

When HP was designing the HP-92...



**HP-91s were used to build
HP-92 development systems...**



An HP-92 Development System



Zooming in
on the label...



Code Names

Many HP calculators had internal code names during their development. The following code names are known:

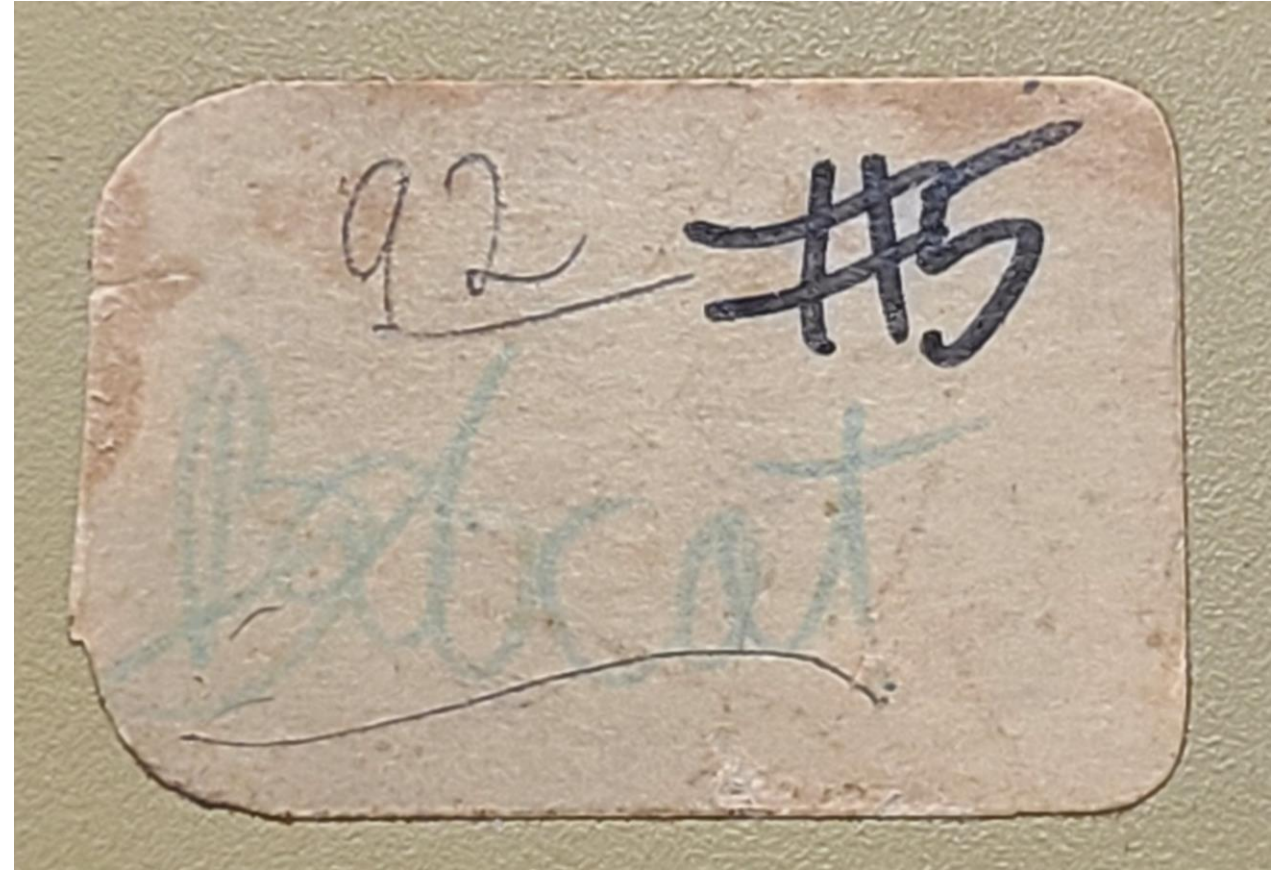
HP-91—Felix

HP-92—Bobcat

HP-97—Kittyhawk

HP-97S—Ricochet

Xpander—Endeavor



- Museum of HP Calculators



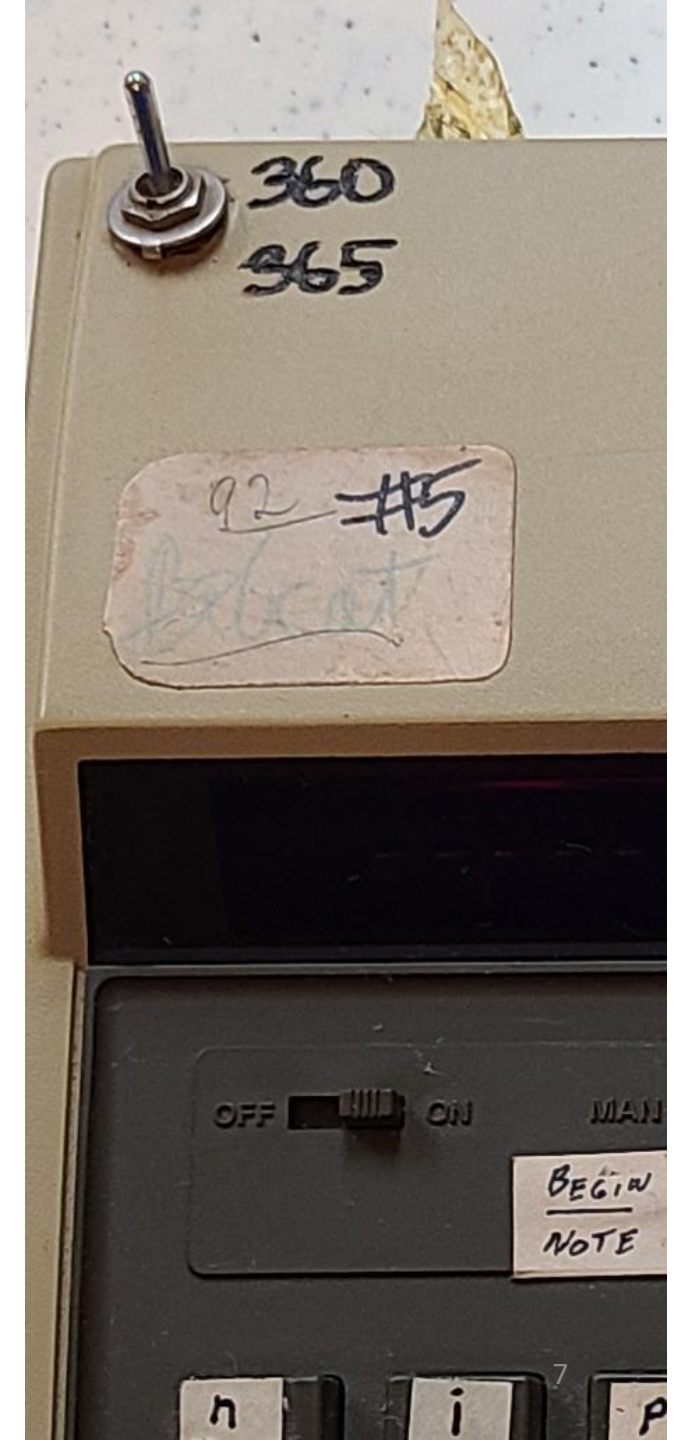
Remember the
development system
switch?

“Like the [HP-80](#), the HP-92 included bond price and yield, but it added call price, coupon amount, and issue, settlement and maturity dates. Also new were Internal Rate of Return calculations, and switches to select 365- or 360-day year calculations and begin/end of period payments.”

<https://www.hpmuseum.org/hp92.htm>

The HP-91 had 3 slide switches, the HP-92 has 4 slide switches with 2 new slide switch functions. The Bobcat development systems used a toggle switch for one of these switches (360/365).

For the Begin/End switch...



The HP-91 had trig functions and a Deg-Grd-Rad switch.

