Sol Terminal Computer
Sol Terminal Computer
Sol Terminal Computer

Processor Technology

Processor Technology
Sol-20 Terminal Computer
Presentation
by

Francis Bauer

July/August 2020

Processor Technology Product Family in 1977

Visit: https://en.wikipedia.org/wiki/Sol-20 for more information

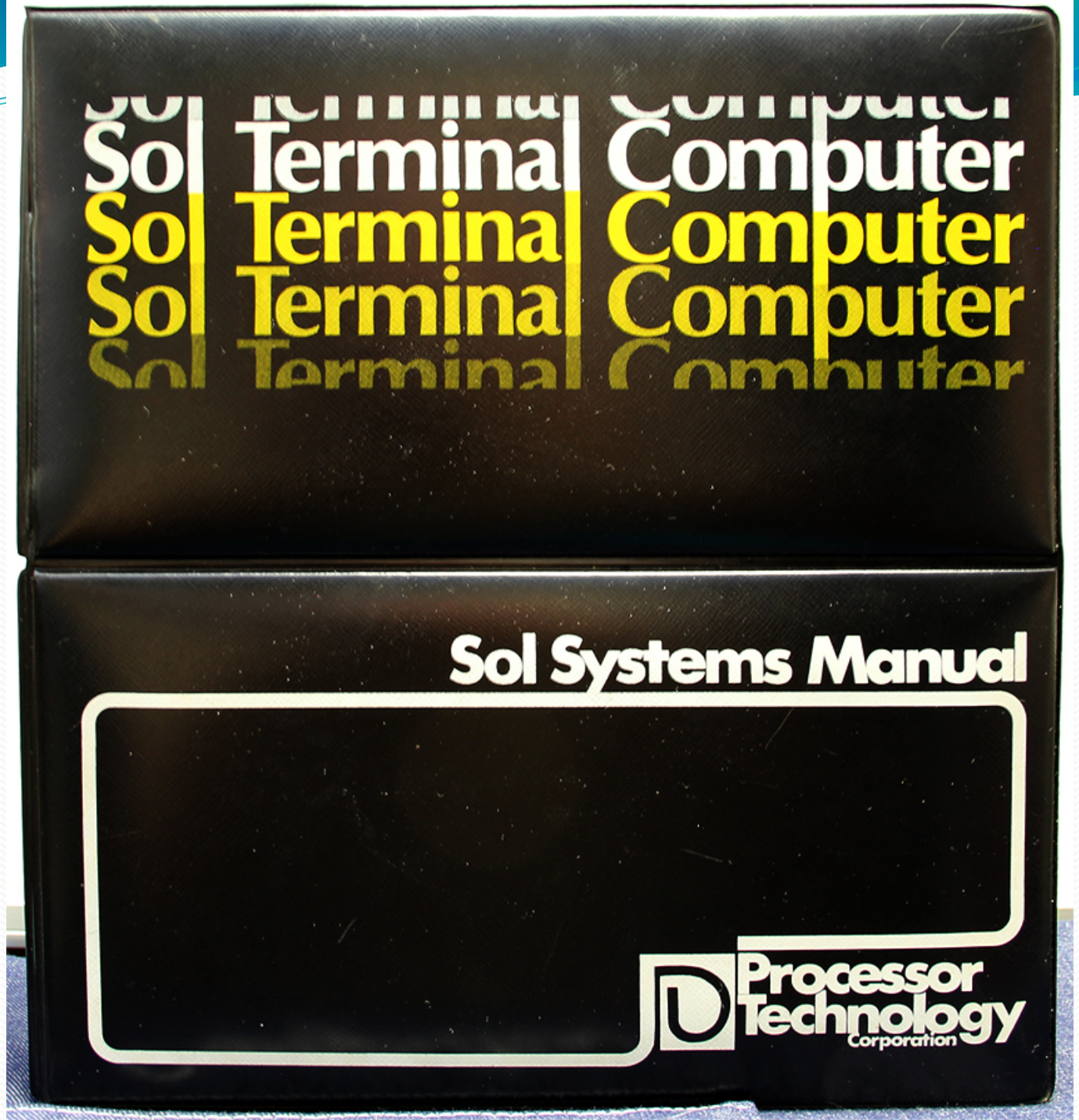
Processor Technology Sol Specifications

Processor Technology Sol Terminal Computers

Introduced:	July 1976 (Popular Electronics Magazine) August 1976 (Personal Computing Show in Atlantic City)
Original Price:	Sol-20 kit: $995 (1976) $1095 (1977) (Including case, large power supply, 5-slot S100 backplane, fan, and 85-key keyboard) Assembled: (1976) $1495 (1977) Sol-10 kit: $795 (1976) $895 (1977) (Includes case, power supply and 70-key keyboard) Assembled: $1295 (1977) Sol-PC kit: $475 (1976) $575 (1977) (Sol single board computer only) Assembled: $745 (1977)
CPU Crystal:	14.31818 MHz
Microprocessor:	(see table below)
Memory:	1kB system RAM on motherboard (C800h to CBFFh) 1kB video RAM on motherboard (CC00h to CFFFh) Expansion via S-100 cards (1kB - 64kB) (0000h to BFFFh) (48kB)
Personality ROM Module:	2kB ROM/EPROM/EEPROM (C000h to C7FFh)
Video Display:	Composite output, 16 lines by 64 characters
Operating System:	(Monitor personality: CONSOL, SOLOED, SOLOS, DPMON, CUTER, PTDOS), CP/M
Input/Output:	Built-in keyboard, serial port, parallel port, composite video monitor output, Cassette data storage
Card Bus:	S-100 bus
Floppy Disk:	P.T. Helios 8", Northstar 5.25", Morrow Thinker Toys 8"
P.T. Software:	ALS-8, BASIC5, 8080 CHESS, 8080 DEBUG, 8080 EDITOR, Extended Cassette BASIC, 8080 PILOT, TREK80, GAME PAC1, GAME_PAC2
Other Software:	CP/M, Northstar Software, Misc. 3rd Parties

Microprocessor:

CPU	Frequency (MHz)	Ø1 Pulse Width (ns)	Ø2 Pulse Width (ns)	Clock Period (ns)	Motherboard Jumper(s)
8080A AM9080ADC	2.045454	140	280	490	A-to-B D-to-E
8080A-2	2.386363	70	210	419	No jumpers
8080A-1	2.863636	70	210	349	A-to-B D-to-C

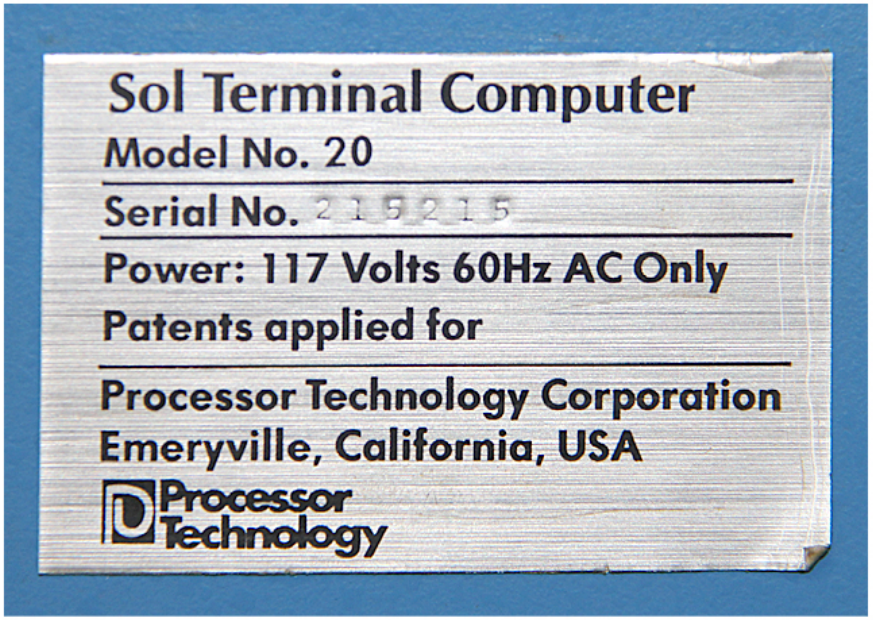

Sol Terminal Computer
Sol Terminal Computer
Sol Terminal Computer
Sol Systems Manual
Processor Technology Corporation

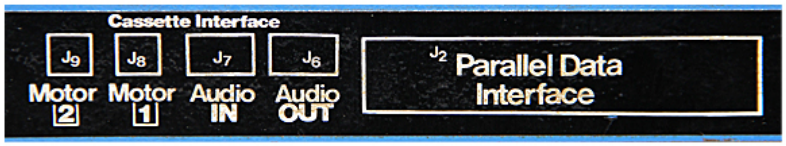
Here is my Sol-20, with its custom Denim Cover

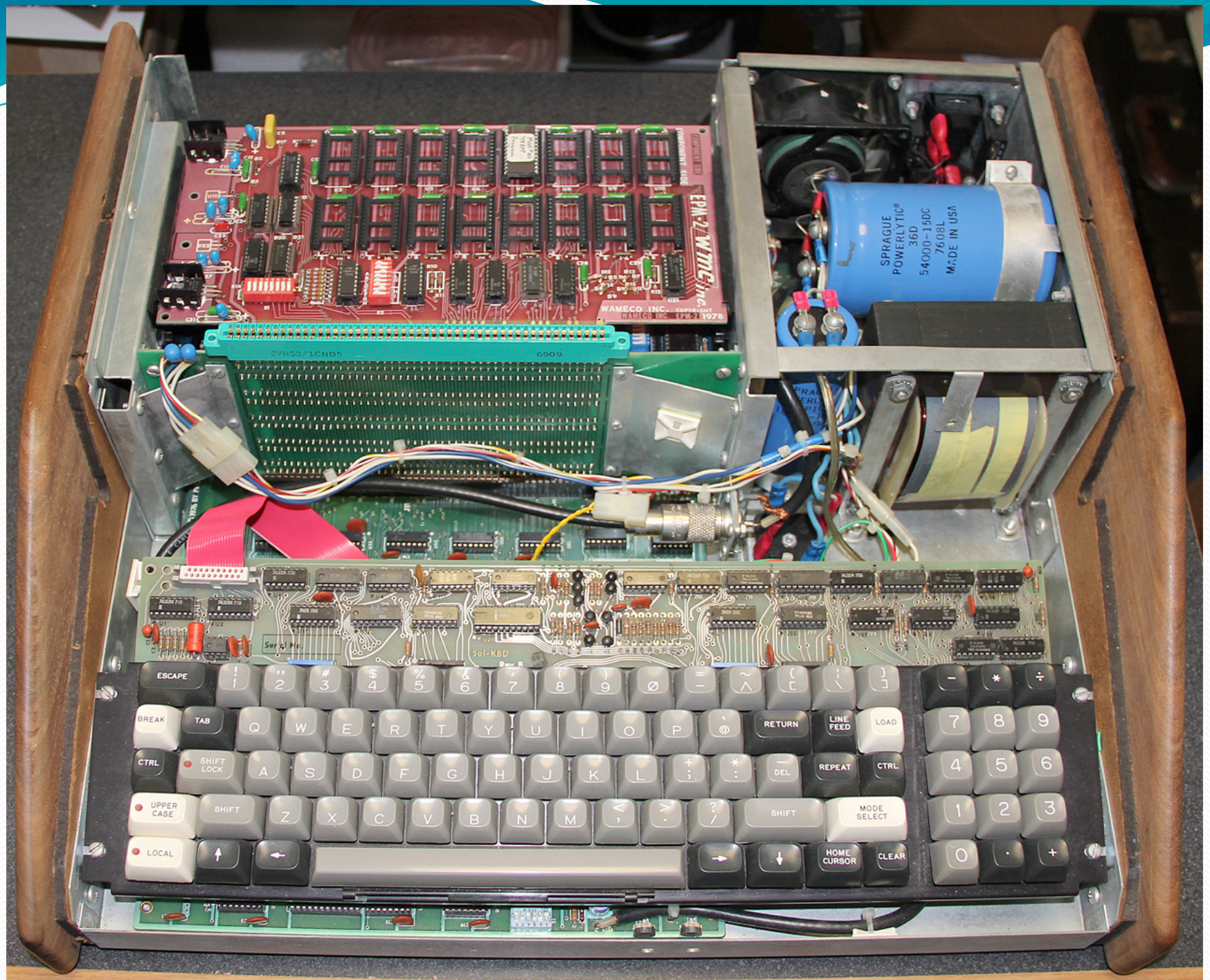
My Sol-20


Sol Terminal Computer
RESET
ON
OFF
Processor Technology
ESCAPE
TAB
CTRL
SHIFT LOCK
SHIFT
LOCAL
RETURN
LINE FEED
REPEAT
DEL
HOME CURSOR
CLEAR

