--- A WORD FROM THE EDITOR -----

## HERE WE ARE AT LAST; THAT'S NICE--WHERE WE GOING FROM HERE?

SORRY WE'RE LATE, but we think the wait was worth it.

We've got three really neat things here:
- --a computer from Central Data that is incredibly cost effective, yet more flexible, better video than almost any other,
- --a capable group of users, that are even interested in writing an APL interpreter,
- --one of the best newsletters anywhere, to bring it all together.

What do you want from your newsletter? We are really serious in asking that. While working on details for four months (Ugh!), we piled all incoming correspondence in a box and didn't look at it until about a week ago. Wish now I had read it as it came in, and answered some of your questions, but of course that probably would have set us back a bit more. In the rush to get this out, we saw Mike Kelley's (9951 Delco Ave, Chatsworth CA 91311) request for enclosure plans. An enclosure was to have been in this 1:1 issue, but was deleted for reasons of time and space. My reaction was not to write a "Sorry, Mike" note, but to get out the drawing board and get that enclosure finished. It is pictured here somewhere, and complete plans have been added to our manual supplement.

Mike also asks about power supplies, keyboards, TV modifications. Thanks, Mike, hope we, and readers, satisfactorily deal with these subjects, both in this and future issues.

What is the purpose of User Notes? To answer all your questions about this 2650-based device? Would you believe that we take more seriously our responsibility to ask questions? We've got hundreds of brilliant people out there. You'll be happy to know we have no pretentions of being able to dazzle all of them with our ingenuity--not all the time. We'll be satisfied if in each issue we present sufficient challenge that by next issue we will have excellent reader response. You are User Notes, and we hope never to forget it--and you.
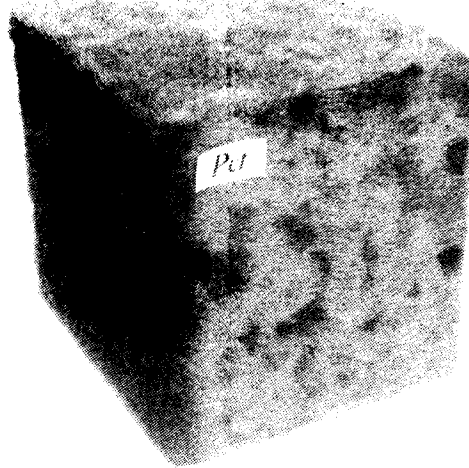
HAIRY COMPUTER--Case design uses two sets of hinges so that everything folds out of way when open for servicing. Made of scrap Masonite, we covered with fake fur, but any material would do, even paint. Somewhere else we saw a computer marked "PET", and when we did, were offended by hard plastic. Who's the guy in the funny hat, running over here? Full construction details in User Group Manual Supplement, available now.

HOW TO WRITE FOR 'USER NOTES'

LEGIBLY. All but program listings and flowcharts are edited and typeset.

This, we think, takes much of the tears out of writing. Your mistakes, if uncaught, become our mistakes, and you can gripe instead of blush.

Do not, however, assume that everyone knows what you have, and just mail us something, like a program listing. We're amazingly dense, and refuse to simply put things in the newsletter, in hope that everyone else will understand. Use frequent "Hey Stupid"'s, if it will help you write on a very basic level. Include photos, if you wish. We prefer negatives, any size, with SASE for return.

HOMEBREWERS

Michael A. Burke of Synetics Electronics (would you believe 123 Coal Alley?), State College, PA 16801 is using the Central Data board in an otherwise completely homebrew system and has developed some interesting mods and additions to the board, including a very (all caps) simple-to-build interface, and program hardware push-down stack. We look forward to details in future issues. More from Michael under software.

Mel Smith, 8970 Linden Lane, La Mesa, CA 92041, has had a homebrew system up for some time. He also has friends in Guam who are 2650 enthusiasts. Practically a neighbor of Notes, this reporter is red faced about all his knowledge of Mel's machine. Mel is quiet, and your reporter gabby, and therefore late with the story. Maybe next issue--with pictures.

James C. Harris, Jr., Rt 1, Box 45-A, Blue Ridge Summit, PA 17214, has been using the 2650 in systems for design and his own personal use for about a year now. How about telling us more about it, James, for future issues? Don't forget pictures, if you can manage.

Jose R. (Joe) Coroas has been using a homebrewed ABC-card version of the 2650 for data logging when calibrating radiometers. Joe is supervisor of laboratory, shop and test division, Southern California Edison Co., in Alhambra. Joe checks-out radiometers (which in turn check-on the sun) purchased by utilities throughout the West. How did he manage taming a microcomputer, from scratch? "I started with a bare 2650 and slowly built it up", he explains.

Oh yes, Joe's system includes 6K of low-power RAM, 2K of PROM, 2 non ext. (what's that?) I/O ports, 8 ext. (?) input ports, a SwTP CT24 TV typewriter (300/1200 baud)

Dave Maciorowski, 173 Oakland Rd., E. Pepperel, MA 01437, typed and edited his letter to Notes on a PDP-11/05. That sure is lots of bucks for producing funny-looking, all-caps toy typewriter print quality. Wouldn't it be nice if our computers put out a pretty face when they printed? Dave's home system includes 2650 processor, 2K x 8 of 1702 EPROM, a 16 x 64 video display, ASCII keyboard, parallel and serial interfaces (including 20mA current loop and breadboarded cassette interface). Even the 44-pin bus is of his own design. How about pictures, and details, Dave?

COMPUTERIZED DIALING

COMPUTERS ANSWERING and dialing telephones. Sounds expensive.

Can be. You can get an S-100 modem board for $280. Or you can build the circuits on page 3, or buy Howard Berenbon's "Telephone with Byte" programs for $15.

Howard, doing business as Software Exchange, 2681 Peterboro, W. Bloomfield, Mich 48033, has written his programs for the 6800.

Why am I reviewing 6800 software? You could buy Howard's programs, and translate, then sell the translations back to him so we all could buy them. Or you could independently write it, and we would give you publicity, even sell it for you, if you wanted. (In that case, we would check to determine that it was independently developed, not a translation).