The HP-92 had no trig and repurposed the Deg-Grd-Rad switch to Begin/Note-End/Bond.



The Bobcat development system keyboard & display...



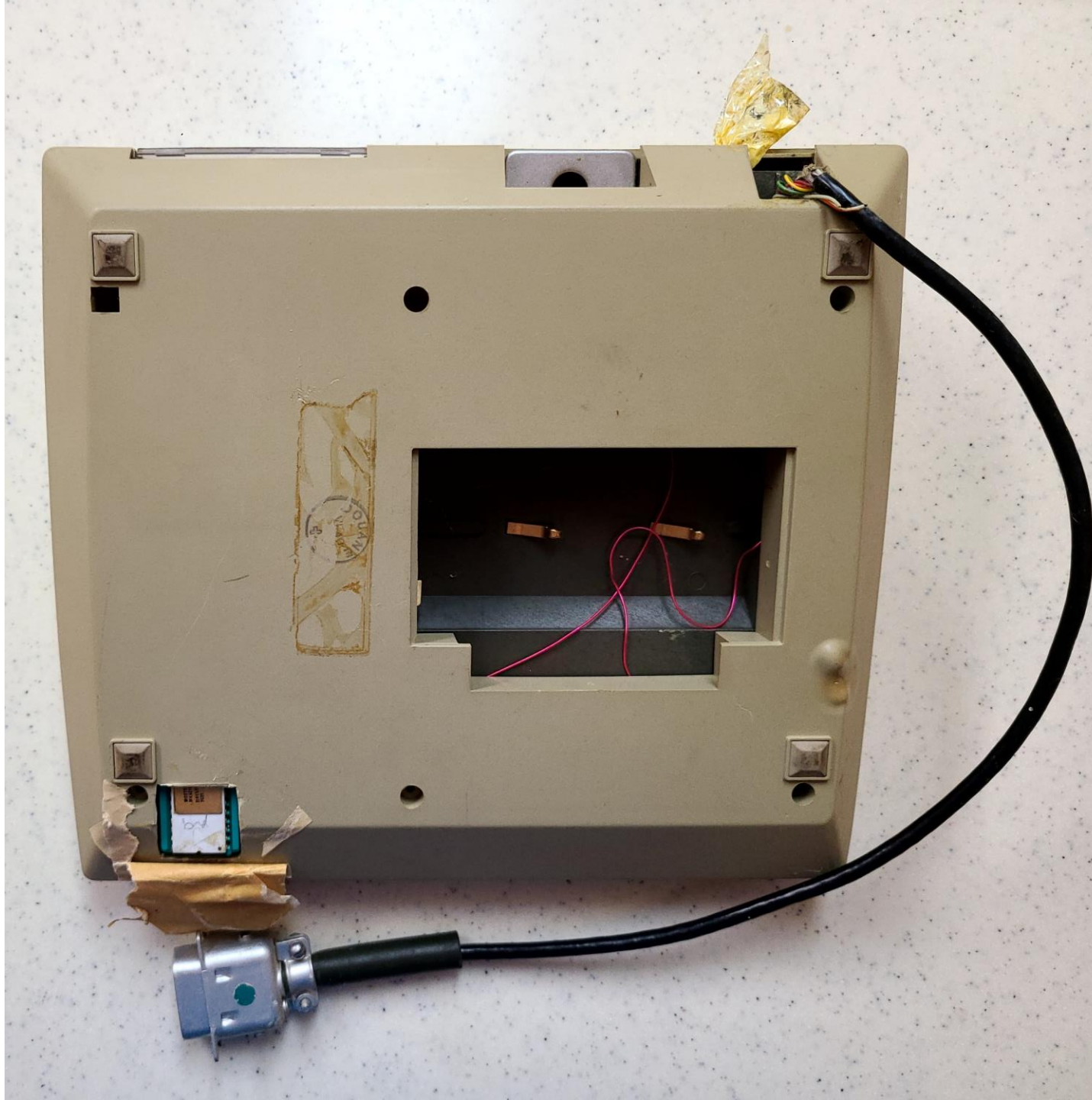


Larger view of keyboard...

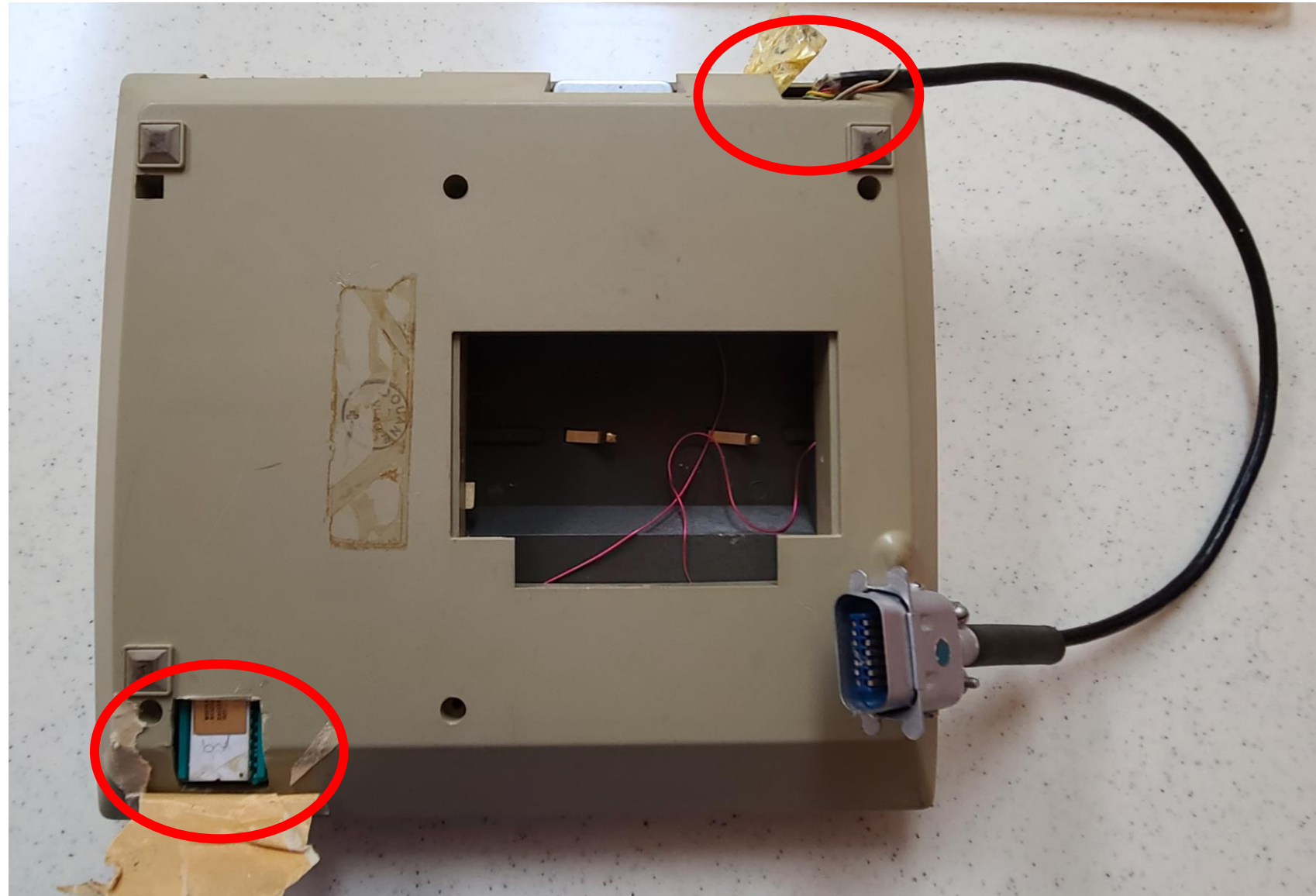
Comparing the
development
system
and
production HP-92
keyboards

