THE COMPUTER HOBBYIEST

BOX 158, SAN LUIS REY, CA 92068

Well Implemented, Selectric printer good

A GOOD PRINTER is usually necessary if we are going to have a useful computer system. Like keyboards, good printers are hard to find.

A printer should be reasonably fast, but this is not of overriding importance. Multi-tasking software will allow you to continue working at your CRT while the printer is doing what you told it to, so speed is not the most important thing.

READABILITY IS QUITE IMPORTANT. WE FREQUENTLY HEAR PEOPLE SAY ALL-CAPS IS MORE READABLE THAN caps-and-lower-case. It is hoped the above four lines have laid that myth to rest.

Cloth ribbon is adequate only for preparing materials for in-house consumption. It is not very readable, does not copy well, should not be used for reproduction. If you get a good buy on ribbons (Nu-Kote, for instance), film ribbon is not expensive.

Proportional space is nice. TCH uses it, as you can see.

TCH's sister publication, Word Processing Letter ($12.95/12 issues), has started a continuing series on printers, and yet another series on Selectric conversion, which may be expanded to include those cute little Olivetti unSelectric portables which discount for about $250, and the very capable Royal single-element typewriter.

We think we see a parallel between Selectric and Volkswagon. Here in the West, maybe not elsewhere, it seems like half the Beetles have been modified to look like Baja bugs, sports cars--even campers. Perhaps never in the history of machines has a no-longer-manufactured product been so popular.

Yes, we have heard innumerable references to Selectrics being
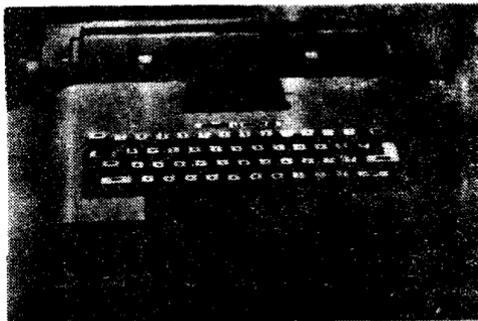
unSELECTRIC--This little single-element Selectric-like Olivetti has simplified stationary typing element and moving carriage. Interfacing to computer should be feasible.

"mechanical monsters", unreliable, difficult to adjust, etc. Is that why more have been sold than any other typewriter?

CONTENTS

Overview:

W HAT DO YOU DO when you've filled 17 of 20 pages, and still have important material to get in? We started thinking tight, let the winter virus turn us belly-up for a week, and, back at the desk, discovered FOUR uncounted pages lurking under the pile. Worst of all, we kept thinking we could untangle the logic of the Radio Shack keyboard--at least enough to use hardware-conversion, page 10, keeping within seven bits so bit-8 (to MSB address line of a 1702 EPROM) could go to a switch marked: ALL CAPS and CAPS/LOWER-CASE. Note Hal Chamberlin's Jan. '78 Kilobaud keyboard piece. That 74154 he calls for is already in place on the Radio Shack. Wiring is a little different, but that can be corrected in software. Somebody want to translate his 6502 program?

Meanwhile, from Radio Shack, Gary Burkhart, electronic components buyer, called to fill us in on a history of the keyboard. It dates back a couple of years, to the innocent days of TV typewriters and surplus keyboards, R-S picked up 10,000 that had 63 keys. When these did not sell, Jerry Heap designed an encoding board. Even then, they didn't move very fast, not until the past couple months. Less than 2,000 keyboards are left, just those in the stores. And there will be no more. Jerry, who also called, is designing another TTL board, and they're using the TRS-80 53-key pad. It will encode all 128 ASCII characters, plus 31 more. There's no decision, according to Jerry, to let us know what's wrong with the old boards.

THE COMPUTER HOBBYIST? Bookmakers has obtained nameplate and circulation. Besides 2650, there are going to be $100 and $50 User Notes, the name will be used on Word Processing Letter, and a new $2/5-line classified Advertiser edition, which assumes TCH's full 3,000 circulation. Imagine: just $66 per page, for 3,000 subscribers!

TCH is believed to be the oldest periodical still circulating in hobby computing. Any history I could give would not do it justice, and would slight some of the founders, but we will say we think TCH has had as much influence on hobby computing as has any other publication. The TCH cassette interface, while it did not win at Kansas City, came out on top in Fort Worth, and is inside the TRS-80. Hal Chamberlin's series on floppy disk has been the source of what most hobbyists know about floppy, whether they know it or not.

UNFLOPPY? Considerable interest has been shown in the 8-track random-access device that is inexpensive, yet acts like a floppy. M.M. Dye, a Westinghouse employe in Japan, tells us how to electrically alter motor speed. R&B Model shop has a saturation-recording tape interface for $50, or $60 with tape deck. They are at Box 92, Glendora, CA 91740. More next issue.   ED

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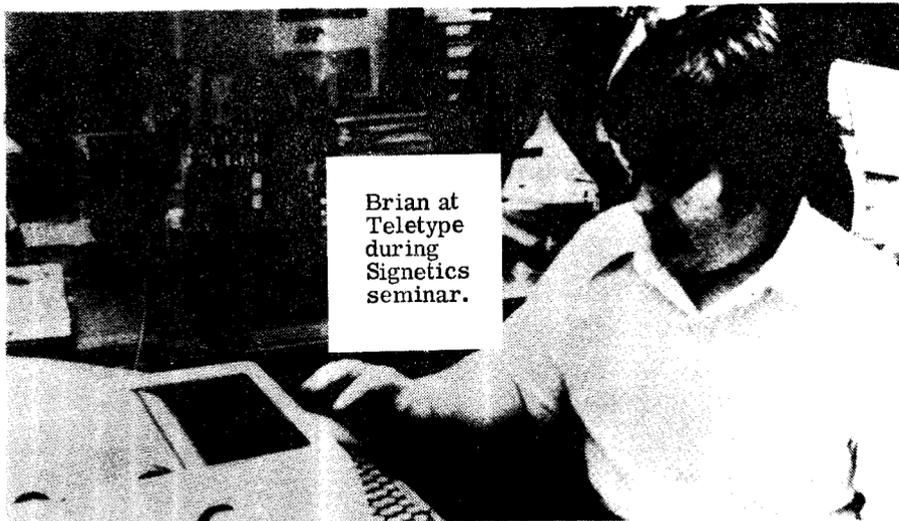8852 Rock Forest Dr.
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Brian at Teletype during Signetics seminar.