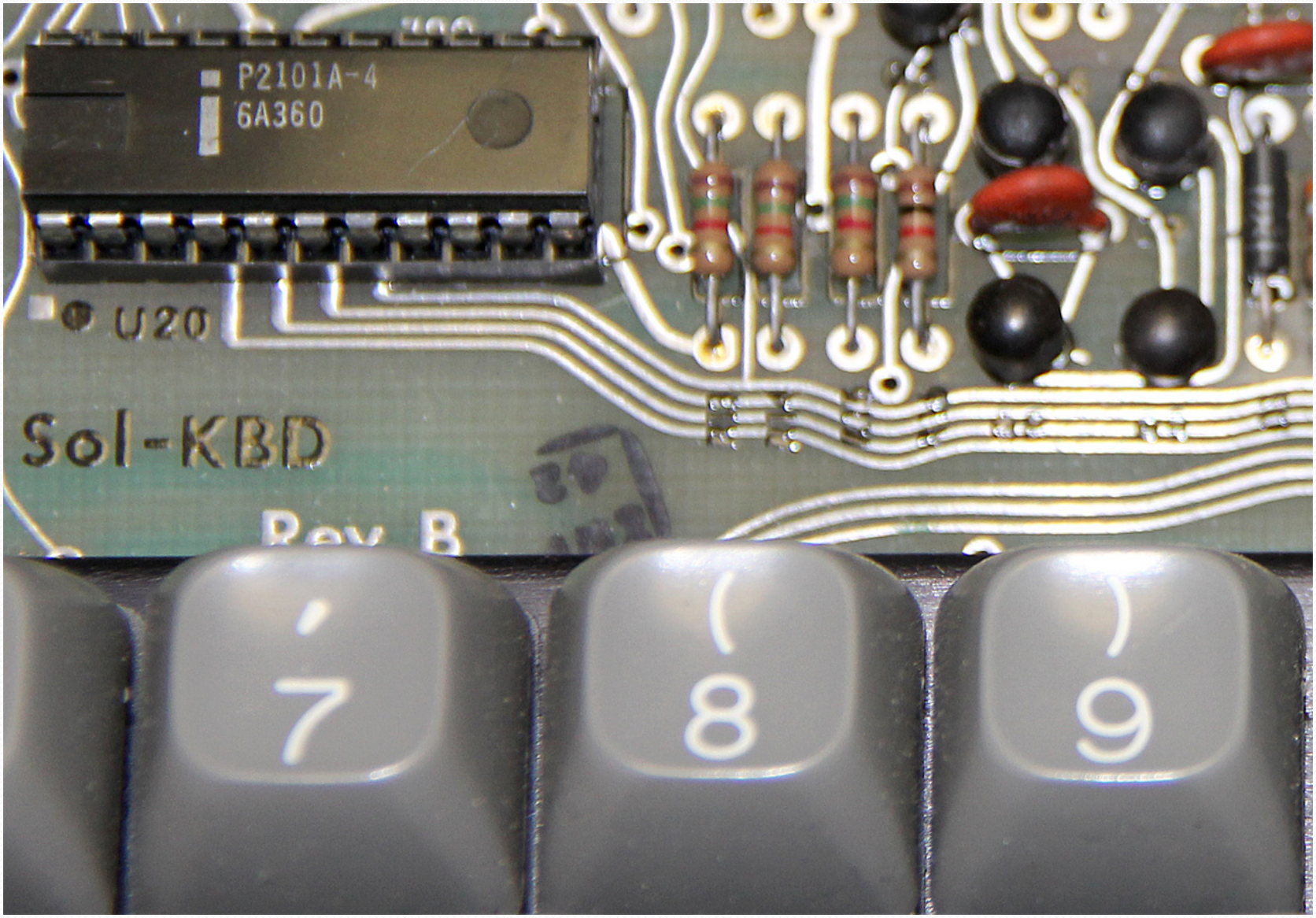
Back panel of my Sol-20



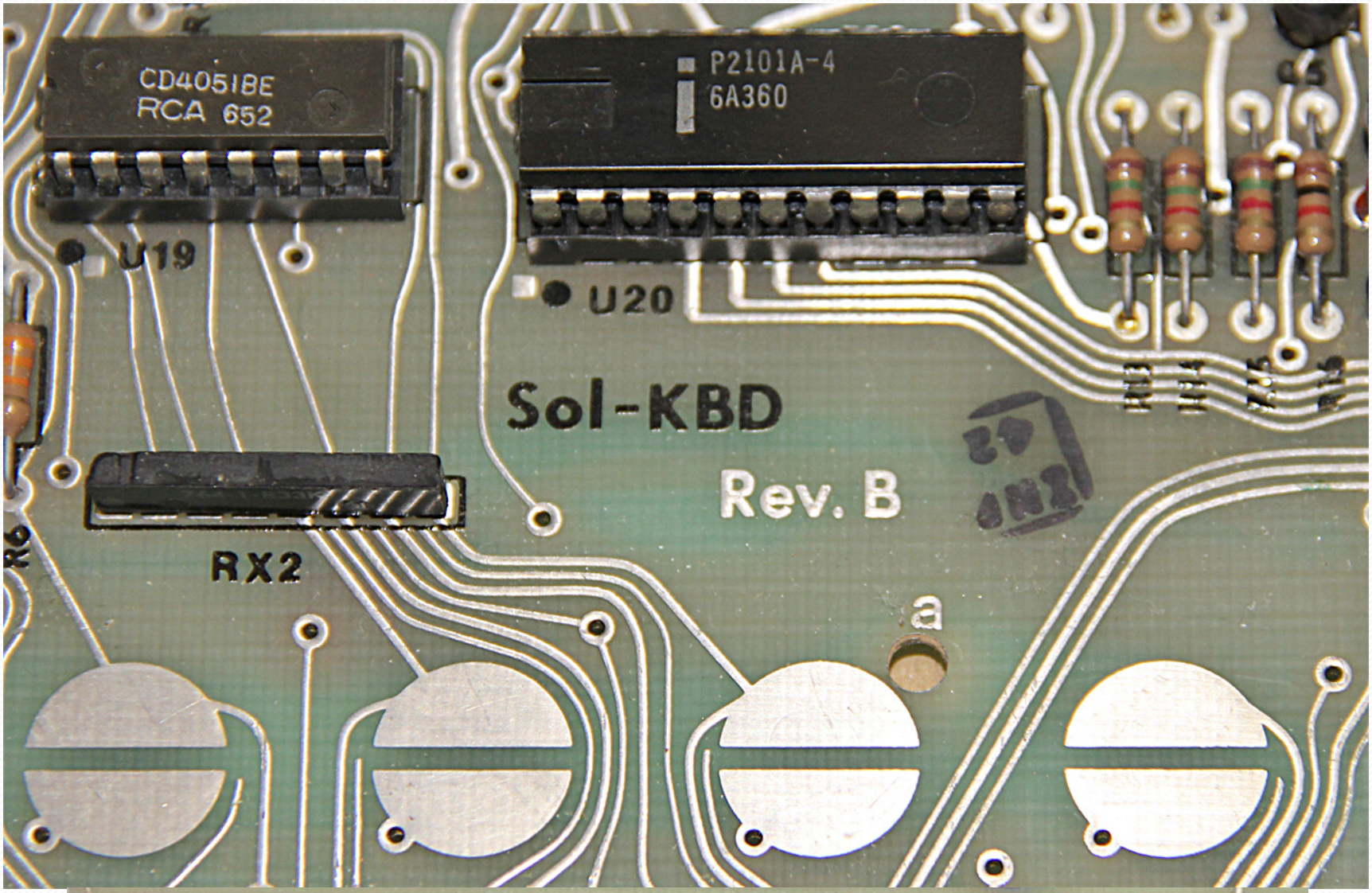



SPRAGUE
POWERLYTIC®
36D
54000-150C
7608L
MADE IN USA
WAMECO INC.
ESCAPE
BREAK
TAB
CTRL
SHIFT LOCK
UPPER CASE
SHIFT
LOCAL
RETURN
LINE FEED
LOAD
REPEAT
DEL
MODE SELECT
HOME CURSOR
CLEAR

Close-up of Sol-20 Keyboard PCB, with Key assembly



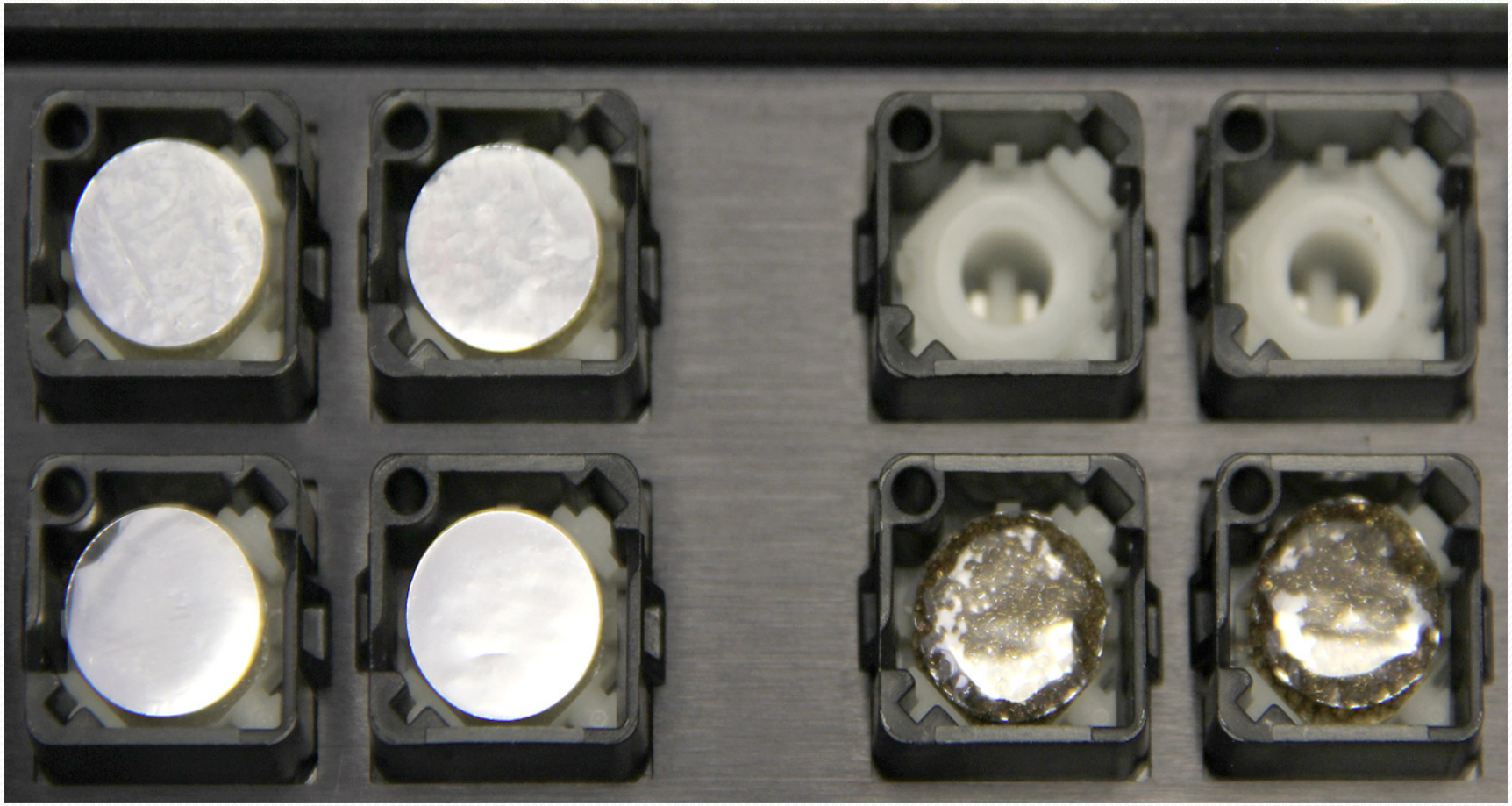
Sol-20 Keyboard PCB, with Key assembly removed