Howard's dialer program, $9.95, allows you to access 650 variable-length telephone numbers, using any combination of two alphabetic characters (that would give 676, Howard).

Typing an "L" lets you load a number, "@" erase while loading, "S" tells it to search/dial, "ESC" lets you exit any of the modes, and "R" lets you "reload", or add numbers to your list without disturbing numbers already loaded.

Hardware required is one PIA (6800-6500-based system parallel output), uses a 6Vdc 500-ohm relay and transistor.

I'd like to see variations of this system, that combine telephone numbers with mail addresses. Howard has a mini text editor/mailing list loader-printer program, $3.95.

The telephone answering program, $4.95 has more bulk than the $10 program, 6 pages, and may be better documented. It answers the phone with a 20-sec announcement, records a 20-sec message.

Hardware required includes two tape recorders, one endless-loop tape, and it too uses the PIA (same one as dialer). His ring-detect circuit is different from GE's, at right, and uses a neon light for detection, in combination with a CdS photocell. Very clever!

Documentation is printed well, despite Teletypewriter-produced all-uppercase letters.

Let's have some reader input on using the Central Data computer these ways, plus using its serial port to make a big computer think it is talking to a modem.

TELEPHONE CIRCUITS

TELEPHONE-ASSOCIATED applications seem certain to be explored by Central Data Co. computer users, so here are some data that may be useful in getting group members started.

First, for the record, we want to make clear that we are not recommending that anybody connect anything to any Telco lines. Ma Bell would kill me! Use your tape recorder speaker and microphone, and acoustic coupling. Please.

Your Kansas-City-standard tape interface should be great for communicating with others on the same standard, once you have a few formating details straightened out.
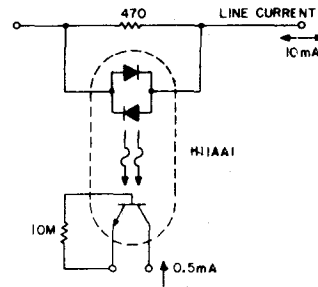

POLARITY INSENSITIVE LINE CURRENT DETECTOR

LINE CURRENT DETECTION--Maybe you want your computer to be able to know that you are using the phone, so that it won't bug you, or decide to call Hal. Objectives should be minimum-unbalancing or loading of the line. Also, relatively high levels of 60 Hz induced voltages must be ignored. This design allows line currents of either polarity to be sensed without discrimination, and will ignore noise up to approximately 2.5 mA.

Want automatic answer capability. Don't try this unless you have your own telephone system. Tell your computer to answer only inter-system calls, no outside calls. Motel owners are going to love this.

RING DETECTORS--These circuits are designed to detect the 20 Hz, 86V rms ring signal, using GE optoisolators, and are taken from the manufacturer's book "Optoelectronics".

GE says the circuits are "bare bones" designed to illustrate concepts and do not eliminate the AC/DC ring differentiation, 60 Hz noise rejection, dial tap rejection, etc.--effects it says must be considered in field application.
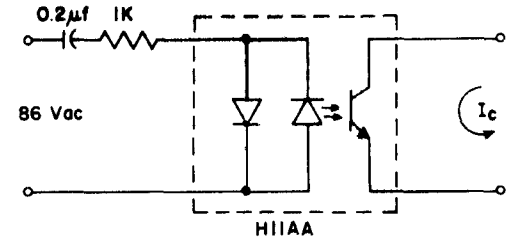

RING DETECTOR 1--Even simpler than the one GE calls "simplest", from the back of the book (page 152). When the 86 Vac ring signal appears, the output transistor of the H11AA AC-input-photon-coupled isolator is turned on. Isolation is up to 1,500 V
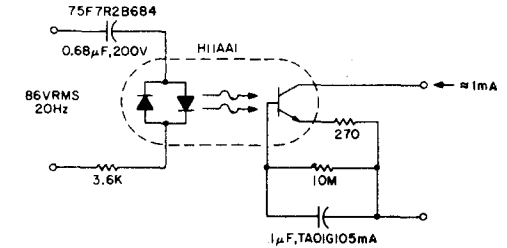
RING DETECTOR 2--Provides about 1 mA signal for a 7 mA line loading about .1 sec. after initial ring. This delay provides a degree of dial-tap and click suppression, as well as filtering out the zero crossing of the 20 Hz wave. GE shows an expansion of this, with a transistor and SCR added, which can power up to an 800 W load. (Wow! Ring signal turns on hotplate, which boils water, which sounds steam whistle, right Rube?).

If lower line-current loading is desired, GE has some suggestions, which we won't bother with.

DIAL-PULSE INDICATOR--Want your computer to monitor your line and prevent unauthorized toll calls? This circuit, with capacitor filtering, rejects high levels of induced 60 Hz noise. The DHD805 provides reverse-bias protection for the LED during transient over-voltage events. Capacitive filtering removes less than 10 msec. of the leading edge of a 40V dial pulse, while providing rejection of up to 25V RMS at 60 Hz.
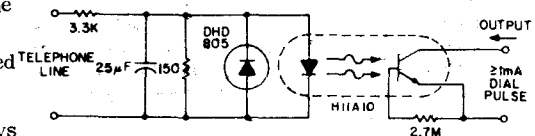
DIAL PULSE INDICATOR

SOFTWARE HACKERS

Mel Smith (also see Homebrew) was writing his own Basic, but now with Jeff Roloff's available, doubts he will finish. How 'bout some extensions of Central Data 4K Basic, Mel? Or a Pilot for educational use?

APL anyone? Michael A. Burke, Box 1008, State College, PA 16801, asks if anyone would like to join him in developing an APL interpreter for 2650, and joining the Byte APL contest, see Carl Helmer's piece in the August issue. Mike, who has that fantastic Coal Alley address (see Homebrew), would like to "uncover any 2650 users" in his "neck of the woods".