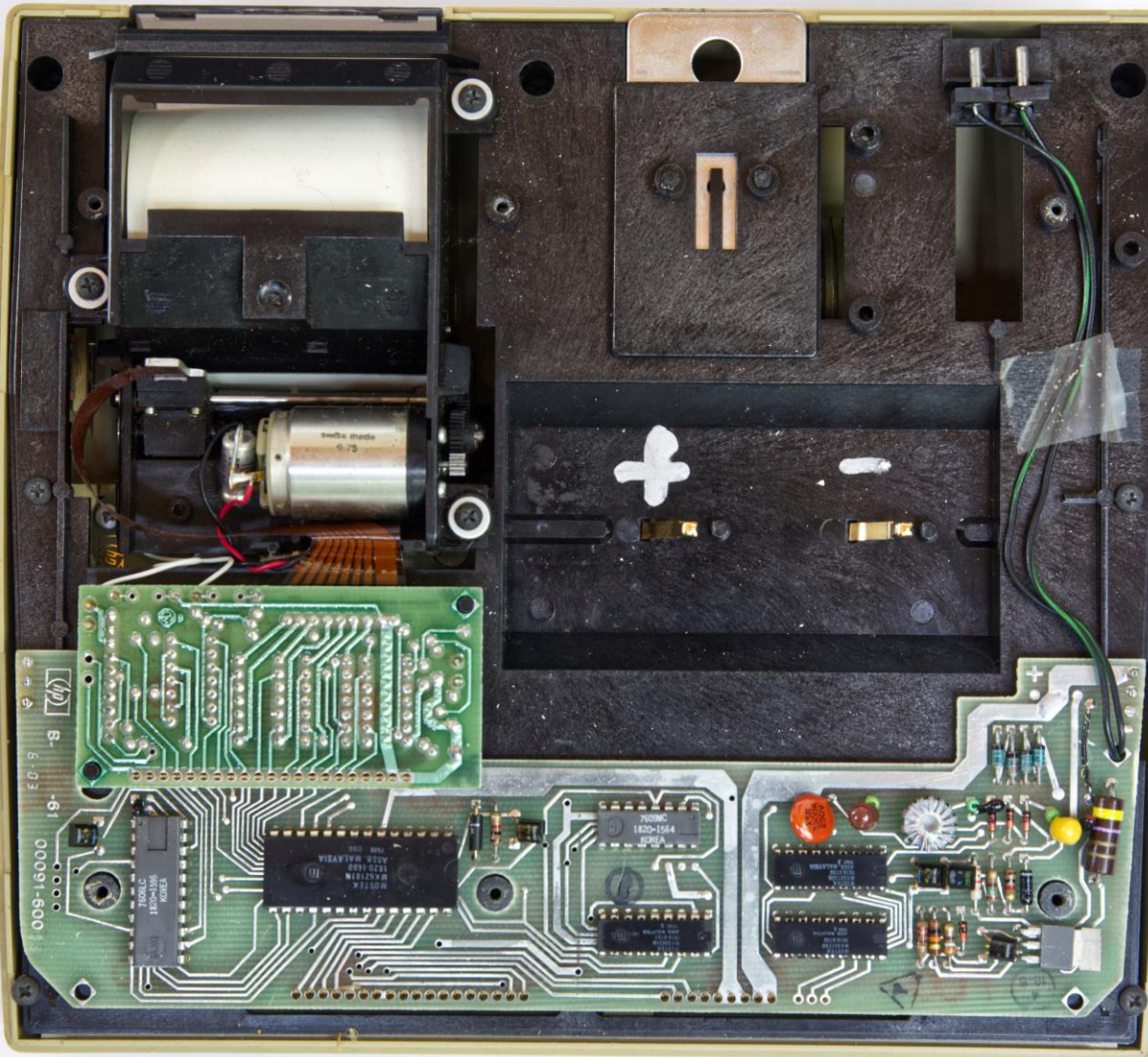


Looking at the
bottom of the
unit...

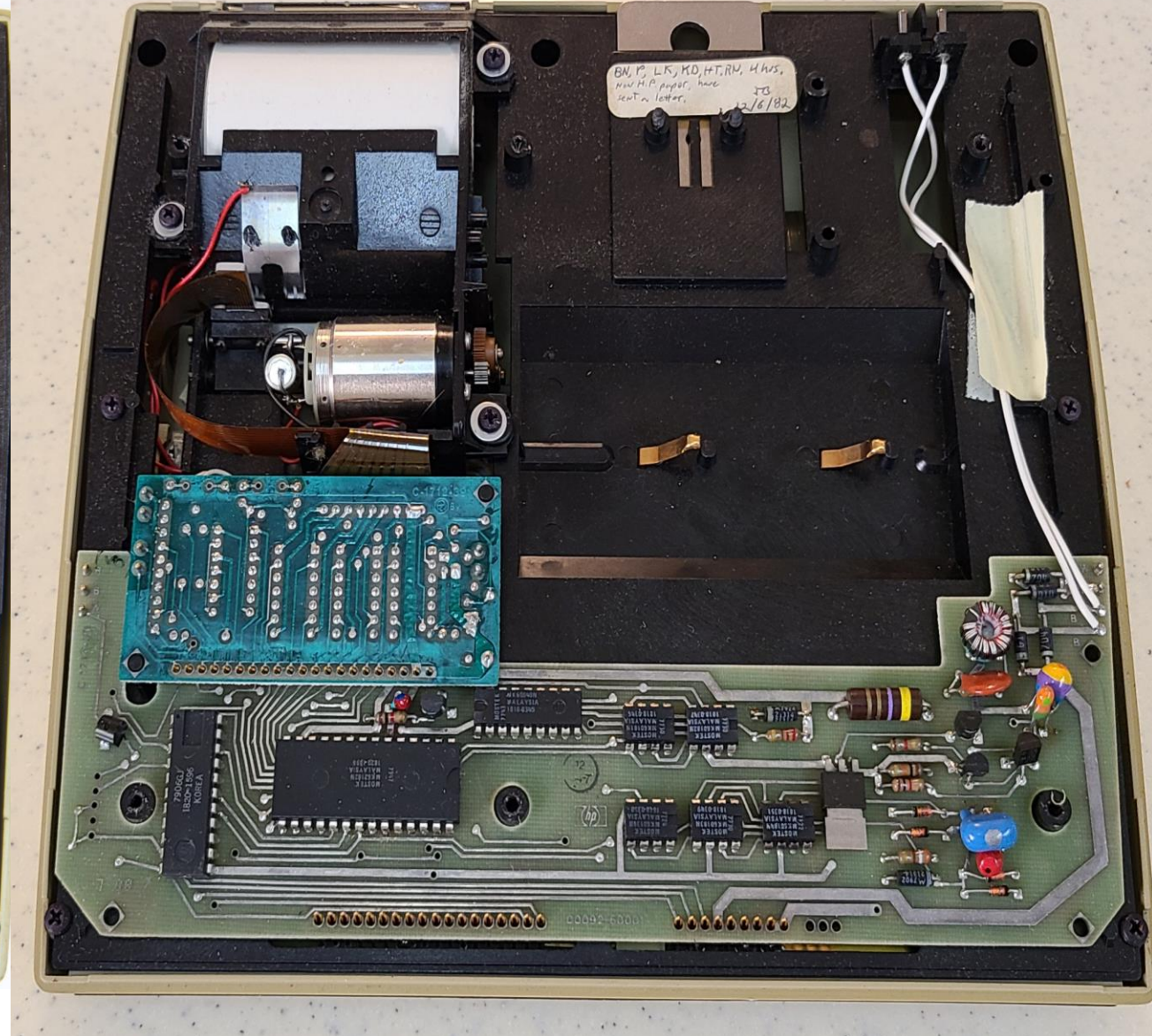


We'll see that the connector is for both power and data. I have no pinout documentation...