Replacement Foam Pads for Keytronic Keyboard

These pads have a metalized Mylar surface that make contact with the Keyboard PCB when a Key is pressed. The Foam ensures that the Key closure/stroke has a soft landing

Underside of the mechanical Key assembly

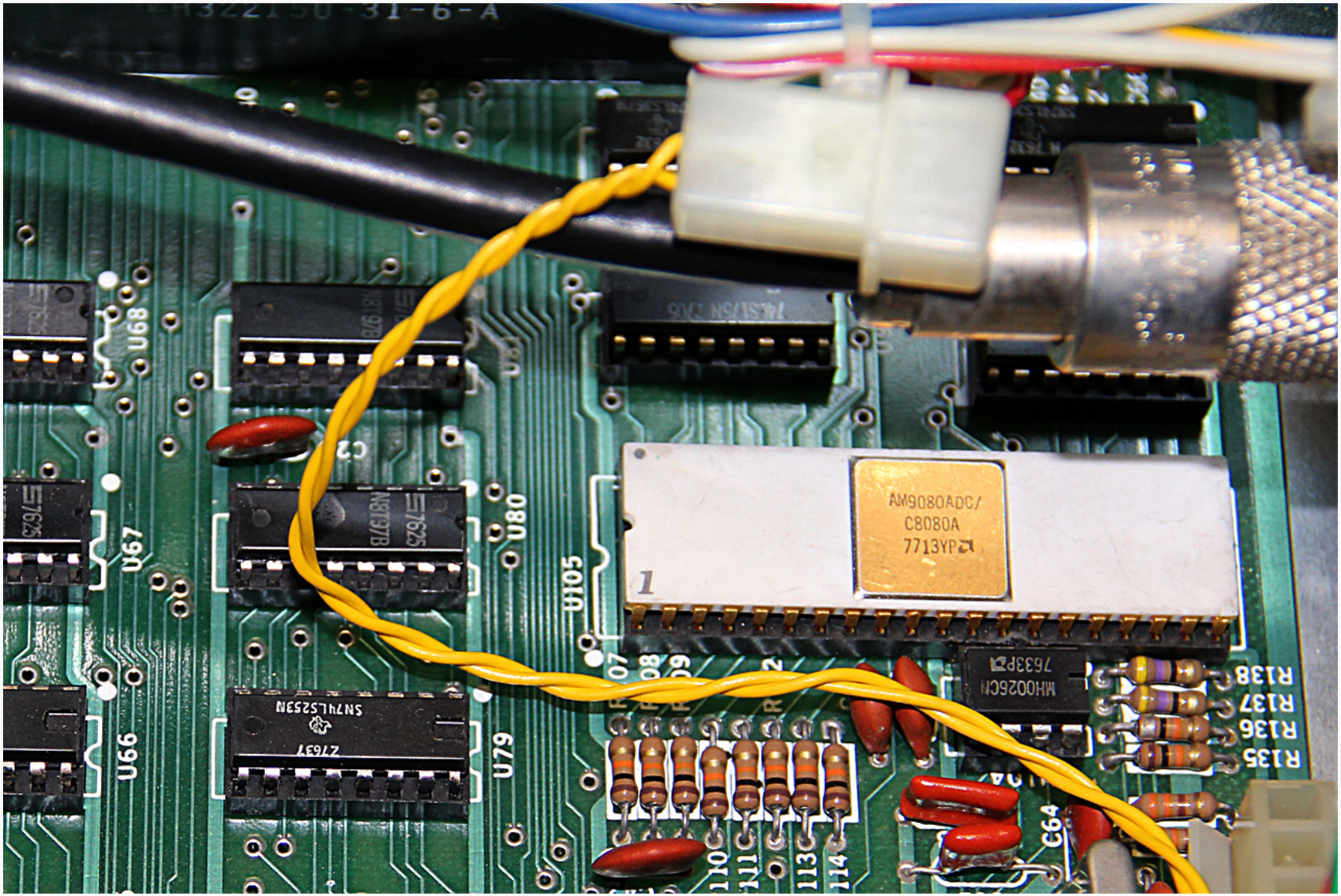


These 4 switches have had the new foam pads installed

The top 2 switches have had the old pads removed

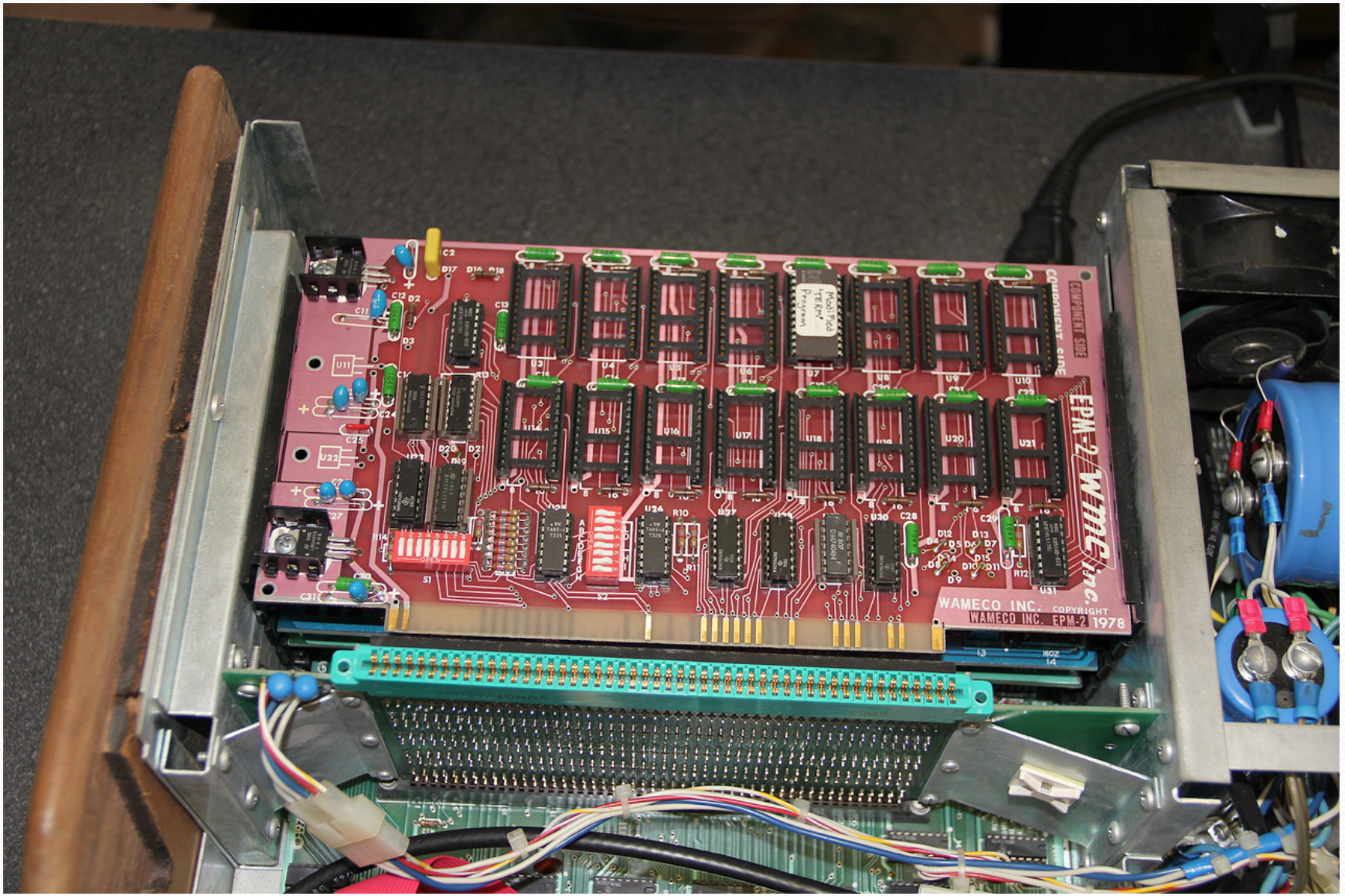
The bottom 2 switches still have the old pads installed