Joe Coroas, the SCal EdCo instrumentation whiz (see Homebrew) points up the problem homebrew and Central Data users are going to have getting together. He is on Signetic's Pipbug II, and says he would be happy to share his data logging programs. Joe has all but one Signetics ' applications note, and would be glad to share them if anybody is in a pinch for one. He needs AS 56, sorting routines. Anybody care to send him a Xerox? He's looking for a Basic, and at time of writing probably hadn't heard of Jeff Roloff's. Signetics has a big Basic, Joe, that probably would work on your Pipbug II system, but who knows if they ever will let anybody have it? Isn't that a pip! An informed source said it was commissioned by two divisions, jointly, but that one division pulled out of the deal, leaving the other division to pay the bill. The group that dropped out is the one that would have marketed it. If anybody mentions this to Signetics, say you read it in Dr. Daub's Journal of Dermitology, or Rolling Stone, or something. Give credit where credit isn't due, or our information sources may dry up. Would it matter? I doubt it.

Dave Maciorowski, our E. Pepperell, MA ham (WA1JHK), see Homebrewers, has modified Pipbug for CRT and keyboard. He had Central Data software on-order, and on the drawing board is a multitask operating system for use in a multiterminal, real-time environment. We want to hear more on that Dave. Incidentally, we may have misspelled Dave's name. No way of telling, the way that rinky PDP-11 rolls that stuff out in all uppercase. We simply have to have a $100-$300 typewriter-quality printer for these inexpensive computers.

Tony E. Pajnic, 3859 Cloverdale Rd., Medway, OH 45341, says his basic interest in computers so far has been hardware, so he is weak in software and programming. Wants name of a book on 2650 programming. Says there is plenty information on 8080 etc., but so little on 2650. Well--I recommend Kemeny and Kurtz' "BASIC Programming", 2nd edition, John Wiley & Sons, New York. Third edition will be out next year some time, but don't wait. How about some readers giving Tony, and the rest of us, a straight answer on that question.

Richard Peterson, Iowa-Illinois Gas & Electric, 206 E. 2nd, Davenport, Iowa 52801, has written a set of macros which allow 2650 assembler source code to be processed directly by the I-IG&E IBM-370 assembler. Isn't that a clever way of getting your software up, even before you have assembled all the parts for your computer! He's working on a subroutine call/return processor with a stack depth of 128, and a game of "life" that will fit in the on-board user memory of 750 bytes. Neat! We want to see it, Richard. He enclosed a printout of his call/return processor subroutine, and sample 370/2650 macro cross assembler output, but this dummy doesn't know what to do with it. I do not yet know what is valuable to people, and what is not. Come-on, let's have a little reader feedback-- raise a little hell with the old editor, will you?

APL FOR 2650?

Someone's got to be kidding! Maybe not. While the 8080 and 6800 crowd is still trying to figure out how to display the funny squigits, Central Data 2650 owners can be well into writing the interpreter. The Central Data computer is the only reasonably-priced machine that lets you program your own display ROM.

'COMMON BASIC PROBLEMS'

WE'RE ALL going to need to start building program libraries, and with Basic about to be shipped, maybe here is a book we all could use.

It is "Some Common Basic Problems" by Lon Poole and Mary Borchers, $7.50, published by Adam Osborne & Assoc., Berkeley.

This is the start of a new series of books, payroll with cost accounting, accounts payable, receivable, and general ledger--all due out before year end. They are written for small Basic, and are said to be usable on most small systems.

We don't have Basic yet, and haven't run these programs, but they look like they would run on 2650 Basic, and this first volume has a lot of useful programs.

CHARACTER DISPLAY ROM

JOE, DOWN THE STREET, has a computer in which he has tied up maybe only a dozen dollars in the character generator ROM. Many of us want both upper and lowercase display, so we are going to have $58 tied up in our character generators. Are we nuts?

Not at all. First off, we have very cost effective systems, despite $58 character generators.

But primarily, we have a flexibility we couldn't have with other systems.

Supposing Joe wanted his computer to help him learn a foreign language, or work in one? Probably every foreign language requires a custom display ROM.

Supposing Joe wanted to use his computer with APL, and that a translator were available. How would he display the queer APL squigits? No trick with the Central Data computer.

How about a musical application. Ever see a VDM display musical notation?

And here is an application that shows great promise. In courtrooms throughout the world, someone sits fingering the funny StenoTyper keyboard, that strange little machine that sits on a tripod. When that court reporter gets out of court, he has to transcribe that adding-machine-like tape into written English (or Hebrew, Hindustani, or whatever the language).

A San Diego word processing firm is just now congratulating itself on having typeset a two-million-word document filed with the U. S. Court of Appeals, the largest such task in history. It is larger than two large-city phone books.

Let me quote: "The preparation started in February, when attorneys submitted material from over 20,000 pages of jury transcript. Pages were typed into a computer system. By using a computerized system it was simple to edit and revise the work. Then the decision was made to file a joint appendix, so the opposition selected their (its) text. New sections were merged with old--an easy task for a computerized text management system--and the chronological order of the transcript was maintained. Documents were edited and revised by counsel for the plaintiff, then again by the defense.