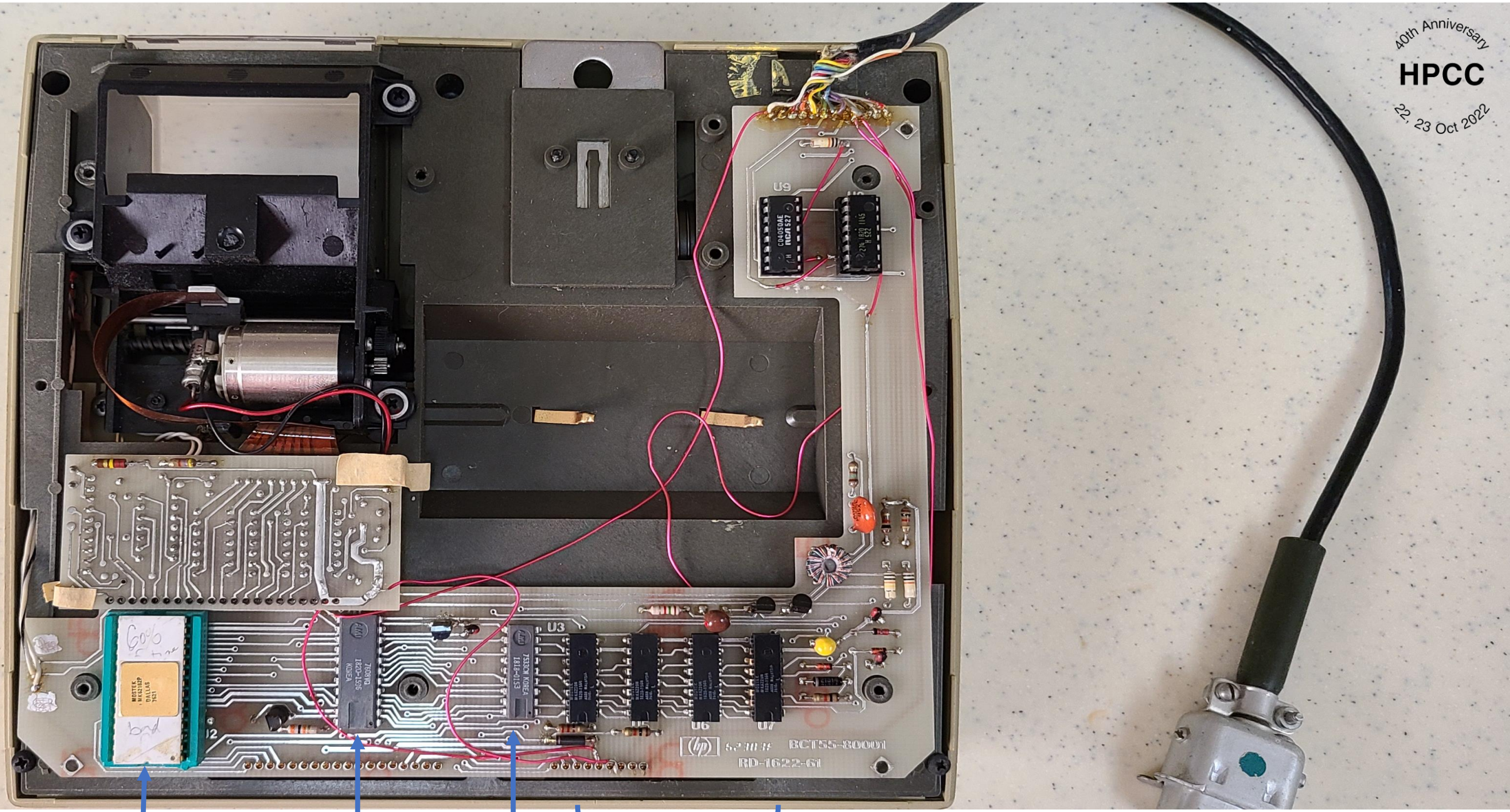


HP-91



HP-92

An inside look at the HP-91, HP-92 for reference



Pik

ACT

(1820-1596)

ROM0

for the display
(1818-0153)

4 RAM chips

for the 64 memory registers
(1820-1564)

- Thank you to Tony Nixon for identifying all but one of the ICs!
- HP part number reference list:
http://hparchive.com/Bench_Briefs/HP-Bench-Briefs-1987-10-12.pdf

Digital-to-Analog (DAC) Conversion

When a number is expressed in binary or binary-coded decimal and an analog voltage is to be produced to represent the number, the most practical way to perform this conversion is to add the currents having values proportional to the weights of the binary bits. Figure 1 represents a simplified binary weighted D/A converter. Switches S1 to SN represent the binary bits and connect either to ground or a reference voltage. Figure 1 shows switch S1 connecting R to the reference voltage and all other switches connected to ground; but since point A is a virtual ground, there is no current through 2R, 4R, up to 2N-1R. The amplifier has, therefore, a gain of $-\frac{5K}{10K} = -0.5$. If the reference voltage is -16V, the output voltages will be: R = 8V, 2R = 4V, 4R = 2V and for 8R = 1V. If S1 and S2 connect to the reference (the other switches to ground), the gain is $-\frac{5K}{6.66K} = -0.75$ and the output voltage 12V. The output is inversely proportional to the value of R.

The disadvantage of the circuit is high-value resistors representing low-weight bits. A better solution is a ladder configuration for groups of four bits as shown in Figure 2. Between each group of four resistors that represent weights of 1-2-4-8, there is a resistor that reduces the gain of the amplifier by 16 for binary and by 10 for BCD weights. This eliminates the need for high value resistors.

The D/A conversion is further simplified with the ladder circuit shown in Figure 3. Note that only values R and $2R$ are required.

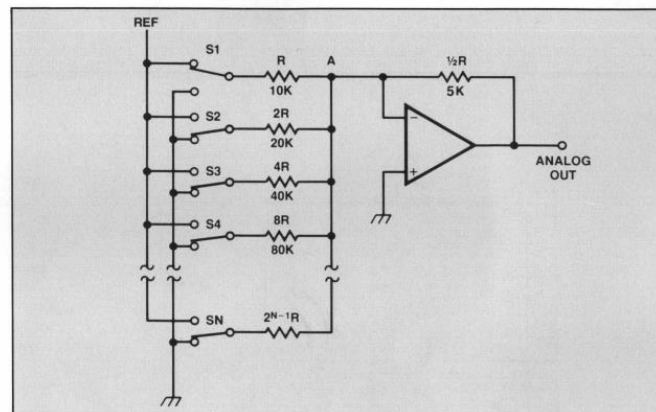


Figure 1. Simplified DAC

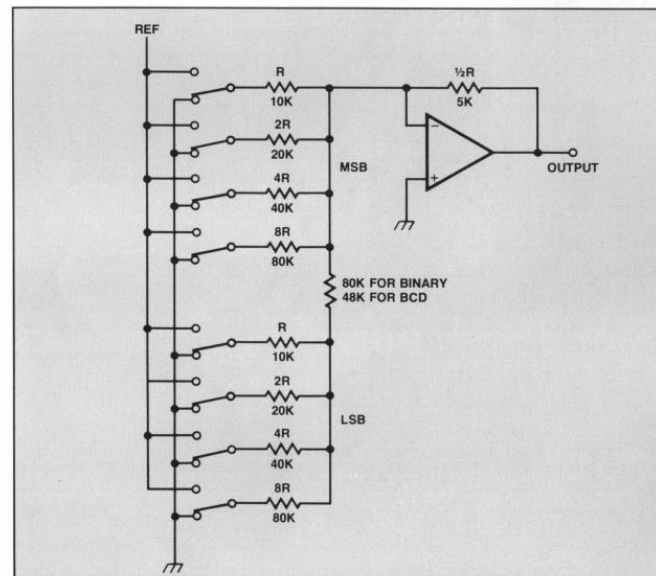


Figure 2. Ladder configuration DAC

Replacement Part Cross Reference

When selecting replacement parts for your HP products, you may notice that many manuals list only an HP part number for the part, even though it appears that this part is manufactured by one of the large semiconductor manufacturers. Service personnel often ask why only HP part numbers are listed.