Close-up of Sol-20 Motherboard



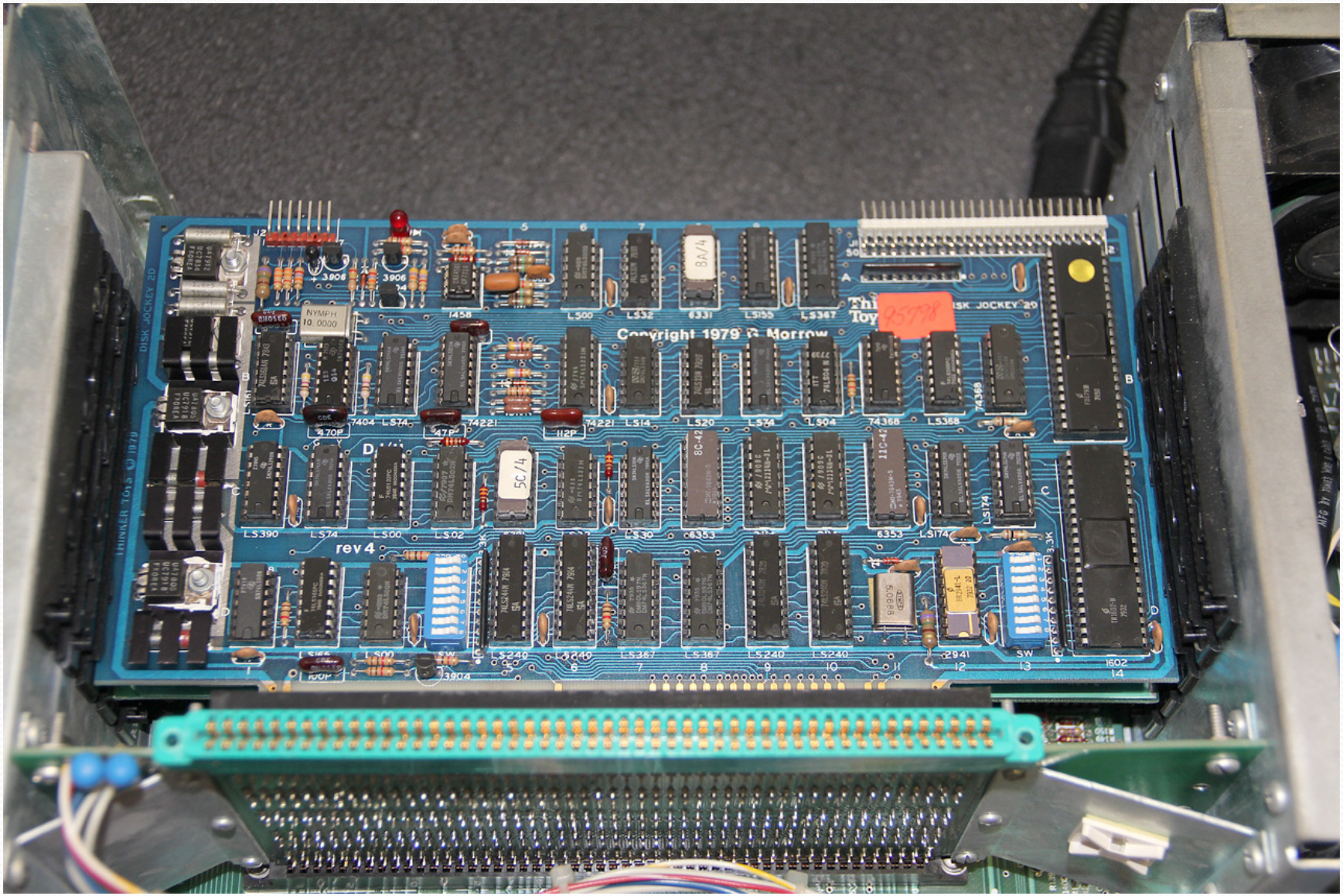
8080A / AM9080ADC Microprocessor

Sol-20 S-100 BUS, 5 slots horizontal, 1 slot vertical



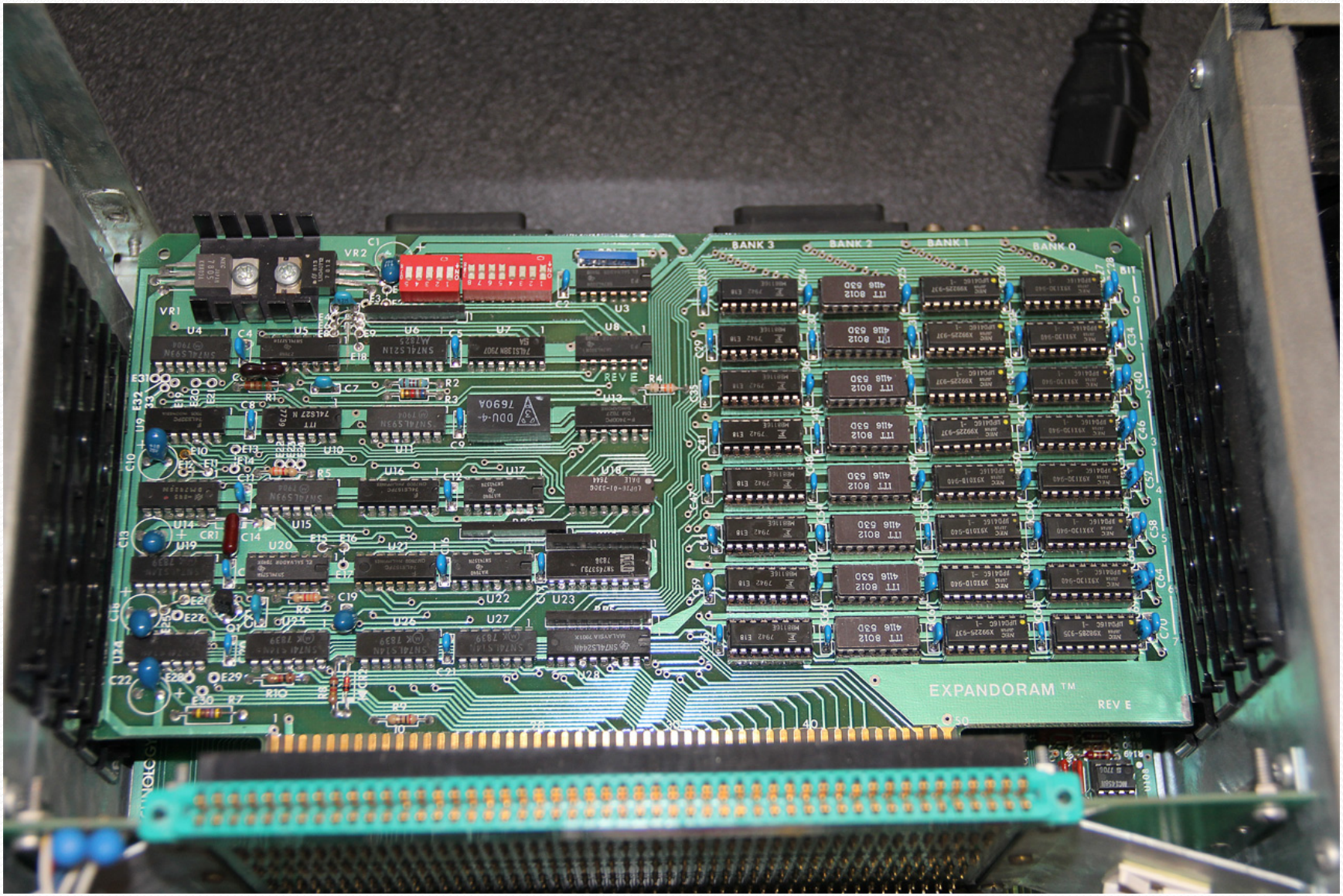
WAMECO EPM-2 EEPROM Board

Sol-20 S-100 BUS, 5 slots horizontal, 1 slot vertical



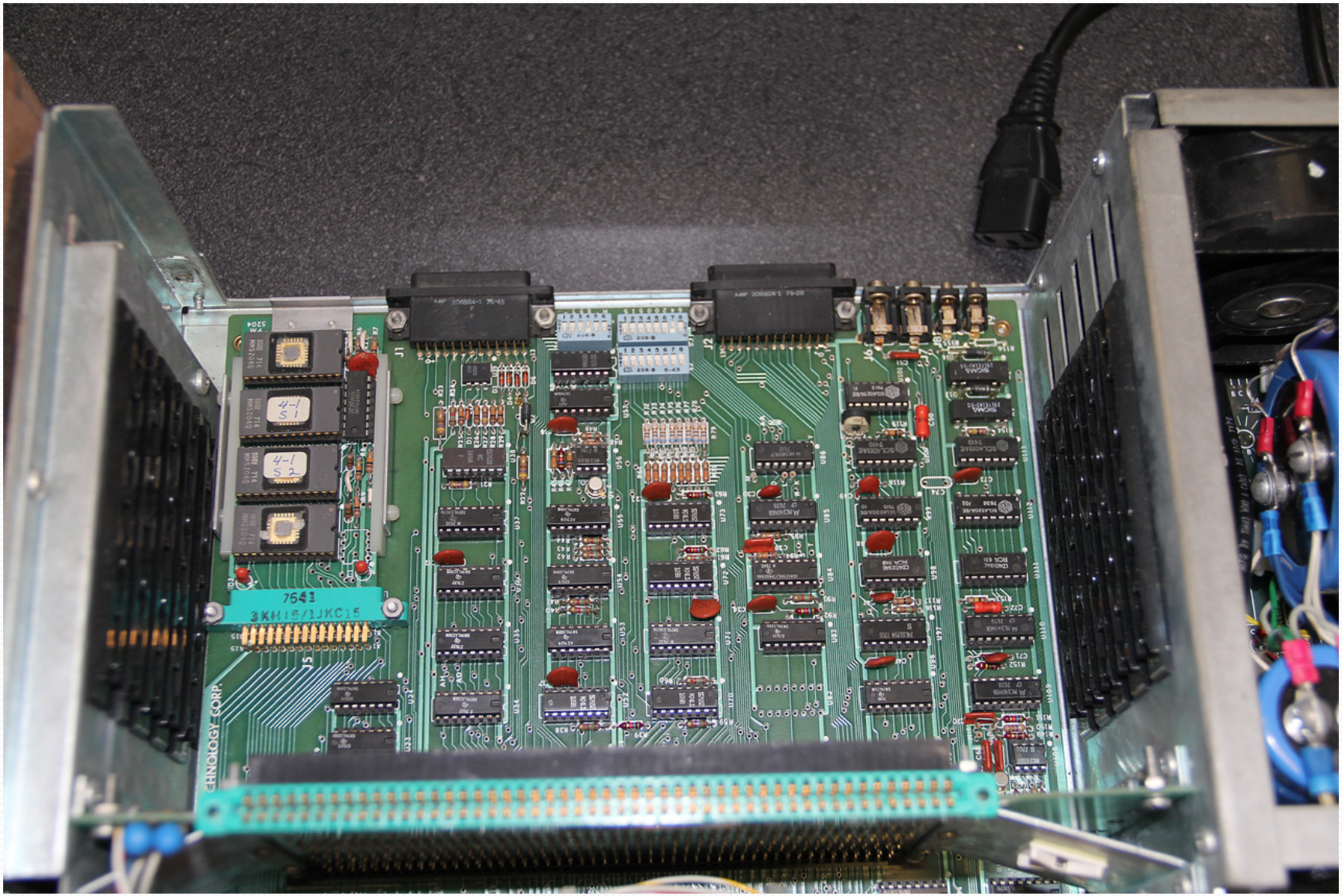
Morrow Thinker Toys Disk Jockey II Board

Sol-20 S-100 BUS, 5 slots horizontal, 1 slot vertical



ExpandoRAM 64kB Board

Sol-20 S-100 BUS, without any S-100 cards installed



Back half of Sol-20 Motherboard with Personality Module

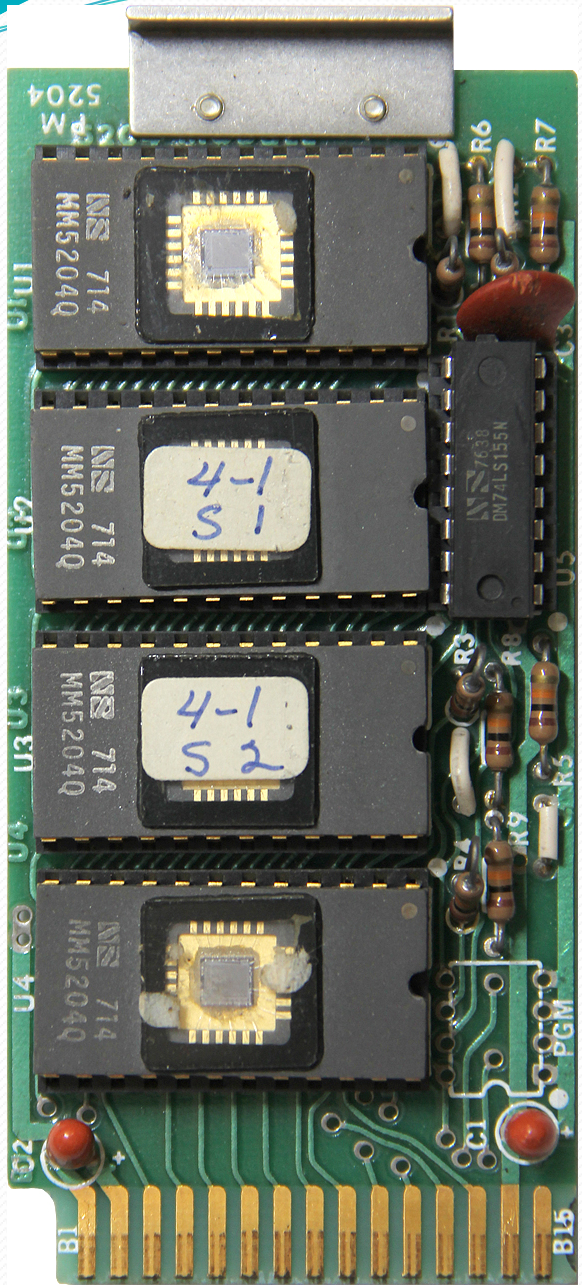
SOLOS™

CUTER™

USER'S MANUAL

Processor Technology Corp.
6200 Hollis St.
Emeryville, CA 94608
(415) 652-8080

Software Technology Corporation
P.O. Box 5260
San Mateo, CA 94402
(415) 349-8080



SOLOS

Quick Command Reference List

Console Commands	
COMMAND	**FUNCTION**
EXEC *addr*	Begin program execution at 'addr'
ENTR *addr*	Enter Hex data into memory starting at 'addr'
DUMP *addr1 (addr2)*	Dump memory data, 'addr1' to 'addr2'
TERM *(portin (portout))*	Enter Terminal Mode
CUST *name (addr)*	Insert or remove a custom command