"Hours of valuable attorney's time were saved by using the most modern word processing techniques. Traditionally, firms prepare materials for typesetting by typing perfect

	0490		04D0		0510
7C	.XXXXX..	3C	..XXXX..	3E	..XXXXX.	42
42	.X....X.	42	.X......X	08	....X...	42
42	.X...X..	40	.X......	08	....X...	42
7C	.XXXXX..	3C	..XXXX..	08	....X...	42
50	.X.X....	02	......X.	08	....X...	42
48	.X..X...	02	......X.	08	....X...	42
44	.X...X..	42	.X....X.	08	....X...	42
42	.X....X.	3C	..XXXX..	08	....X...	3C
3C	..XXXX..	7E	.XXXXXX.	04	.....X..	7E
42	.X....X.	04	.....X..	0C	....XX..	40
02	......X.	08	....X...	14	...X.X..	40
02	......X.	10	...X....	24	..X..X..	7C
1C	...XXX..	02	......X.	7E	.XXXXXX.	02
20	..X.....	02	......X.	04	.....X..	02
40	.X......	42	.X....X.	04	.....X..	02
7E	.XXXXXX.	3C	..XXXX..	04	.....X..	70

	04A0		04E0		0520
0E	....XXX.	42	.X....X.	40	.X......	42
04	.....X..	44	.X...X..	40	.X......	66
04	.....X..	48	.X..X...	40	.X......	5A
04	.....X..	70	.XXX....	40	.X......	5A
04	.....X..	50	.X.X....	40	.X......	42
04	.....X..	48	.X..X...	40	.X......	42
44	.X...X..	44	.X...X..	40	.X......	42
38	..XXX...	42	.X....X.	7E	.XXXXXX.	42

CHARACTER GENERATION--Here is a sample of the rework we gave the character generator listing, from our manual supplement.

copy, consuming hours of retyping, editing, revising, and always needing to re-proof material to avoid errors. Then the material is given to typesetters--who again type the same thing, thus requiring another proofreading cycle (usually by the typesetters as well as by the attorneys)."

Ok, enough of the most modern word processing techniques. Let's consider something a little less antiquated. Say we have written a ROM program to display the StenoTyper character set. Our five-legged people sit in court and keystroke their two-million-plus words. Ok you ten-million characters--gotcha! We have captured those keystrokes two keyboarding generations earlier than the "most modern word-processing methods".

A computer program would be developed to convert StenoType into English, and the court reporter would simply monitor a TV while transcription was under way, and do the necessary editing. Imagine the cost savings in this one application. Certainly enough to pay for quite a few $325 Central Data Co. computers! Try doing this on any other microcomputer. Try doing this with "the most modern word processors available".

For readers who are interested in developing character generator ROMs, we have re-documented the Central Data uppercase ROM, and developed a strategy for converting it to lowercase. It is printed in the manual supplement, available from User Notes.

KEYBOARD PROBLEMS?

In Jeff Roloff's reply to a question in the September Radio-Electronics, he stated that the Radio-Shack keybaord works well in the 2650 computer system. This is not entirely correct. This keyboard is not standard ASCII and the key functions may need to be redefined for this system. Specifically, the PROMS recognize a 1B code for the escape function, but the R-S keyboard generates a 7E. A 1B is not generated anywhere on this keyboard. A major modification would be required to correct this. A better solution would be the availability of a PROM that would recognize 7E as an escape. Actually 00, using the Break key, would be better, since 7E would leave a **<** on the screen after the escape function.

Another problem with this keyboard is the control key. Instead of modifying the normal key code, this key generates a code by itself, causing problems in the Editor/assembler. The control C code is generated with a shift C but Here Is takes only one keystroke. Control P is not available so RAM locations 2348 and 28FA should be changed from 10 to 02 and Shift R can be used for this function. For control 0 use shift 0. Change location 28EC from 15 to 05 and use shift U for control U. Carriage return is generated by shift **]** but it is better to use Linefeed to get this into a single stroke. For this, change the following locations from 0D to 0A: 2245, 2289, 22EA, 2359, 2364, 23A5, 2695, 284D, 28A5, 2921, 296C, 2D82.

One last change needed in the Radio-Shack keyboard is the addition of a 1K Ohm resistor from pin 5 of Z11 to +5V. This eliminates a floating input that sometimes causes continuous repeat functions.

Mike Herbach,
Signetics engineering

QUALITY PRINTER

Brian Moran, 7335 N. Manning Drive, Peoria, IL 61614, plans to interface a standard electric typewriter via 4-line-to-16-line decoders and low-voltage solenoids, among other projects. Here is the low-cost typewriter-quality printer! He also is planning to write a report on new Signetics releases, such as the 2651 programmable communications interface. He has Pipbug listings, along with Signetics "intelligent typewriter" listing. We look forward to hearing more from Brian.

EDITOR'S NOTE:
What Mike is saying is he had to go to one Hell of a lot of effort to get his R-S keyboard working, and don't buy one if you can avoid it. We hope to be testing the George Risk Industries kit, $59.95, soon. Address: G R I Plaza, Kimball, Neb. 69145. Another keyboard you might avoid is the SwTP, which appears to be unstepped, which is rather unprofessional.

GUIDE TO EXECUTIVE

Mike Herbach says the R-E-published list of user-available executive subroutines is incomplete, and has worked up the following:

LOC	NAME	USE
0000	init	reset & clear display (does not save registers)
0024	lfcr	linefeed & carriage return. clears new line. useful for clearing display (uses r0, r3)
006A	hxot	prints 2-digit hex character from R2 (uses R0, R1, R2, R3)
0083	retu	return to exec, saves registers for I command
0088	saver	stores registers in 17EB-17F3. can double available registers
0170	wrbl	write a blank on screen. to tab or do other typewriter functions, use in a loop
01B6	inhx	gets 2-digit hex character from keyboard & puts in R3 (uses R0, R1)
026F	d2	3.33ms delay (uses R0)
0273	d1	1.67ms delay " "
0278	d6	10ms delay " "
030F	kbin	gets keyboard input into R3
0396	wchr	writes ASCII character in R3 (uses R4)

PARTS SITUATION

We want to hear readers' solutions to the parts problem. To paraphrase Cunnard, it appears that getting there is at least 90 per cent of the hastle! We note the following combination of suppliers has most of the parts: James, address in about any magazine, and Jade Co., 5351 W. 144th, Lawndale, CA 90260. Particularly, Jade Co. has that damned little zener. Who sells the crystal?