It is recommended that HP replacement parts be used to ensure that the original performance of the product will be obtained. While some parts used in HP instruments are identical to that which can be purchased at a local electronics distributor, many times parts will be selected for certain characteristics, such as gain, bandwidth, capacitance, etc. There may also be slight mechanical differences, such as the shaping or length of leads, and in

some cases special quality checks are employed to ensure that only the highest reliability parts are used.

Therefore, we suggest obtaining replacement parts from HP to maintain the quality that you have paid for in your instrument. There may be situations however, where HP replacement parts are not in stock and substituting parts will allow you to return the product to service immediately. In these cases it may be worthwhile to see if a substitute part will work in the circuit. Perhaps an HP part could be ordered and installed at some later date.

To help you in these situations, here is a cross-reference of HP integrated circuit part numbers to manufacturers "generic type" part numbers (whom in most cases is the originator

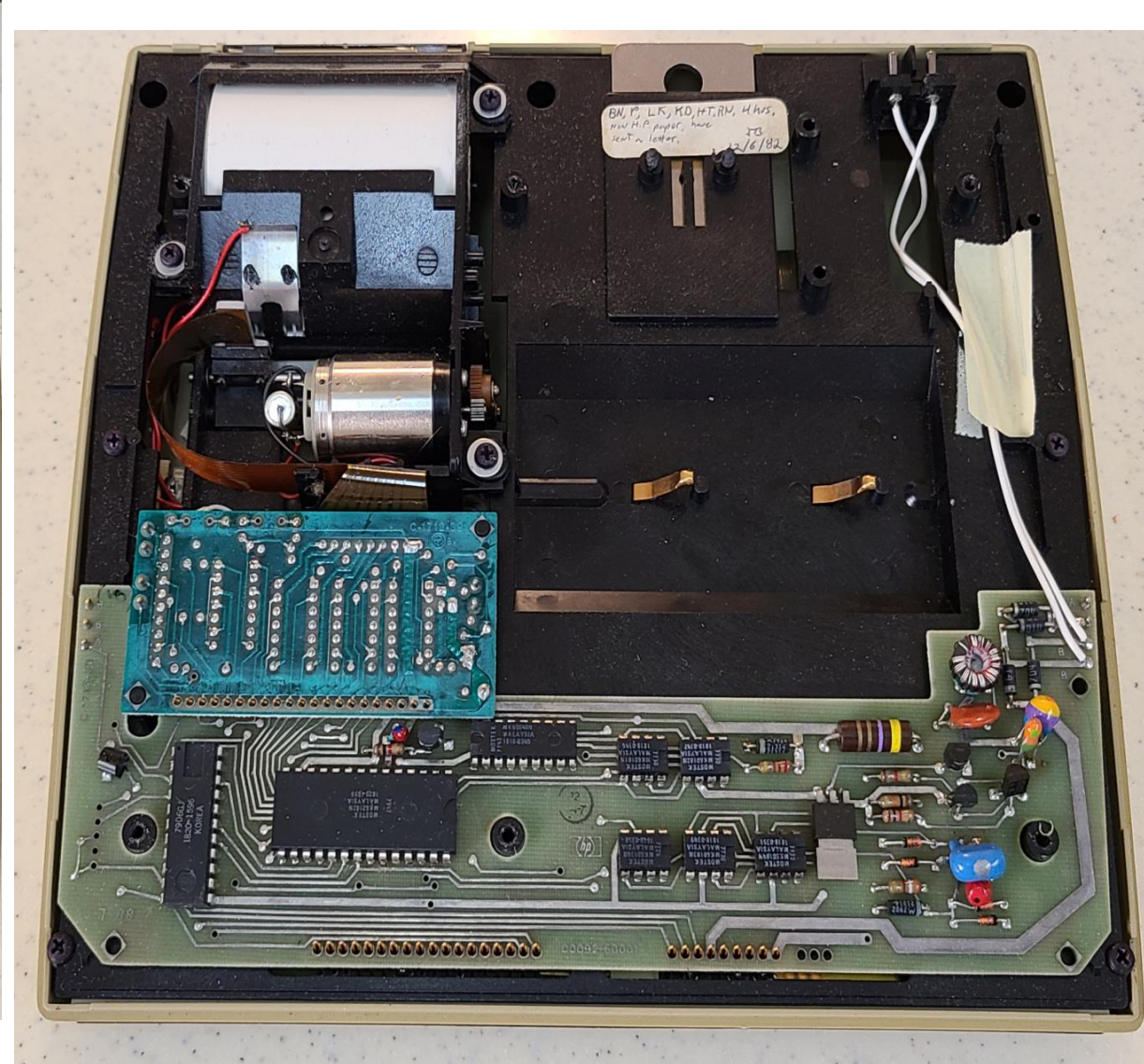
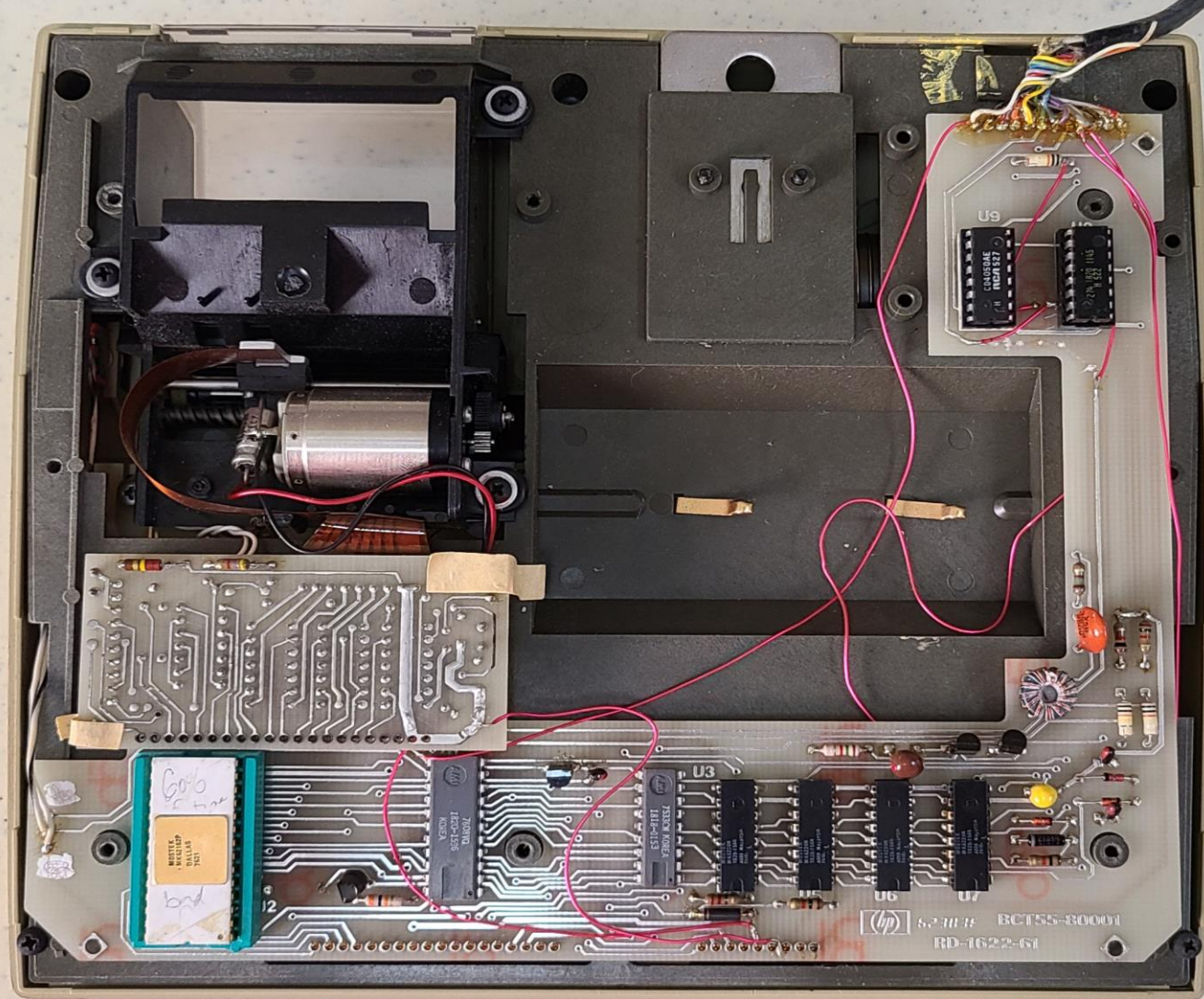
of the part). Even though the cross-reference only lists one manufacturer, there may actually be several approved sources for an HP part. While every attempt was made to ensure the accuracy of the list, it is advisable to compare the description of the device being replaced with the description of the substituted part. For example, if the service manual describes the device being replaced as a "dual J-K flip-flop", check this against the description of the replacement part.