Tape Commands	
COMMAND	**FUNCTION**
GET *(name(/unit) (addr))*	Get a tape file into memory
SAVE *name (/unit) addr1 addr2 (addr3)*	Save a file from memory to tape
XEQ *(name(/unit) (addr))*	Get then execute a tape file
CAT *(/unit)*	Catalog tape files

Set Commands	
COMMAND	**FUNCTION**
SET *S=data*	Screen character rate
SET *I=port*	Input port to SOLOS
SET *O=port*	Output port to SOLOS
SET *N=data*	Number of NULLS following CRLF
SET *XEQ addr*	Auto-execute addr
SET *TAPE 0 or 1*	0=1200 baud, 1=300 baud
SET *TYPE data*	Type 'byte' header
SET *COUT addr*	Custom output addr
SET *CIN addr*	Custom input addr
SET *CRC data*	Allow ignoring of tape CRC Read Errors

PSEUDO PORTS FOR SOLOS		
Pseudo Port	**Input**	**Output**
0	Keyboard	VDM driver
1	Serial port	Serial port
2	Parallel Port	Parallel Port
3	User written routine	User written routine

Note: All addresses ('addr') are specified in Hex

Sol-20 with 9” Sanyo B/W composite monitor

Sol-20 and CRT are currently powered-down

Sol-20 with 9” Sanyo B/W composite monitor

Sol-20 and CRT are powered-up

Side-by-Side comparison of Display Speed difference

Memory Dump with SET S=0

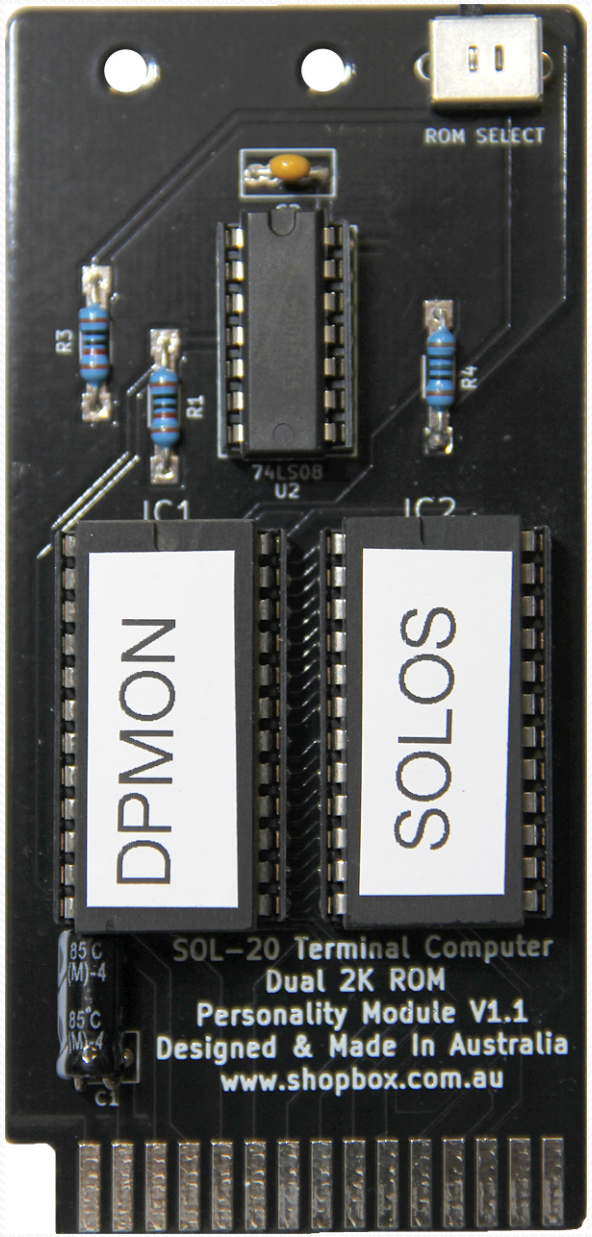
Memory Dump with SET S=5

Zenith 12” Green Phosphor CRT

The SOL-20 is in TERM mode, which is allowing the system to act as an ASCII Terminal and display text coming in through in this case the Serial port.

Zenith 12” Green Phosphor CRT

The overall appearance of the monitor is pleasing



DPMON

Quick Command Reference List

Group I Commands (Similar to SOLOS)	
COMMAND	**FUNCTION**
EX *addr*	Begin program execution at 'addr'
SE *S=data*	Screen character rate
SE *I=port*	Input port to DPMON
SE *O=port*	Output port to DPMON
SE *N=data*	Number of NULLS following CRLF
SE *COUT addr*	Custom output addr
SE *CIN addr*	Custom input addr
CU *name (addr)*	Insert or remove a custom command
BO	Boot Helios II(If Helios Version DPM)
TE *(portin (portout))*	Enter Terminal Mode
TB	TARBELL boot
LOAD KEY	Boots disk system (N*,TARBELL,HELIOS)

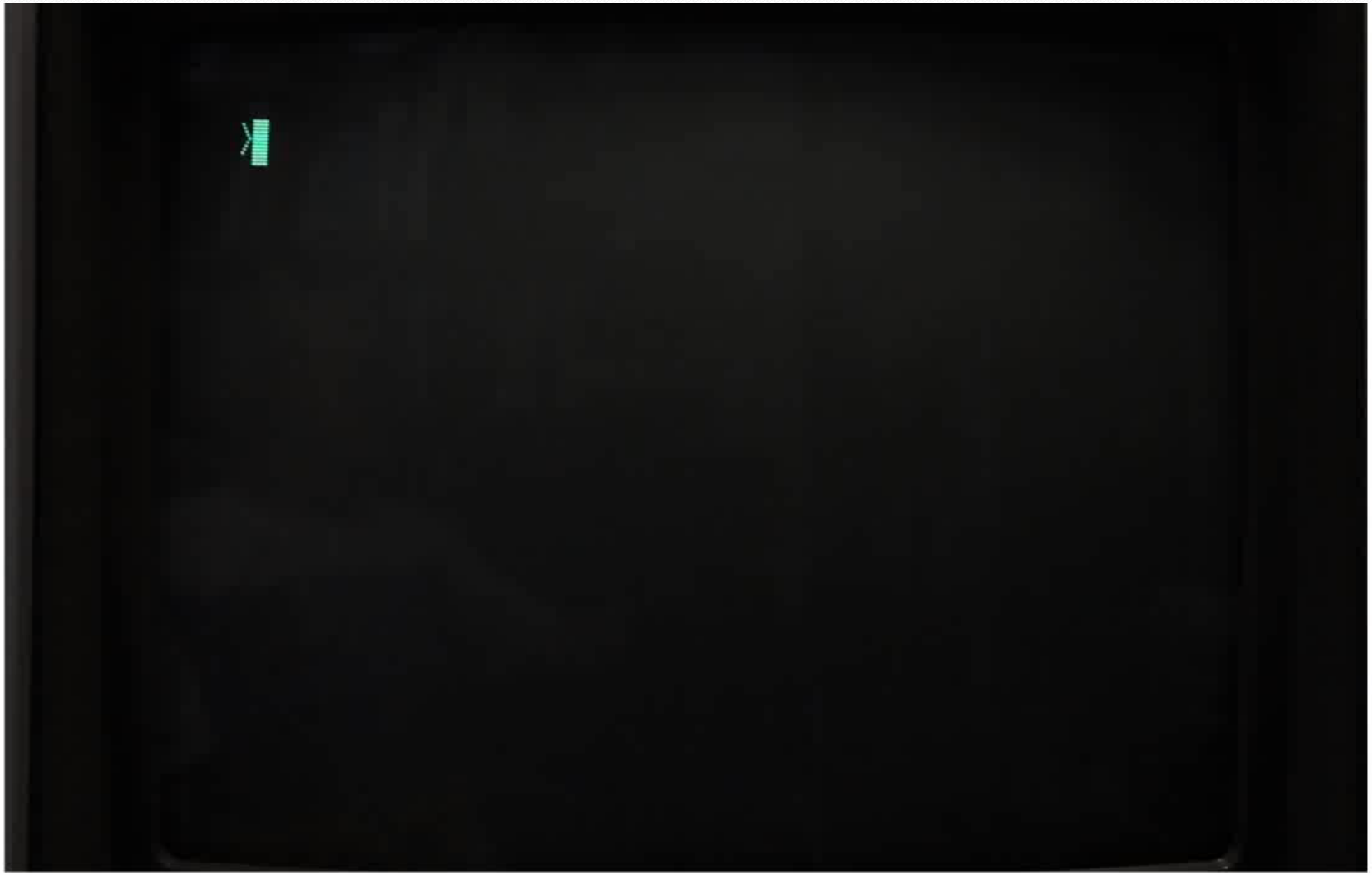
Group II Commands (New Commands)	
In these command descriptions the following symbols are used:	
SSSS = Starting Address for Memory Block	
EEEE = Ending Address for Memory Block	
HHHH = Hex Character Input	
CCCC = ASCII Character Input	
AAAA = Memory Address Input	
Pressing the MODE key will Abort/Terminate most commands.	
COMMAND	**FUNCTION**
DA *SSSS EEEE*	Display ASCII memory dump
DH *SSSS EEEE*	Display HEX memory dump
EA *SSSS*	Enter ASCII Character String
EH *SSSS*	Enter HEX Byte String
FM *SSSS EEEE HH*	Fill Memory with a HEX Value
LC *LL*	Lower Case Conversion
MM *SSSS EEEE AAAA*	Move Memory Block, Non Destructive in either direction
CM *SSSS EEEE AAAA*	Compare Memory Blocks
AR *SSSS EEEE AAAA*	Address Reference locator within a block
FH *SSSS EEEE HHHH*	Find HEX Word occurrences within a memory block
FB *SSSS EEEE HH*	Find HEX Byte occurrences within a memory block
FA *SSSS EEEE CC*	Find ASCII Character pair within a memory block
FC *SSSS EEEE C*	Find ASCII Character (Single) within a memory block
TM *SSSS EEEE HH*	Test Memory using 00 & FF fills and walking bit test