Leslie Clifton (Cliff) McDonald, 5129B Alhambra Ct., Norcross, GA 30093, promises to share his experience with Poly-Paks, SD Sales, Dig-A-Key, and James.
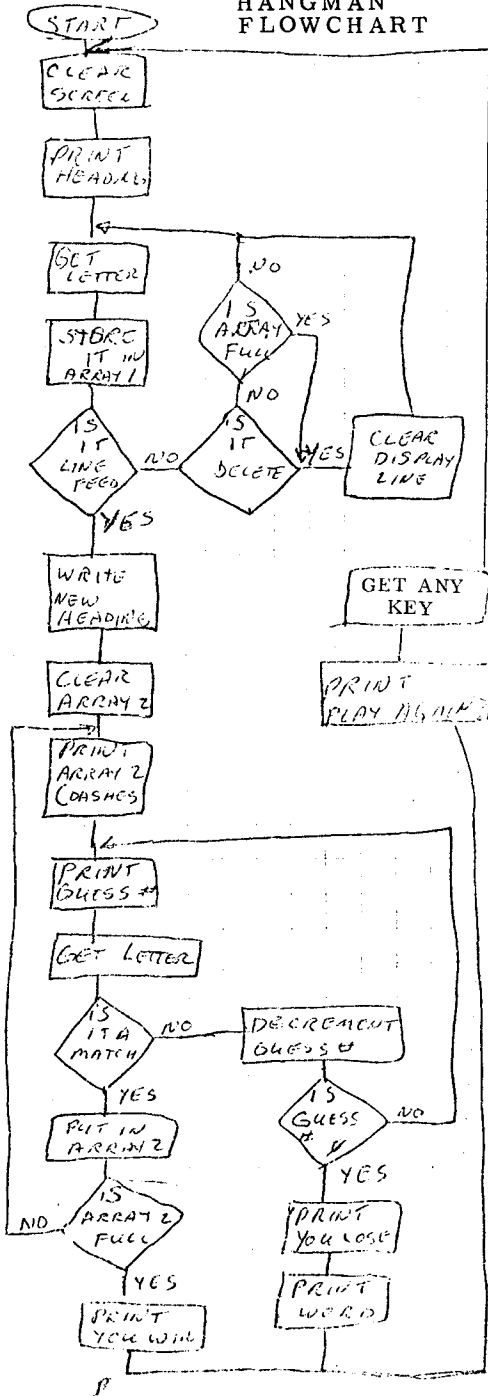
INSTRUCTIONS for playing Hangman can be easily deduced by reading literals at end of program. Thanks, Mike, for a good job. This is the kind of game we want--educational. Also, Richard Peterson's Life. We want mostly useful programs, with occasional significant games.
--Bill.

Addr	Code		Label	Mnemonic	Operand	Comment
1510	04 09		SETUP,	LODI,R0	9	
1512	CC 17 B8			STRA,R0	GSCNT	
5	05 10			LODI,R1	10	Clear display
7	3F 00 24		L1,	BSTA,UN	LFCR	
A	F9 7B			BDRR,R1	L1	
C	05 20			LODI,R1	20	Erase curser
E	CD 97 FE			STRA,R1	ICUR1	
21	05 10			LODI,R1	10	Set curser location
3	CD 17 FE			STRA,R1	CUR1	one line down and
6	05 41			LODI,R1	41	4 columns in from
8	CD 17 FF			STRA,R1	CUR2	top left
B	05 FF			LODI,R1	-1	
D	0D 37 00		L2,	LODA,R0	MSG1,R1,+	Print first heading
30	18 06			BCTR,Z	WDSET	
2	C3			STOZ	R3	
3	3F 03 96			BSTA,UN	WCHR	
6	1B 75			BCTR,UN	L2	
8	3F 00 24		WDSET,	BSTA,UN	LFCR	Get input character
B	05 FF			LODI,R1	-1	
D	3F 03 0F		WDIN,	BSTA,UN	KBIN	
40	C3			LODZ	R3	Put it in Array #1
1	CD 37 B9			STRA,R0	ARY1,R1,+	
4	E4 0A 0D			COMI,R0	LF	Ck for linefeed
6	18 0B			BCTR,EQ	HDNG	
8	E4 7F			COMI,R0	DEL	Ck for delete
A	38 83			BSTR,EQ	IDEL	
C	E5 14			COMI,R1	14	Ck for 21'st char.
E	3C 15 9E			BSTA,EQ	DEL	Delete line if found
51	1B 6A			BCTR,UN	WDIN	loop to next input
3	CD 17 B7		HDNG,	STRA,R1	WDCNT	Store # of chars.
6	04 2D			LODI,R0	A"-"	ASCII dash
8	05 14			LODI,R1	14	fill array#2 with
A	CD 77 CC		L3,	STRA,R0	ARY2-1,R1	dashes
D	F9 7B			BDRR,R1	L3	
F	05 10			LODI,R1	10	Move curser up
61	CD 17 FE			STRA,R1	CUR1	
4	05 41			LODI,R1	41	
6	CD 17 FF			STRA,R1	CUR2	
9	05 FF			LODI,R1	-1	
B	0D 37 35		L4,	LODA,R0	MSG2,R1,+	Print message #2
E	18 06			BCTR,Z	START	
70	C3			STOZ	R3	
1	3F 03 96			BSTA,UN	WCHR	
4	1B 75			BCTR,UN	L4	
6	3F 00 24		START,	BSTA,UN	LFCR	
9	3F 15 C6			BSTA,UN	PRAY	Print Array #2
C	3F 00 24		TURN,	BSTA,UN	LFCR	
F	3F 15 D5			BSTA,UN	PGSS	Print guess no.
82	3F 03 0F			BSTA,UN	KBIN	Get guess from kbd
5	3F 15 F8			BSTA,UN	CKARY	Set flag if match
8	0E 17 B8			LODA,R2	GSCNT	
B	B4 40			TPSU	FLG	Test for flag set
D	98 05			BCFR,Z	CNTDN	Next guess if not
F	3B 2E			BSTR,UN	PRAYS	If set reprint array
91	1F 16 0C			BCTA,UN	WINCK	Ck if array is full