NOTE

This is not a comprehensive list. If the part number you are looking for is not listed here, the semiconductor is made exclusively for Hewlett-Packard and there is no substitute—it must be replaced with the same HP part number. □

Manufacturers Code Number Cross Reference

No.	Manufacturer	No.	Manufacturer	No.	Manufacturer				
00039	NEC ELECTRONICS INC	MTN VIEW	CA US 9404380545	8	05917	SIFMA AB	STOCKHOLM	SW S 8136C0631	0
00046	UNIFRICO CORP	MA EXINGTON	MA US 0121730817	1	05946	VALCO DRUM	MA	CA 0203109540	0
00050	ESAM INTERNATIONAL SYSTEMS INC	SUNNYSIDE	CA US 4008554063	3	06121	RIENAS AG	MINICH	CH 8000	8
00075	WESTERN DIGITAL CORP	NEWPORT BEACH	CA 9262502840	1	06138	SSC ATES	MILAN	IT A1500	8
01425	STANDARD MICROSYSTEMS CORP	HAUPHAUGE	NY		06134	FUJITSU MICROELECTRONICS INC	SANTA CLARA	CA US 9505480167	6
01542	HIV OIL JSC	MA EX 051128480	8	06137	MITACHI AMERICA LTD	SUNNYSIDE	CA 9408640013	1	
01390	PLESSEY SEMICONDUCTORS	SANTA ANA	CA 9270554648	9	06134	TOSHIBA CORP	TOKYO	JP S0962	2
01698	TEXAS INSTRUMENTS INC	DALLAS	TX US 752601295	0	06194	FERRANTI LTD ELECTRONICS DIV	OLDHAM LANC	EG K1196	1
01876	HP DIV OF 2D IC S'IS	MA EX 050288480	4	06545	LAMBDA ELECTRONICS CORP	MELVILLE	NY 1174680013		
01951	GEORGE C SEMICONDUCTOR PROF DEPT	SANTA CLARA	CA US 0112312350	1	06551	SCIENTIFIC COMPONENTS GROUP	MA	CA 0252109514	1
01973	QI CORP	AUBURN	NY 1320103508	7	06861	NETI NETWORKS CORP	WORCESTER	MA 0160605097	29
01991	TRANSITRON ELECTRONIC CORP	WAKEFIELD	MA 0188024046	9	06916	SINT CORP	TOKYO	JP 141 S0482	1
02023	ITL SWITCHES	CHICAGO	IL US 6063104426	6	07050	SONIC POWER SYSTEMS	SANTA CLARA	CA 950505486	3
02041	TECHNOLOGICAL INDUSTRIES INC	TX ROSHARON	TX 0019594771	1	07121	SUPERIOR INC	SUNNYSIDE	CA S04986	5
02180	PRECISION MONOLITHICS INC	SANTA CLARA	CA US 9505406665	6	07171	SANTA ELECTRIC INC	TOKYO	JP	8
02237	FAIRCHILD SEMICONDUCTOR CORP	CUPERTINO	CA US 9501407263	6	07197	ENGINEERED COMPONENTS CO	SAN LAULIS OBISO	CA 93401	3
02290	KATHCON CO SEMICONDUCTOR DIV HQ	MOUNTAIN VIEW	CA US 9400709131	3	08132	HP DIV W4 CICO	CUPERTINO	CA	3
02568	RAYSON	MA EX 0112312350	1	08507	INTERTECH	SCOTT VALLEY	CA		6
02686	WATKINS-JOHNSON CO	PALO ALTO	CA US 9410414482	4	08565	COMPUTER LABS INC	GREENSBORO	NC	4
02713	GENERAL INSTRUMENT CORP (DICE)	HICKSVILLE	NY 1180124936	6	08608	SILICON SYSTEMS INC	TUSTIN	CA	2
02763	TELETYPE SEMICONDUCTOR	MOUNTAIN VIEW	CA 9403415818	1	08661	TELARIS TELECOMMUNICATIONS INC	IRVINE	CA	4
02838	DYNAMIC MICRODEVICES INC	WINCHESTER	MA 0189017101	1	08810	ROCHEMILL INTERNATIONAL	ANN ARBOR	MI	2
02882	ZELTEK INC SUB OF REDCOR CORP	CONCORD	CA 9450201795	9	09161	NETI SEMICONDUCTOR	KANATA OTTAWA	CN	1
02883	SILICONIX INC	SANTA CLARA	CA US 9505417856	7	09274	ANALOG SYSTEMS	TORONTO	AZ	2
02910	SONITECH CORP	SUNNYSIDE	CA US 9408418264	8	09281	TAPES SEMICONDUCTOR	SAN JOSE	CA	1
02945	MONROD DEVICES INC	MONROD	MA US 0266224355	4	10953	INTEGRATED DEVICE TECHNOLOGY, INC	SANTA CLARA	CA	3
03129	AVANTIX INC	SUNNYSIDE	CA US 9505424539	2	11021	DATA-INTERTEL	MANHATTAN	MA	8
03406	NATIONAL SEMICONDUCTOR CORP	SANTA CLARA	CA US 9505227014	6	11041	EPSON CORP	TORRENCE	CA	6
03545	TELETYPE PHILBRICK REUSIS	FERHAM	MA 0202624812	1	11058	LINKER TECHNOLOGY CORP	MILPITAS	CA 95035	9
03677	AMERICAN MICRO SYSTEMS INC	WINDHAM	VT 0569114717	1	11081	THOMSON-CSF	CHRYSLER	FR	2
03688	ANALOGIC CORP	WAKEFIELD	MA 0180338184	9	11111	SEK TECHNOLOGY INC	SAN JOSE	CA	2
03714	INTERTEL INC	CUPERTINO	CA 9501434293	3	11302	MAXIM INTEGRATED PRODUCTS	SUNNYSIDE	CA	7
03755	HYBRID SYSTEMS CORP	BURLINGTON	MA 0185032556	4	11330	ATI TECHNOLOGY	CHICAGO	CA	2
03780	HYTRON INC	SANTA CLARA	CA 9505939661	6	11347	SIMPRES SEMICONDUCTOR CORP	SAN JOSE	CA 95134	0
03793	SILICON GENERAL INC	SAN JOSE	CA 9513143333	7	11452	ANALOGIC AUTOMATION PRODUCTS DIV	ANALOGIC	CA	6
03794	ADVANCED MICRO DEVICES INC	SUNNYSIDE	CA US 9408643335	5	11561	RELIABILITY INC	TIFFANY	NY	8
03799	HARRIS CORP	IRVINE	CA 9261434371	1	11596	CIRCUIT TECHNOLOGY INC	FARMINGDALE	LI	4
03811	NEC CORP	SANTA CLARA	CA US 9505414644	7	11604	COMLINEAR CORP	LOWLAND	CA US 80537	6
03947	NCR CORP	DAYTON	OH US 044794740	4	11668	ROCKWELL INT'L SEMICONDUCTOR DIV	NEWPORT BEACH	CA	1
04077	CERMETEX INC DIV REPUBLIC CORP	MOUNTAIN VIEW	CA 9404505007		11688	GALAX MANUFACTURING CO INC	PLEASANT HILL	CA US 94523	9
04083	ARMATEK CORP	BURLINGTON	VT US 7500550088	2	11825	ANALOGIC SYSTEMS	CINCINNATI	CA US 94518	7
04092	MONOLITHIC MEMORIES INC	SANTA CLARA	CA US 9505459364	3	11943	SILERSA SEMICONDUCTOR	SAN JOSE	CA US 95132	1
04200	SPRAGUE ELECTRIC CO	LEXINGTON	MA US 0217356289	2	12125	SAMSUNG SEMICONDUCTOR INC	SANTA CLARA	CA US 95054	1
04507	TIM INC	CLEVELAND	OH US 4412471785	1	12147	TELMOR INC	SUNNYSIDE	CA US 94086	5
04516	TECH-DRUM CORP	MA EX 0112312350	1	12276	TELMOR GAKKI CO LTD	TOKYO	JP 438-0		
05542	MINNRETAIL INC	MINNEAPOLIS	MN US 5540891929	6					