Sol-20 DPMON Examples

Example to Display Memory as ASCII Characters

SET S=5
DA 0000 0060

Sol-20 DPMON Examples



Fill Memory and Display Memory as Hex

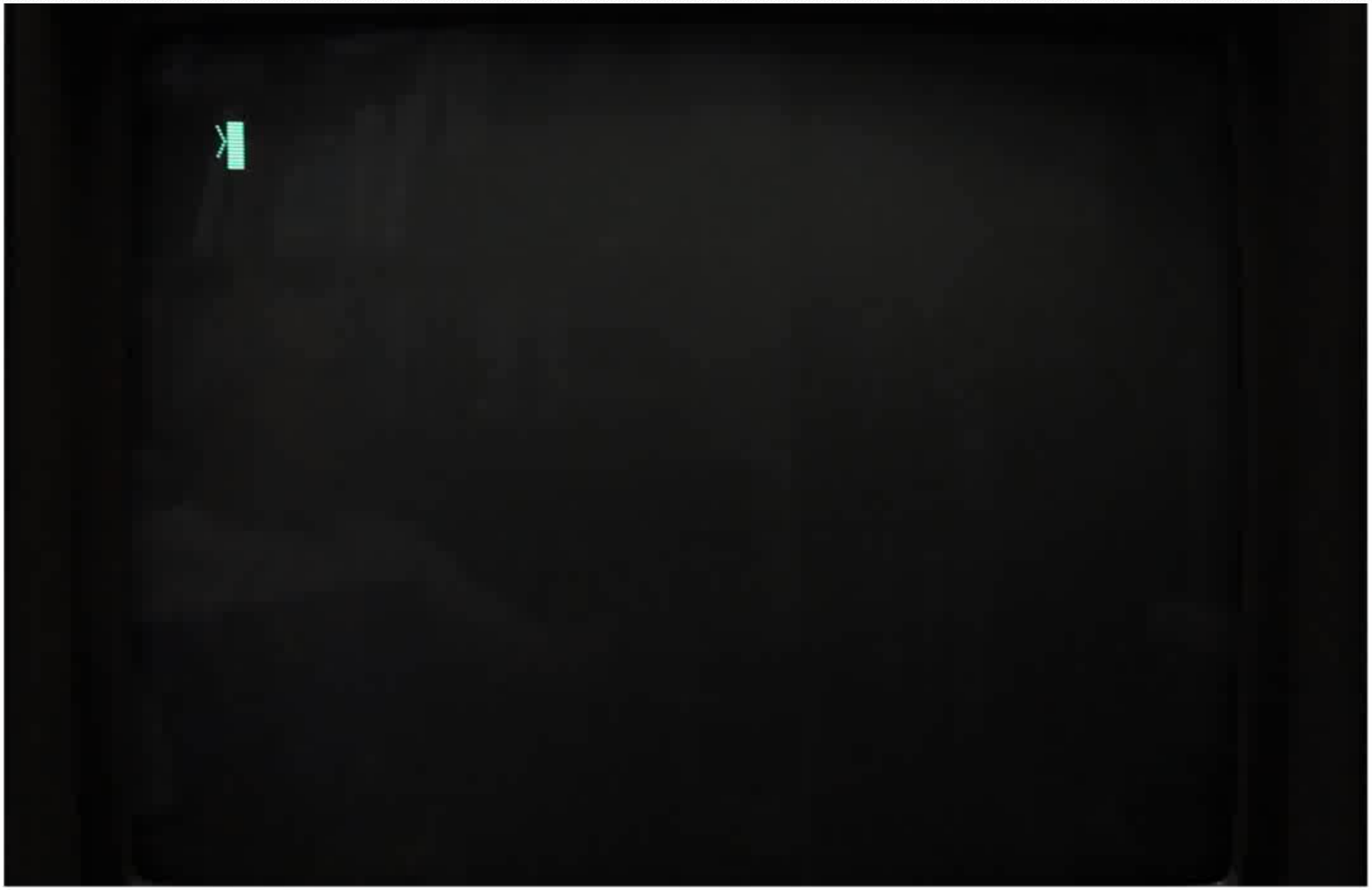
FM 0000 0060 00
DH 0000 0060

Sol-20 DPMON Examples

Loop 5 times testing all of RAM Memory

TM 0000 BFFF 05

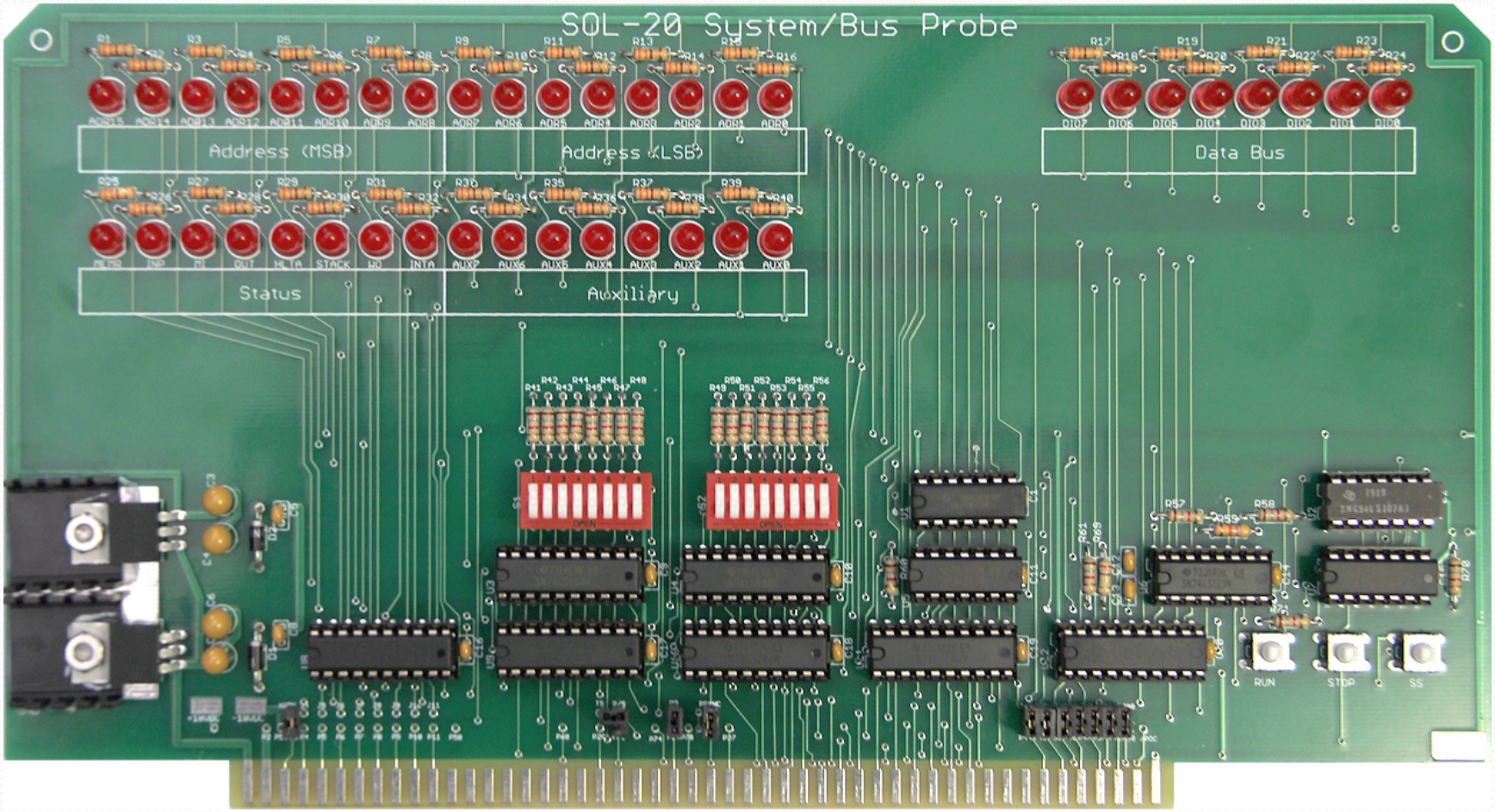
Sol-20 DPMON Examples



Find specific ASCII Characters in Memory

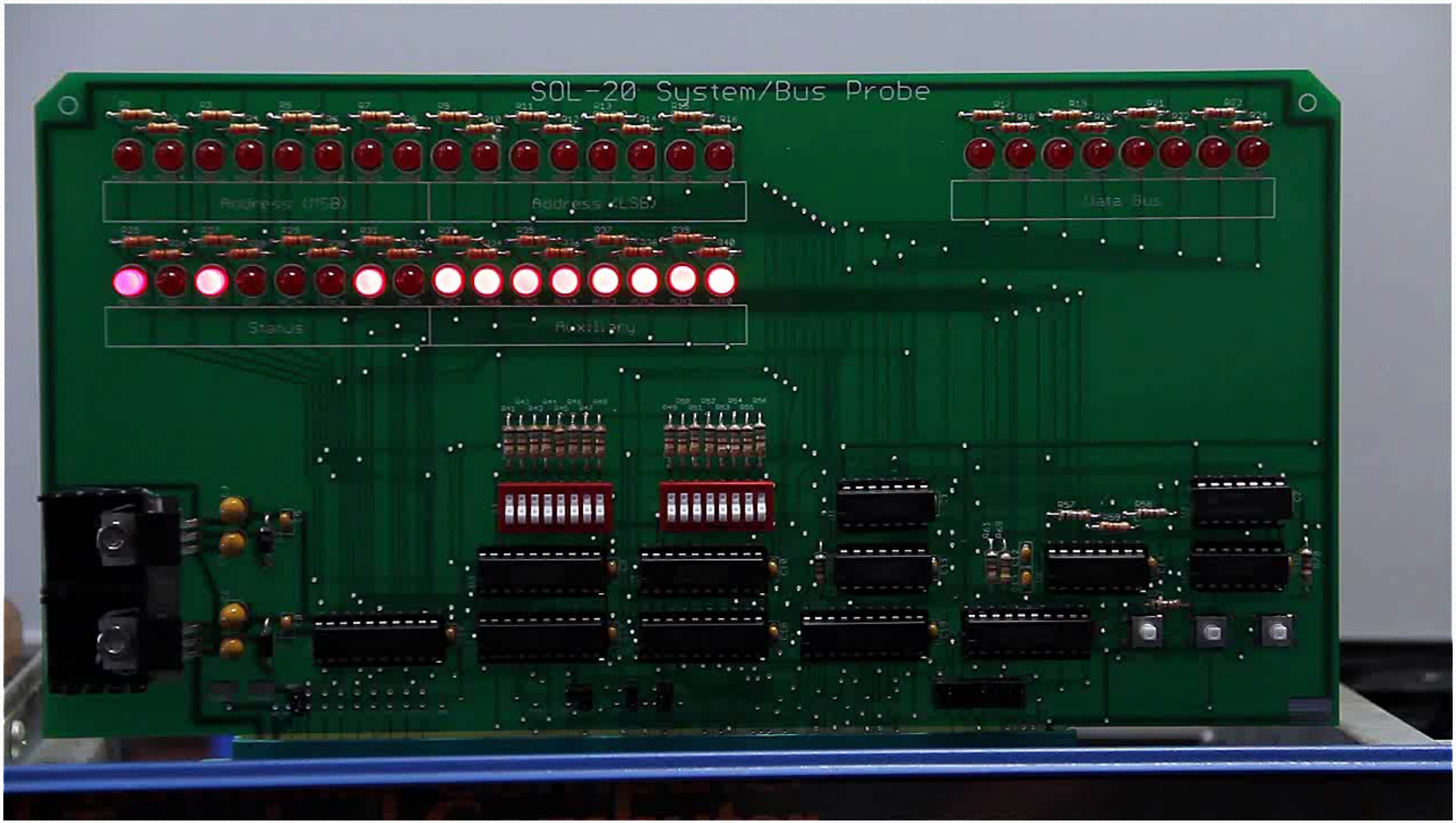
FC 0000 BFFF F
FC 0000 BFFF B

Sol-20 S-100 System/Bus Probe



This is a useful S-100 board that is helpful in debugging programs/hardware and was created around 2007 by a Sol-20 enthusiast.
The board essentially gives you front panel abilities similar to the Altair and IMSAI Microcomputers and gives you single-step program control.