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1594 FA 03      CNTDN,  BDRR,R2   WRONG     If last guess used
   6 1F 16 1C           BCTA,UN   LOSE      print "you lose"
   9 CE 17 B8   WRONG,  STRA,R2   GSCNT     If not go on
   C 1B 5E              BCTR,UN   TURN
   E 07 20      DEL,    LODI,R3   20        Subroutine to
  AO CF 97 FE           STRA,R3   ICUR1     delete input word
   3 0F 17 FF           LODA,R3   CUR2      Blank curser then
   6 A7 10              SUBI,R3   10        move back one space
   8 CB FA              STRR,R3   ICUR2     and blank it,too
   A 77 08              PPSL      WC
   C 0F 17 FE           LODA,R3   CUR1
   F A7 00              SUBI,R3   0
  B1 CB FA              STRR,R3   ICUR1
   3 75 08              CPSL      WC
   5 A5 01              SUBI,R1   1         Repeat untill input
   7 9A 65              BCFR,N    DEL       count goes negative
   9 07 1C              LODI,R3   CURCD     Then write curser
   B CF 97 FE           STRA,R3   ICUR1
   E 17                 RETC,UN             Now get another char
   F 05 10      PRAYS,  LODI,R1   10        Space out to print
  C1 3F 01 70   L5,     BSTA,UN   WRBL      array after guess
   4 F9 7B              BDRR,R1   L5
   6 0E 17 B7   PRAY,   LODA,R2   WDCNT     Print array #2
   9 05 FF              LODI,R1   -1
   B 0D 37 CD   L6,     LODA,RO   ARY2,R1,+
   E C3                 STRZ      R3
   F 3F 03 96           BSTA,UN   WCHR
  D2 FA 77              BDRR,R2   L6
   4 17                 RETC,UN
   5 05 FF      PGSS,   LODI,R1   -1
   7 0D 37 6A   L7,     LODA,RO   MSG3,R1,+  Print "GURSS #"
   A 18 06              BCTR,Z    CONT1
   C C3                 STOZ      R3
   D 3F 03 96           BSTA,UN   WCHR
  E0 1B 75              BCTR,UN   L7
   2 06 0A      CONT1,  LODI,R2   0A        Subtract 0A from
   4 AE 17 B8           SUBA,R2   GSCNT     guess count to get
   7 3F 00 6A           BSTA,UN   HXOUT     increasing number
   A 05 FF              LODI,R1   -1        and print it
   C 0D 37 73   L8,     LODA,RO   MSG4,R1,+  Print "OF 9"
   F 18 06              BCTR,Z    CONT2
  F1 C3                 STRZ      R3
   2 3F 03 96           BSTA,UN   WCHR
   5 1B 75              BCTR,UN   L8
   7 17         CONT2,  RETC,UN
   8 74 40      CKARY,  CPSU      FLG       Reset flag, then
   A 0A 91              LODR,R2   IWDCNT    compare each char
   C 05 FF              LODI,R1   -1        in array #1 to
   E 0D 37 B9   L9,     LODA,RO   ARY1,R1,+  guessed char.
1601 E3                 COMZ      R3        and set flag if
   2 98 05              BCFR,EQ   CONT3     match
   4 CD 77 CD           STRA,RO   ARY2,R1   and put char in
   7 76 40              PPSU      FLG       array #2
1609 FA 73      CONT3,  BDRR,R2   L9
   B 17                 RETC,UN
   C 0D 17 B7   WNCK,   LODA,R1   WDCNT     Check array #2
   F 0D 57 CD   L10,    LODA,RO   ARY2,R1,-  for dashes, if none
  12 E4 2D              COMI,RO   A"-"      print "you won"
   4 1C 15 7C           BCTA,EQ   TURN
```

```
7 59 76            BRNR,R1    L10
9 1F 16 50         BCTA,UN    WIN
C 3F 00 24   LOSE, BSTA,UN    LFCR        Print "you lost; the
F 05 FF            LODI,R1    -1                word was:"
21 0D 37 7B  L11,  LODA,R0    MSG5,R1,+
4 18 06            BCTR,Z     CONT4
6 C3              STRZ       R3
7 3F 03 96         BSTA,UN    WCHR
A 1B 75            BCTR,UN    L11
C 05 FF      CONT4,LODI,R1    -1
E 0E 17 B7         LODA,R2    WDCNT       Print array #1
31 0D 37 B9  L12,  LODA,R0    ARY1,R1,+
4 C3              STRZ       R3
5 3F 03 96         BSTA,UN    WCHR
8 FA 77            BDRR,R2    L12
A 3F 00 24   OUT,  BSTA,UN    LFCR
D 05 FF            LODI,R1    -1          Print "push any key
F 0D 37 9C   L13,  LODA,R0    MSG6,R1,+        to play again"
42 18 06           BCTR,Z     CONT5
4 C3              STRZ       R3
5 3F 03 96         BSTA,UN    WCHR
8 1B 75            BCTR,UN    L13
A 3F 03 0F   CONT5,BSTA,UN    KBIN        Ck for keyboard input
D 1F 15 10         BCTA,UN    SETUP
50 3F 00 24  WIN,  BSTA,UN    LFCR
3 05 FF            LODI,R1    -1
5 0D 37 94   L14,  LODA,R0    MSG7,R1,+   Print "you won"
8 18 06            BCTR,Z     CONT6
A C3              STRZ       R3
B 3F 03 96         BSTA,UN    WCHR
E 1B 75            BCTR,UN    L14
60 1B 58     CONT6,BCTR,UN    OUT
1662
```