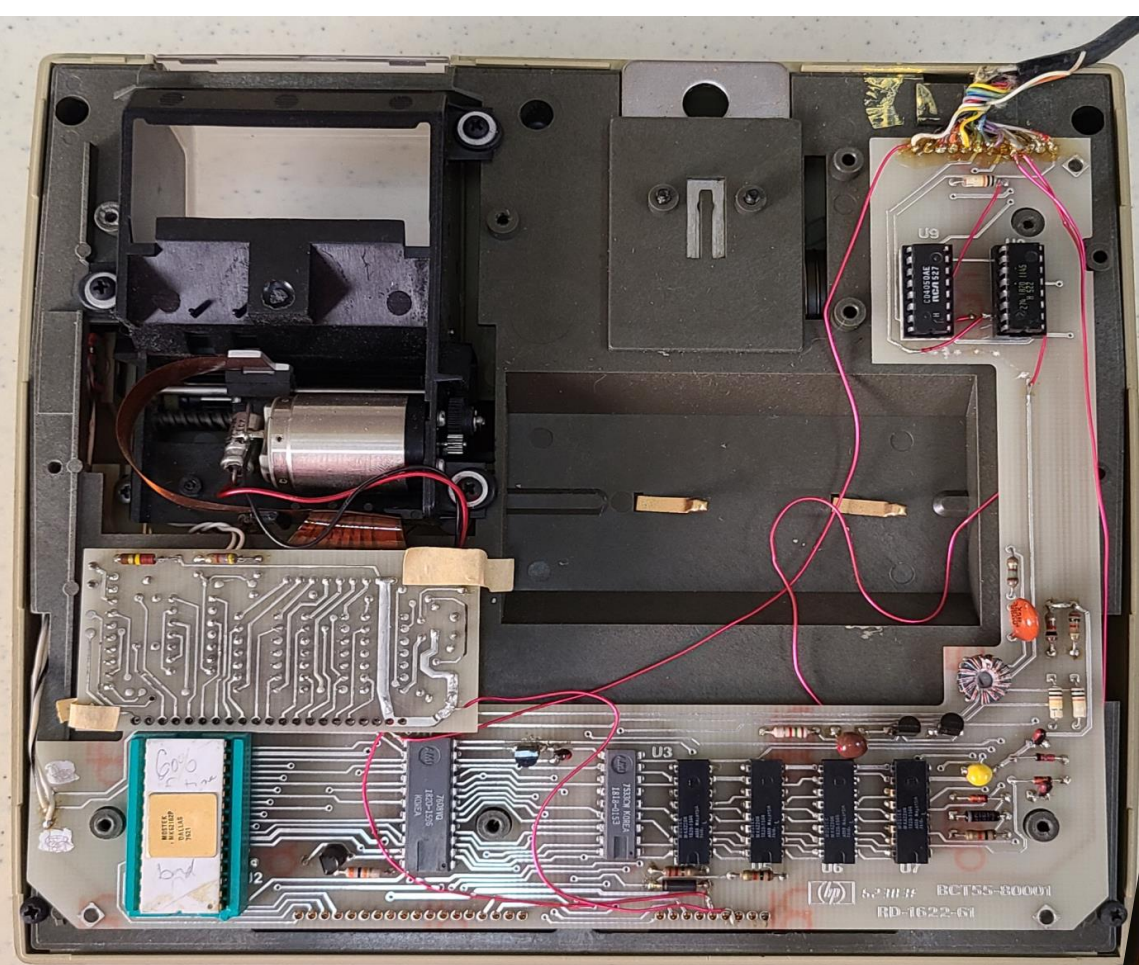
Bobcat Dev Sys

HP-92

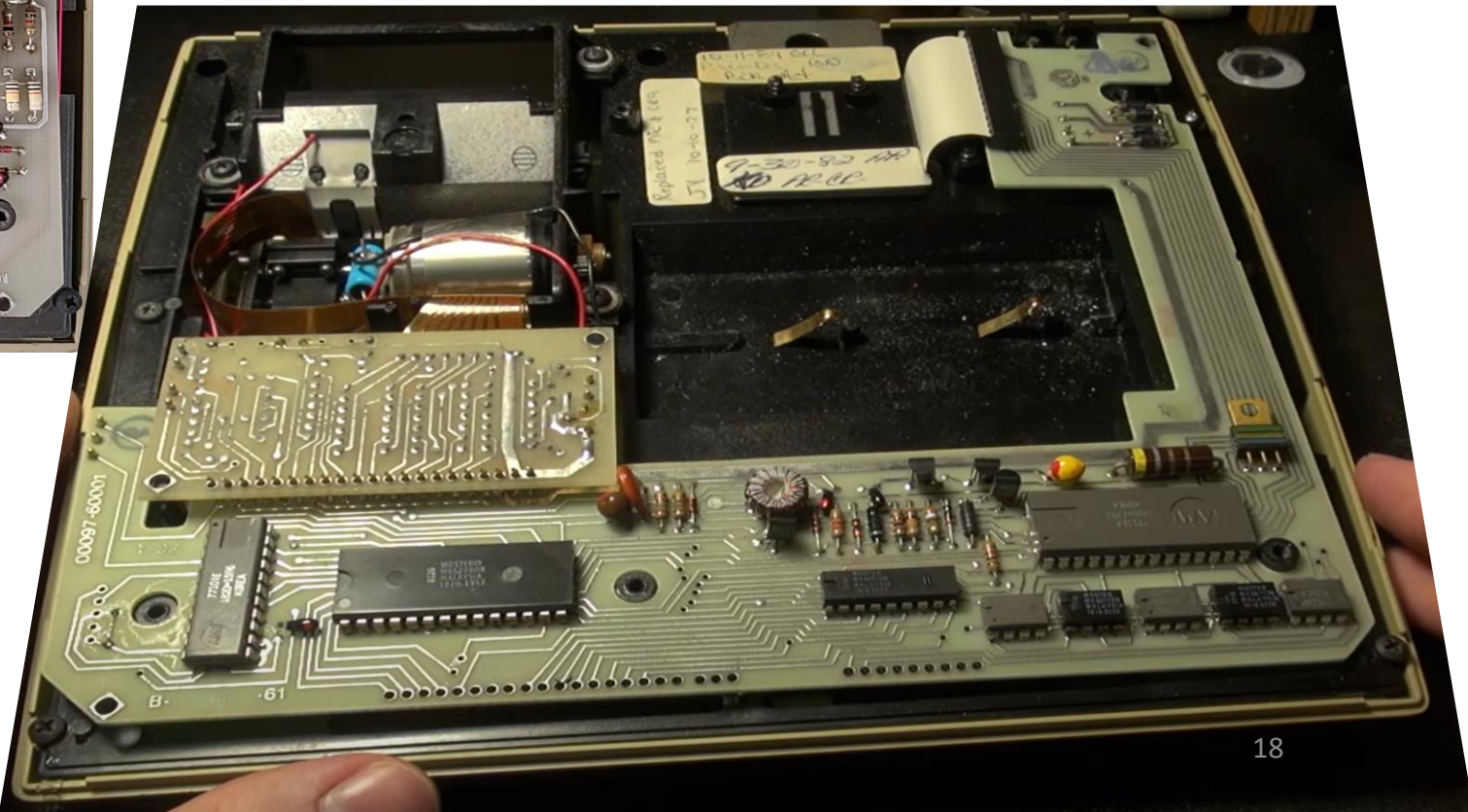
For Comparison

For Comparison

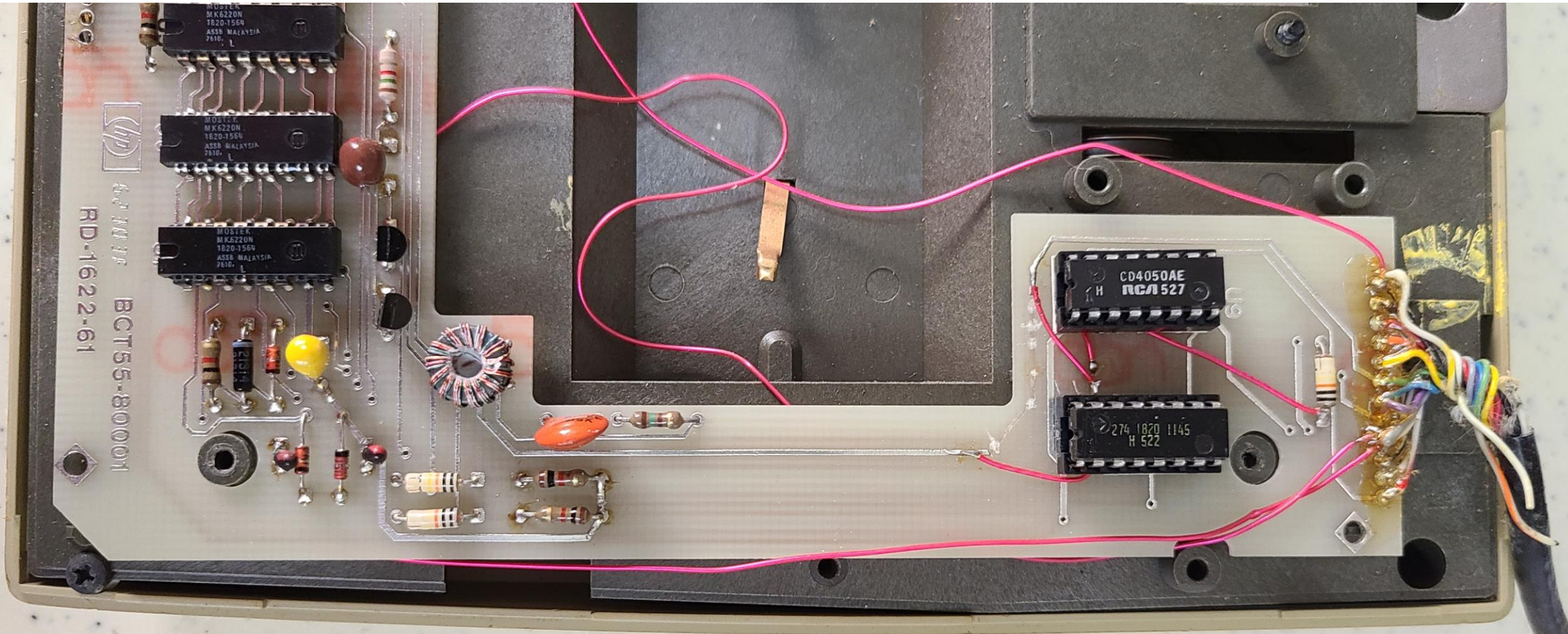
HP-97



Bobcat Dev Sys

