103-001	10K	1/4W 5% CARBON FILM
R55	852-312103-001	10K	1/4W 5% CARBON FILM
R56	852-312103-001	10K	1/4W 5% CARBON FILM
R57	852-312103-001	10K	1/4W 5% CARBON FILM
R58	852-312103-001	10K	1/4W 5% CARBON FILM
R59	852-312101-001	100 OHM	1/4W 5% CARBON FILM
R60	852-312103-001	10K	1/4W 5% CARBON FILM
R61	852-312101-001	100 OHM	1/4W 5% CARBON FILM
R62	852-312103-001	10K	1/4W 5% CARBON FILM
R63	852-312101-001	100 OHM	1/4W 5% CARBON FILM
R64	852-312103-001	10K	1/4W 5% CARBON FILM
R65	852-312101-001	100 OHM	1/4W 5% CARBON FILM
R66	852-312103-001	10K	1/4W 5% CARBON FILM
R67	852-312101-001	100 OHM	1/4W 5% CARBON FILM
R68	852-312103-001	10K	1/4W 5% CARBON FILM
R69	852-312101-001	100 OHM	1/4W 5% CARBON FILM
R70	852-312103-001	10K	1/4W 5% CARBON FILM
R71	852-312101-001	100 OHM	1/4W 5% CARBON FILM
R72	852-312103-001	10K	1/4W 5% CARBON FILM
R73	852-312101-001	100 OHM	1/4W 5% CARBON FILM
R74	852-312103-001	10K	1/4W 5% CARBON FILM
R75	852-312221-001	220 OHM	1/4W 5% CARBON FILM
R76	852-312221-001	220 OHM	1/4W 5% CARBON FILM
R77	852-312103-001	10K	1/4W 5% CARBON FILM
R78	852-312102-001	1K	1/4W 5% CARBON FILM
R79	852-312221-001	220 OHM	1/4W 5% CARBON FILM
R80	852-312221-001	220 OHM	1/4W 5% CARBON FILM
R81	852-312103-001	10K	1/4W 5% CARBON FILM
R82	852-312221-001	220 OHM	1/4W 5% CARBON FILM
R83	852-312221-001	220 OHM	1/4W 5% CARBON FILM
R84	852-312103-001	10K	1/4W 5% CARBON FILM
R85	852-312221-001	220 OHM	1/4W 5% CARBON FILM
R86	852-312221-001	220 OHM	1/4W 5% CARBON FILM
R87	852-312103-001	10K	1/4W 5% CARBON FILM
R88	852-312222-001	220 OHM	1/4W 5% CARBON FILM
R89	852-312103-001	10K	1/4W 5% CARBON FILM
R90	852-312221-001	220 OHM	1/4W 5% CARBON FILM
R91	852-312221-001	220 OHM	1/4W 5% CARBON FILM
R92	852-312103-001	10K	1/4W 5% CARBON FILM
R93	852-312223-001	22K	1/4W 5% CARBON FILM

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