```
1700 MSG1 INPUT A WORD OF 20 LETTERS OR LESS AND PUSH LINEFEED
1735 MSG2 TRY TO GUESS THIS WORD -- TRY ONE LETTER AT A TIMEbbb (b for
176A MSG3 GUESS #
1773 MSG4 OF 9                                           blank)
177B MSG5 YOU LOST; THE WORD WAS:        17B9 ARY1  20 locations
1794 MSG6 YOU WON                        17CD ARY2  20 locations
179C MSG7 PUSH ANY KEY TO PLAY AGAIN
                                        Tape dump:  D1510 LFF
17B7 WDCNT  1 location                               D160F L52
17B8 GSCNT  1 location                               D1700 LB6
```

2650 UPBRINGING

How DO YOU GET your computer going, after you've finally stuffed it with ICs?

This is not meant as a replacement for Jeff's troubleshooting narrative, the May R-E, but a supplement.

Mike Herbach thinks he may have de-bugged more Central Data boards than anyone outside of Champaign. He was about the first person up in Silicon Gulch to get the board up, and, being known as a helpful person, he became the local midwife for Central Data Boards.

His advice: "You've got to play with timing." First it is horizontal and vertical timing. Substitute parts in the clock circuit. Here is where the enlarged drawings in the User Group Supplemental Manual start coming in handy. When the timing is right, you have a static display on the TV.

Now you want to wire up a reset line. Most any switch will do. Maybe you have a couple unused, un-encoded switches on your keyboard. If so, you may wire two in series (that way you can't accidently reset--you must push both keys simultaneously). Another good place for

reset is on the back panel of the computer, where it won't accidentally be pushed. Usually, after the reset button is pushed, nothing happens, and you have more de-bugging to do.

Mike mentioned a DC static check, and I'm going to get the static, because I've forgotten what that was all about. Obviously, this is a standing column, so next time we'll correct what was too garbled this time.

Look for unwanted character repeats. Say the 3rd, 5th, etc. characters are repeating. You've got a dropped or shorted bit in one addressing counter.

Shorted address pins show up as lines repeating.

I think we've now got our static check: we've checked-out and gotten the reset circuit working, now pull out the processor chip (big white 2650). One-by-one, put a wire in each address line to the 2650, pins 2-14, 18 & 19, pin 23 (R/W), ground.

Look on your big set of drawings from User Notes. Make sure all the good things happen that should go on when each of those pins is grounded.

We'd like to hear reader comments on this subject (as well as all others). It would be nice if someone would sketch out a block diagram of the system. People should let us know what little facts could be added to the diagrams that would make troubleshooting easier, and require less elaborate equipment. Looks to UN as though Jeff's techniques would work with nothing more than a logic probe, except in the timing section, and cassette interface. Mike's techniques do not require oscilloscope. Let's come up with de-bugging techniques that allow anybody to bring one of these bears online, using nothing more than the TV monitor. "TV Oscilloscope" by Kenneth Barbier, the July Byte, is required reading for this assignment. Don't forget setting the pots on the cassette interface.   ###
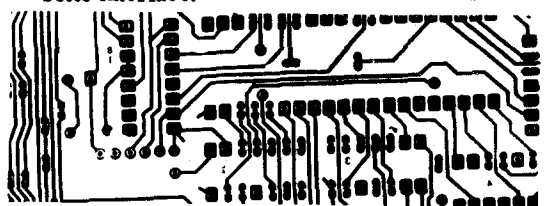
SOLDER BRIDGE?--You'll find it more easily if you have the enlarged foil print in User Notes' Manual Supplement.

WHAT THESE COMPUTERS NEED IS GOOD, CHEAP, FAST MASS STORAGE

WE'RE FAST moving toward the point where the average Central Data computerist is going to be tying up a lot of money in PROM.

There is a very undesirable syndrome in small computing. People get tired of waiting for slow cassettes to load, and start getting software "burned" in ROM. In no time, they realize they have enough money tied up in ROM to buy a floppy. Next step is to buy the floppy and wish you didn't have the ROM. Finally, the floppy breaks down a bunch of times and the person is glad he has the ROM.

Besides the money that gets tied up in ROM, the devices, when funds are limited, are contrary to the basic idea of a computer: a machine that can be very fundamentally changed simply by a change of software. Write your programs in "stone", ROM, and unless you have unlimited multiples of $27, you are limited in what you can do.

REVISE 'EXEC'? YES--IN RAM!

We're starting to get deluged with suggested revisions of the Executive ROM. Then there is the character generator ROM. We, and others, are suggesting changes. There's talk of a Basic ROM.

If we had fast tape, we could load what we wanted, in resonable time, into RAM that has memory protect and battery backup. When "protected", a computer "crash" can't harm it, so you don't have to reload it. With battery backup, you even survive power failure, and you can leave the board powered-up overnight, so no reload needed.

Advice: let's not buy revised Executives. What we have is good enough to let us load what we want, and we then can "fly" on that. Let's put all our expansion funds in RAM, and keep just our limited "tablets of stone". Let us give lots of attention to memory protect and battery backup features, and to faster tape storage.

CHARACTER GENERATOR IN 'RAM'?

Let us even consider a little auxiliary board that plugs into the character generator ROM socket, and gives us RAM at that location. Then we can modify character display with minimum fuss, no cost. In the present character generator, the "W" is too narrow, and