Sol-20 S-100 System/Bus Probe



This video shows the System/Bus Probe Board being used to watch an executing Machine code program. The breakpoint switches are set to pause program execution at 0000h and then using the <SS> button to single-step through the program execution.

Sol-20 Software

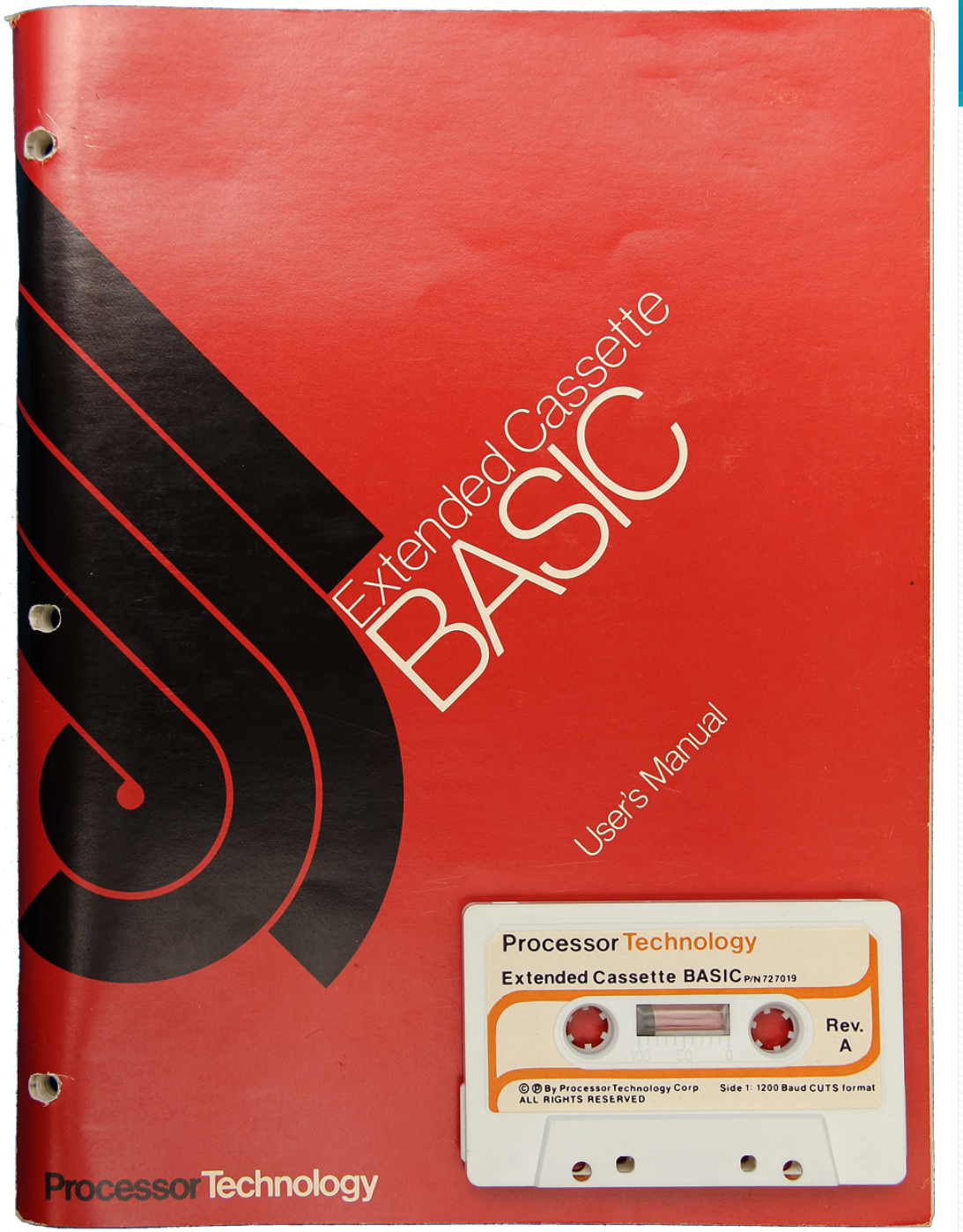
Processor Technology created a number of Software packages and programs for use with the Sol-20.

Most all of this software is available in a number of different formats for loading into the Sol-20. These formats include Cassettes and audio *.wav files, text files suitable for loading using the SOLOS ENTER command and floppy disk files for Helios or CP/M.

Other 3rd party entities have also created software for the Sol-20.

There is also the large collection of CP/M software that can be run on the Sol-20, when it is setup with appropriate floppy disk hardware.

The following slides show some of these software packages and documentation , along with some video examples of the software running.


Extended Cassette
BASIC
User's Manual
Processor Technology
Extended Cassette BASIC P/N 727019
Rev.
A
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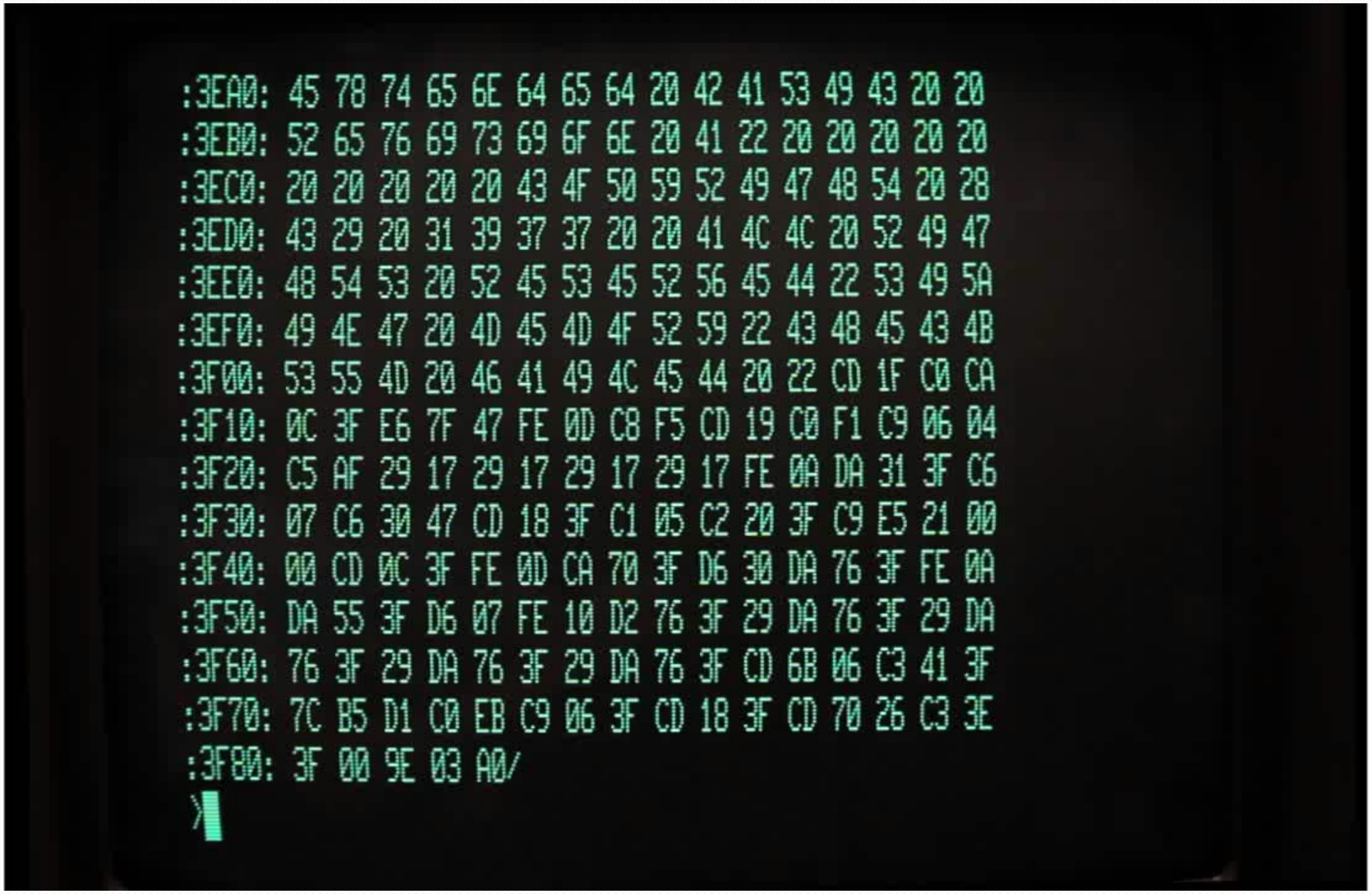
Side 1: 1200 Baud CUTS format
Processor Technology

Processor Technology 16k Extended Cassette BASIC



This video shows the starting of the 16k Extended Cassette BASIC language and then the loading and running of a program.

ALS-8 Program Development System

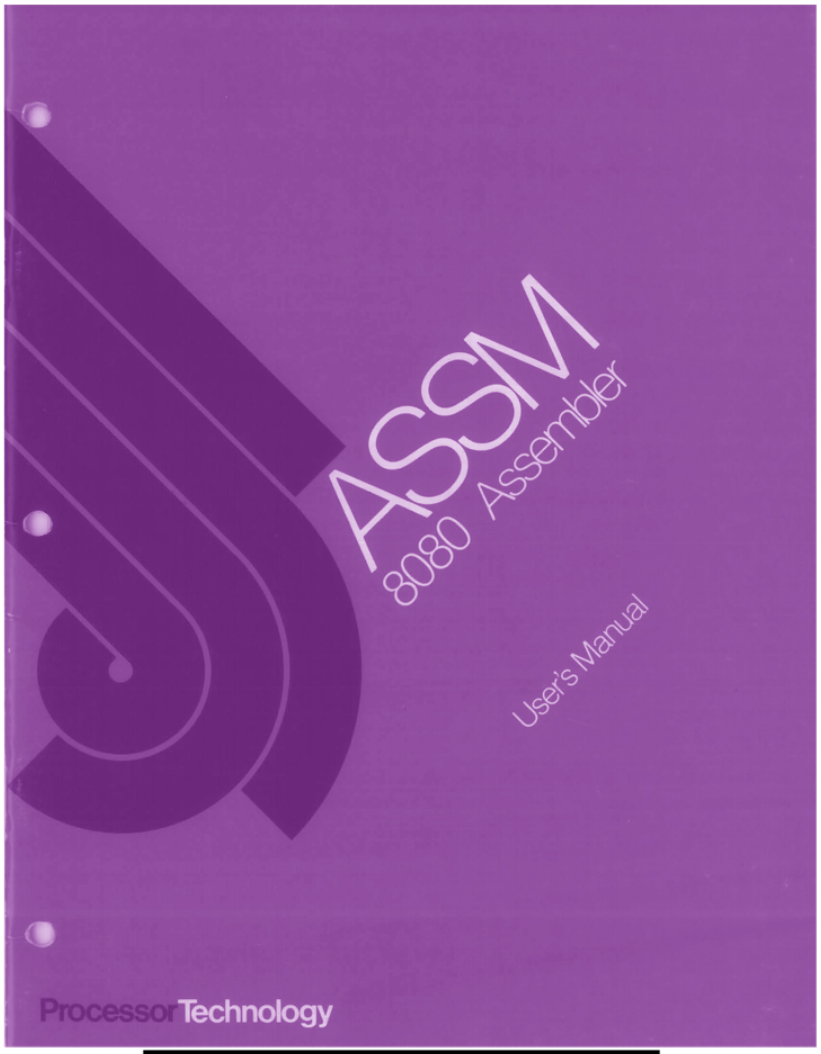
ALS-8 PROGRAM DEVELOPMENT SYSTEM

OPERATOR'S MANUAL

PROCESSOR TECHNOLOGY CORPORATION
6200 Hollis Street
Emeryville, CA 94608

(415) 652-8080

 Manual No.727013


ASSM
8080 Assembler
User's Manual
ProcessorTechnology


ProcessorTechnology
ASSM, Advanced 8080 Assembler P/N 727122
Rev. A
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BASIC 5 T.M.