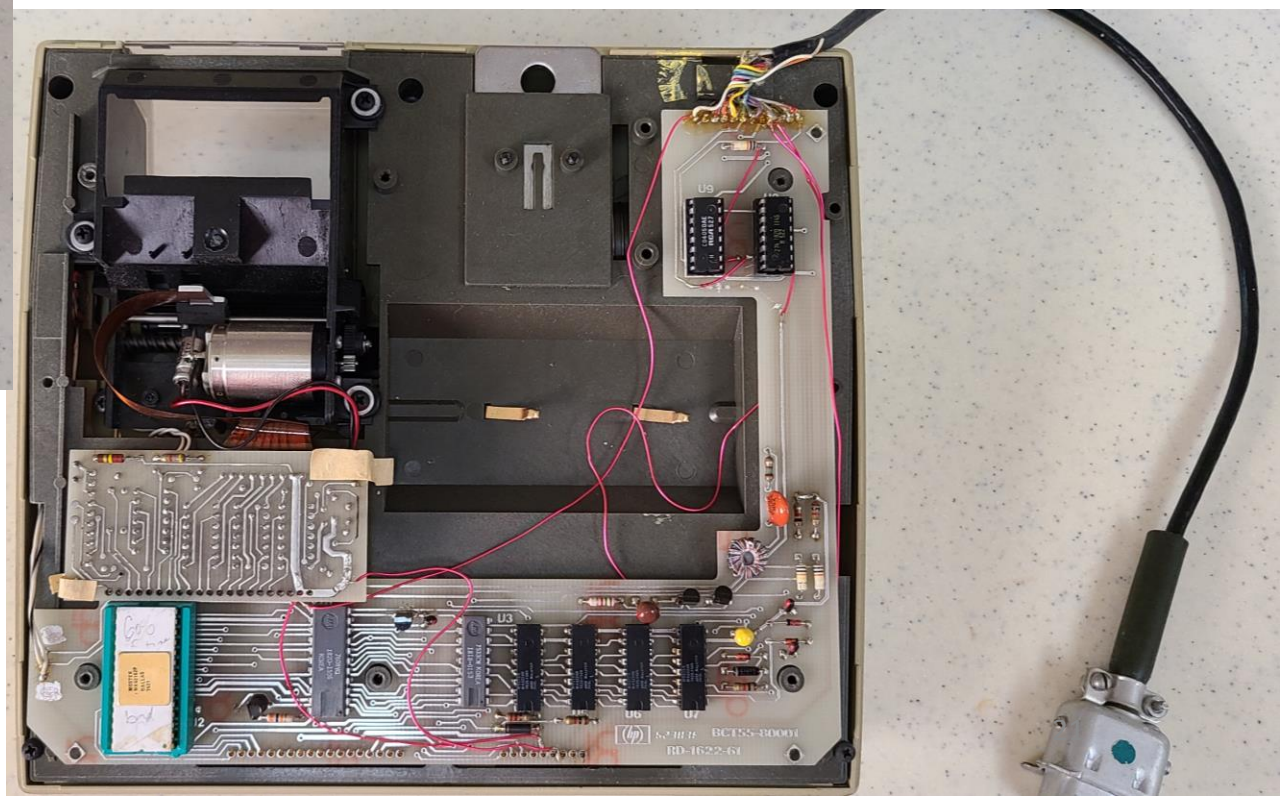


A Close-up of the cable connection...



The unit is also likely non-working
given the writing on the socketed
PIK IC... 😞





Thank you!

40th Anniversary

HPCC

22, 23 Oct 2022