musical notation and script (handwriting)! You listening, Jeff? The little auxiliary character-generator RAM board could have a place for our present ROM, so that if loading of RAM were suspect, we could flip a switch and disdoes not display well on TV. Spend another $27 on it, plus $27 for lowercase? Let's figure out how to connect RAM to that location, so we can play with really neat graphics, alternate displays, foreign languages, etc. Even play from ROM. Impossible? ECD MicroMind has it, but that is $1,000. We could have it.

INEXPENSIVE FAST TAPE POSSIBLE:

Fast tape? Where do we get that? Least expensive would be to use eight-track mechanisms, available for $12 or so. Let us:
- --speed them up, electrically, to 7 1/2 inch/sec., or so.
- --give computer control over which of eight tracks is being read/written.
- --develop saturation recording, control board.

Saturation technique gives us maximum speed, simplifies things, and eliminates need for an erase head, which the $12 eight-track does not have. Required reading is David Allen's "Saturation Recording's Not All That Hard", Jan. '77 Byte. Why doesn't someone make up a board for sale? I'll write David Allen.

Allen was held down to getting no more than 1,300 baud out of his 1 7/8"/sec $5 tape recorder. If we speeded eight-track to 7 1/2 inch/sec., we should be able to do 5,200 baud!

Eight-track cartridges range from the 9,000-foot, 80-minute size, to any smaller size you should want, assuming you are willing to splice it.

Uncut, the 80-minute cartridge gives you a worst-case access time of 10 minutes, far too long for most uses, and would store maybe 800,000 bytes.

A 20-min cartridge would therefore store 200,000 bytes, give us 2.5 min worst-case access, 1.25 mean access. That's 187' tape.

All eight-track cartridges give us immediate access to eight programs.

Cut the tape in half again and you are about in the mini-floppy storage range, and have reasonably-fast access.

Cut down to just a few feet and you have good access times, and could probably do some magnetic sorts that many people think could be done only on an expensive system.
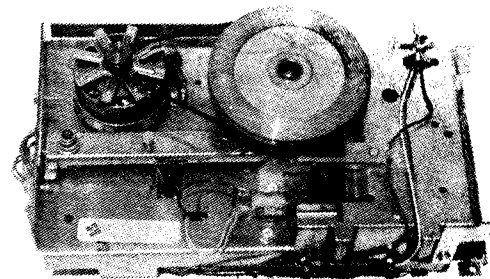
UNFLOPPY

Four "unfloppy" drives cost about $50, give immediate access to 32 programs (tracks), can store up to three megabytes. Some of the machines can have long tapes, and long worst-case access times, while others can have smaller, or small loops. Worst-case access time can be as short as one second or so.

Lots more about this "unfloppy" in next issue. Let's have some reader input. Particularly, let us have some inexpensive circuits for doubling the speed of the 110V syncronous motor.   ###

BOOKMAKERS
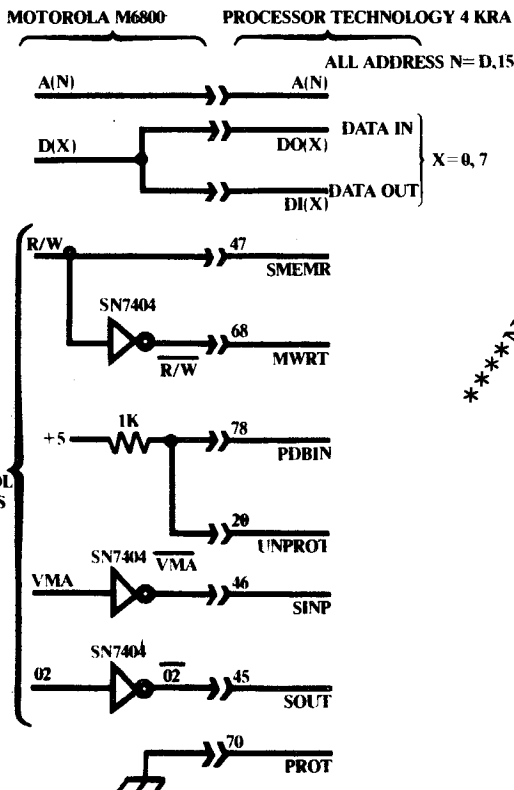
Box 158, San Luis Rey, CA 92068

PROCESSOR TECHNOLOGY ACCESS.

When you're combining equipment from different manufacturers, optimum performance often depends on specific information about the idiosyncracies of their connections. Owner's manuals can't cover every permutation and combination, so think of this feature as a running supplement that gets down to cases.

PT 4KRA Memory Boards and the Motorola M6800

The following diagram should help you expand your M6800 system with minimum headaches. Note that the M6800 can drive 2 4KRA cards at reduced clock rates without bus drivers; however, full buffering is recommended.

CONNECTING PROCESSOR TECHNOLOGY 4KRA MEMORY CARD FOR USE IN MOTOROLA M6800 SYSTEMS

MOTOROLA M6800   PROCESSOR TECHNOLOGY 4 KRA

ALL ADDRESS N= 0,15

A(N) → A(N)

D(X) → DO(X) DATA IN
D(X) → DI(X) DATA OUT   X = 0, 7

R/W → 47 SMEMR
SN7404, $\overline{R/W}$ → 68 MWRT
+5, 1K → 78 PDBIN
→ 20 UNPROT
SN7404 $\overline{VMA}$, VMA → 46 SINP
SN7404 $\overline{\Phi2}$, $\Phi2$ → 45 SOUT
→ 70 PROT

MC6800 BUS CONTROL SIGNALS

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INTERFACING INFORMATION--Here's what PT has to say. How about using Central Data S-100 interface with SwTP? Neat! We

VDM-1 and the 6800 Microprocessor
The VDM-1 can live quite happily with your 6800 if a small amount of signal processing is performed externally.

Signals which may be directly used by the 6800 system are:

ADR0-ADR15 High-active address
DO0-DO7, High-active data lines. They
DI0-DI7 may be connected in parallel to form a bi-directional data bus if necessary.

Signals which require conversion or re-interpretation:

PSYNC Connect to high-active VMA (Valid Memory Address)

$\Phi2$ Connect to $\Phi1$ clock

Pin 4 of IC 18 (74LS132) Break connection to Pin 3 and connect to Pin 2

SINP, SOUT Connect to the highest-order address bits which are "1" when registers are addressed. (Bits 14 and 15 are suggested.) Presence of a "1" on either line will cause the address decoder to switch its comparison to to the status port address. The status port will therefore respond to any address whose top six bits are set by jumpers (see your VDM-1 manual), and whose bits 8 and 9 are zero. The low-order 8 bits are not decoded during status port response.

$\overline{PWR}$ Externally generated signal consisting of VMA • $\Phi2$ • R/W

MWRITE Inverted PWR

PDBIN Externally generated signal consisting of VMA • $\Phi2$ • $\overline{R/W}$

XRDY, PRDY Not used

Note that +8V, +16V and −16V are still required to operate the board, and that 6800 systems designed for all 5-volt operation may have to be augmented. Simple unregulated supplies will perform well, but care should be taken not to exceed +10V on the +8V line to avoid excessive dissipation in the +5V regulator.

want more on this, and multi-processing. A Z-80 board on Jeff's S-100. Great!