USER'S MANUAL

FOR USE WITH

SOLOS T.M., CUTER T.M. & CONSOL T.M.

Processor Technology Corp.
6200 Hollis St.
Emeryville, CA 94608
(415) 652-8080

Software Technology Corporation
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ProcessorTechnology


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ProcessorTechnology
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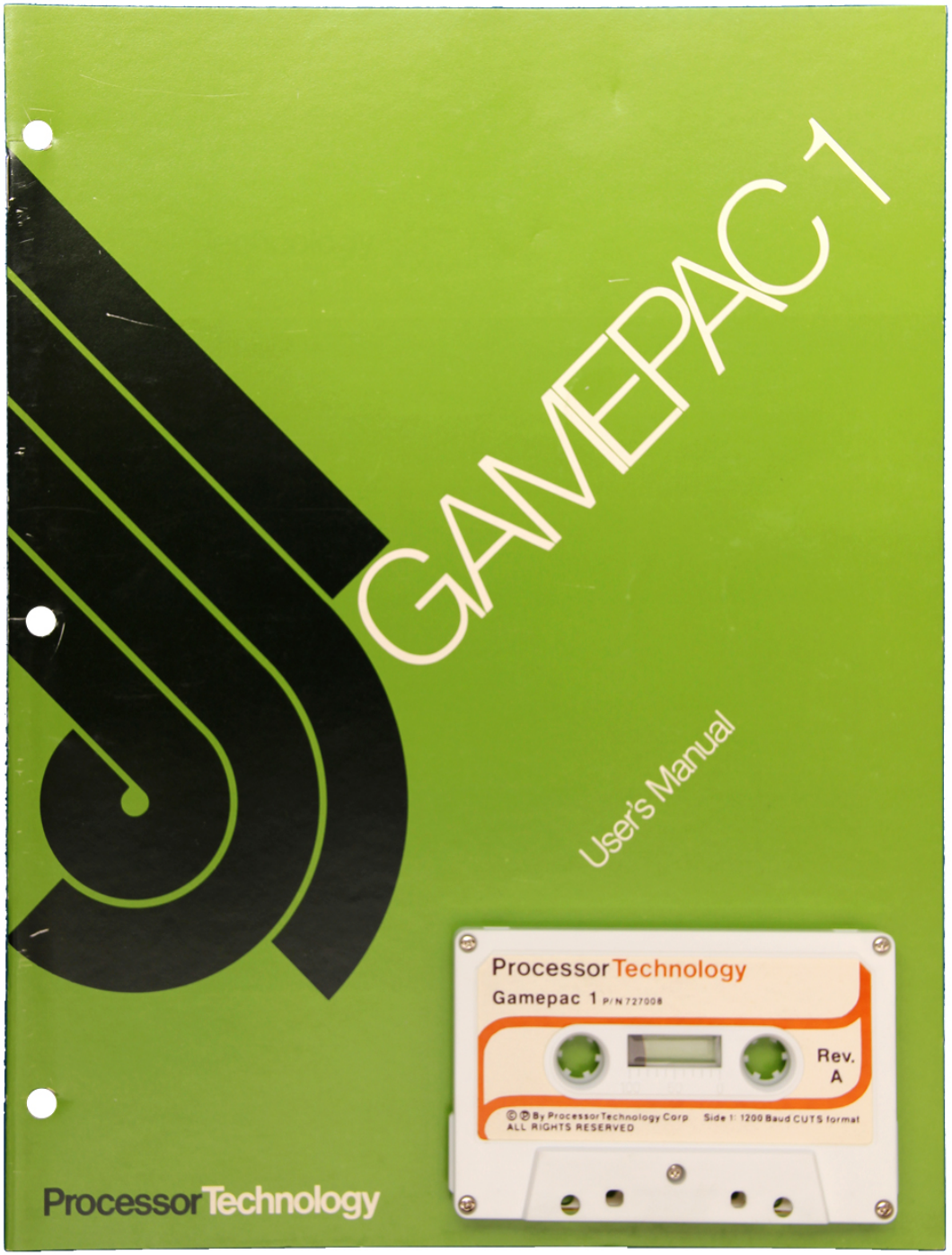
ProcessorTechnology


GAMEPAC 1
User's Manual
Processor Technology
Gamepac 1 P/N 727008
Rev. A
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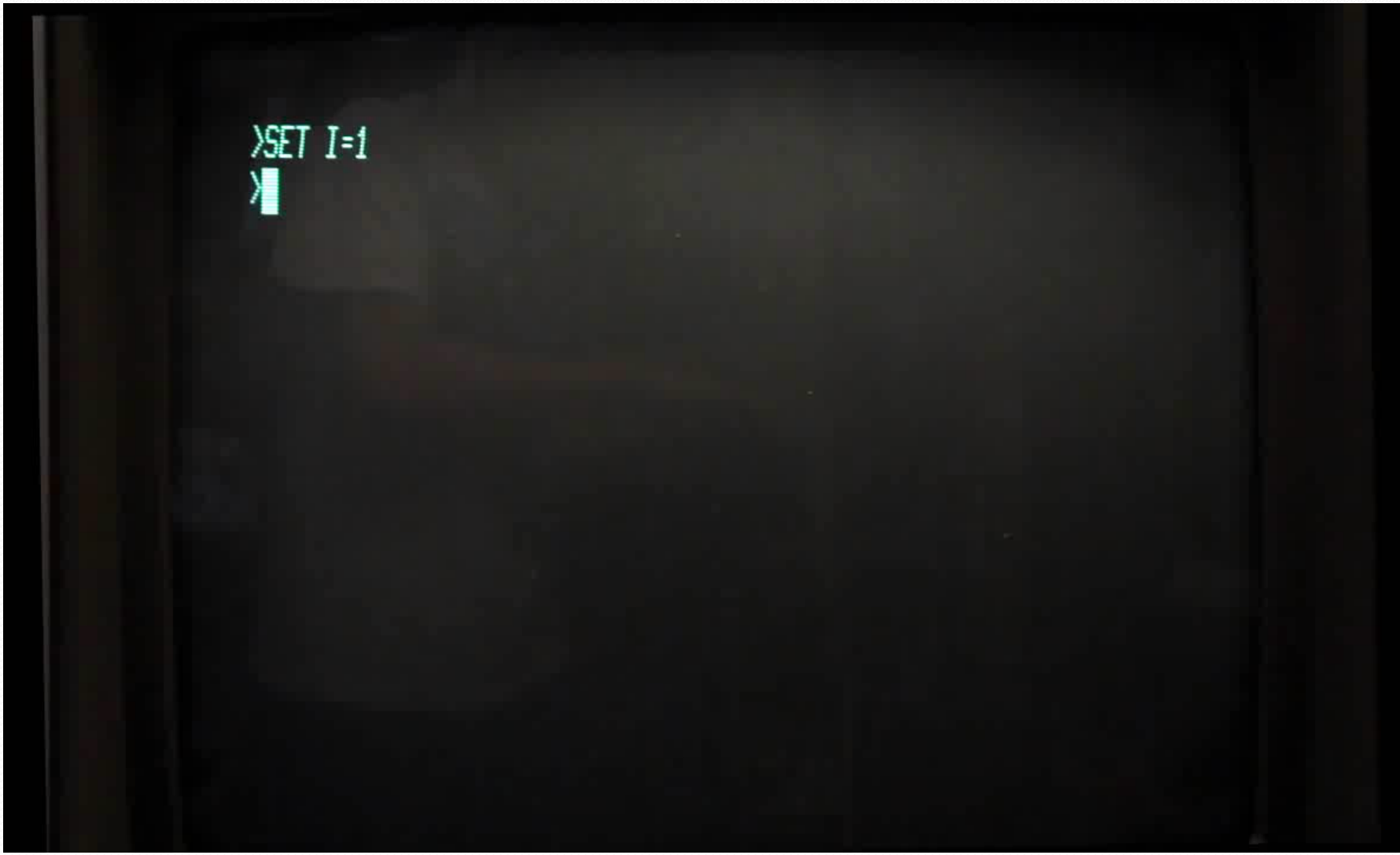
Side 1: 1200 Baud CUTS format
Processor Technology

Processor Technology Target Game



This video shows the running of the Processor Technology GAMEPAC1 Target game in Demo mode.

GAMEPAC 2

User's Manual

ProcessorTechnology

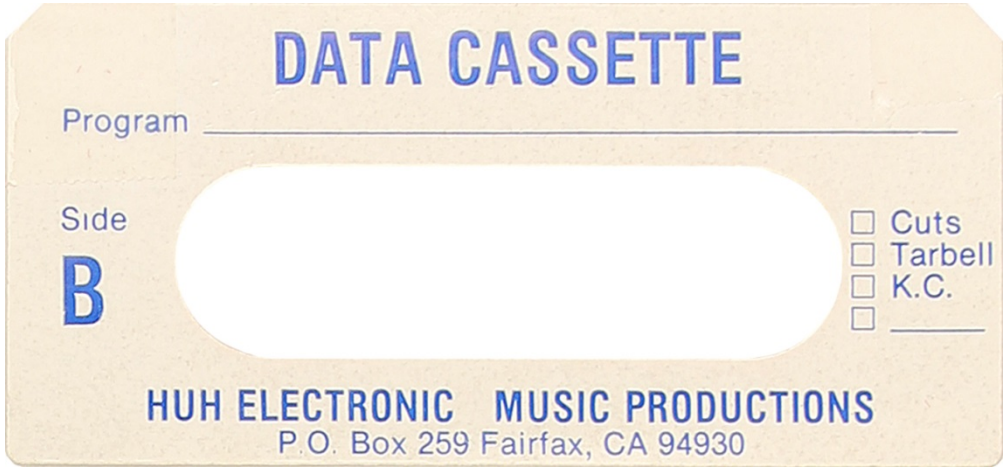

TREK-80
User's Manual
TREK-80
TRK80: The machine language program
SIDE ONE
PART NO. 727009
Processor Technology
Side 1: 1200 Baud CUTS format
Side 2: 300 Baud K.C. format
Processor Technology

3rd Party BASIC Language

MSA BASIC

SOLOS AND CUTER VERSION

Generic Data Cassette



It turns out Mark Garetz of HUH ELECTRONIC MUSIC PRODUCTIONS was associated with the Homebrew Computer Club and developed & marketed add-ons for the PET computer, among other things. Also collaborated with Sol Libes on the S-100/IEEE-696.

Post Office Box 579, Pacific Grove, California 93950, (408) 649-3896

CP/M 2.2 ALTERATION GUIDE

Post Office Box 579, Pacific Grove, California 93950, (408) 649-3896

CP/M 2.2 INTERFACE GUIDE

Post Office Box 579, Pacific Grove, California 93950, (408) 649-3896

CP/M 2.2 USER'S GUIDE

Processor Technology URLs

There is a wealth of information about Processor Technology and Sol Terminal Computers available on the Internet.

Here are some of the major sites worth visiting:

https://www.sol20.org/

This site contain a lot of information, software and a very good emulator called "Solace". If you want to experience working with a Sol, the "Solace" emulator is a great way to do it.

http://www.digibarn.com/collections/sol-all.html

http://oldcomputers.net/sol-20.html

https://deramp.com/processor_tech.html

https://www.youtube.com/watch?v=Oj4VLuLYeOM

Video about the Sol-20 System/Bus Probe

http://vintagecomputer.ca/files/Processor%20Technology/

Thank you for viewing my Presentation

Processor Technology
Sol-20 Terminal Computer
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Francis Bauer

July/August 2020