USER PROFILE:

Brian Moran

Brian K. Moran, 14, has become, to our knowledge, the first TCH 2650-edition subscriber to write about the processor in the national press. Crucify us if we're wrong.

In the November Byte, the Peoria high school student tells of becoming interested in the Signetics device, and attending a three-day factory-sponsored seminar.

To our knowledge, that was the second article about Brian to appear nationally--there was picture and story in the July/Aug./Sept. Signetics Microcomputer News. The bums ignored our request for copy of the picture, which we reproduce from their pages.

Byte's long-lead times, and other factors, lead to interesting discrepencies between the two articles.

He is 12 in the one, 14 in the other. Hmmm, even slow mails can't explain that two years. Computer error? Or could Signetics be trying to counter that famous Intel ad?

Does he attend Washington School for the Academically Gifted, as Signetics has it, or Richmond High School, as Brian says in Byte? We'll bet one of those

was last year, the other this, but we don't know about that Signetics article, which says:

"Across the country, there are an estimated 5,000 individuals who have built complex computers that are installed in homes."

Can Signetics be that far behind in comprehending the hobbyist market?

Lots of other curious things turn up when we compare the articles, and Brian's two letters to TCH, dated June 7th and July 22. So let's work from them:

In June, Brian said he had been interested in the 2650 for about a year and a half, and had a computer since August '76. That was an Applied Microtechnology AMT-2650.

"The CPU card was just a trainer, nothing useful for a real starting point for a system."

He was having a PC board drwan and etched for adapting the 2650 to S100 bus. How about something on that project, Brian?

In July, he write that future activities include interfacing a standard electric typewriter to his system via 4-line-to-16-line decoders and low-voltage solenoids, burglar alarm for the home, emulators for other popular machine's software, construction of modems and low-cost LED full alphameric portable

display and keyboard console.

He is planning to write a report on new releases from Signetics, such as the 2651 programmable communications interface.

Brian has Pipbug, and listings on Signetics "Intelligent Typewriter." Is the latter of any value in printer interfacing, Brian? We asked someone at Signetics, and drew a blank.

Hope to have more from Brian in next issue. Particularly, that S100 interface and typewriter concept. On that latter, Brian, we were thinking of using higher voltages on the solenoids, which we'd control with LASCR opto isolators. Very little is needed beyond about 50 24V solenoids, 12+ LASCRs (6 x6 array, plus shift solenoid), and line current. Those are my thoughts, let's kick it around, Brian. ED

WRAPUP:

Los Angelenos

Mike Kelley of Chatsworth (not to be confused with Mike Kelly of Chicago) was interested in what others in the Los Angeles area were doing with their 2650 computers.

We gave him a list of area subscribers and he reports the following:

Aruk Tuntsasuwat works for 2650-system-owner Joonho Suh, and is trying to get the computer up. Gave him the program for the TVT, told him how to input it and execute. He is now up and trying to understand the 2650 instruction set.

David Artinian, 14, of Encino, was having hardware problems.

Irwin L. Ford, Thousand Oaks, is collecting the last few parts and should be up shortly.

The four children of A. Franklin Turner, M.D., Pasadena, are playing with his 8800B while he works at getting his 2650 up. On his Altair, he is writing programs associated with his medical practice.

Clarence G. Mundt, Van Nuys, is in every way a computer professional. He has a homebrew system and is deep into sophisticated 2650 software. [Let us hear about some of it, Clarence. We'd like to print anything you are willing to share with other users, and if you want to sell some, our columns are open to you for that, too.]

-30-

USER PROFILE:

Irvine Stapp

Irvine P. Stapp, of Lexington, KY, is a full-time consultant engineer to the University of Kentucky Medical Center Instrumentation Section.

He got his 2650 for self-instruction in microcomputer applications, being previously turned off by the near-universal OEM assumption that everyone either had or could get [and wanted] an ASR 33 Teletype.

Irvine bought a ready-built Central Data Co. 2650 board in May, and October 1 had three Godbout-built 8K RAM boards "running their warranties out" waiting for the S100 interface.

Meanwhile, he worked in 2650 machine language on programs that do hex arithmetic, screen scrolling, store and recall lines from the screen, two-dimensional plots of data tables, wheeu! How about sharing some of those goodies with TCH readers, Irvine?

Hardware-wise, he breadboarded a circuit that converts Morse to alphabet, and has copied maritime utility stations as far away as Honolulu--it was solid!--as well as countless ships and hams.

Irvine previously played with a borrowed KIM-1, and thinks the 2650 suffers somewhat in not being able to operate on memory locations directly. Outside of that, he is very fond of the simple and straightforward I/O facilities of the 2650, for small control and dedicated applications.

He also is "accumulating" another system, piece by piece, at the lab, so by now Lexington probably has at least two 2650s.

How about sharing some of that neat software with TCH readers, Irvine. And keep in touch, we want to know more about your two systems.   -30-

Gains confidence

I had some doubts as to the capabilities of the 2650, but on seeing your letter in the September Radio Electronics, I was somewhat reassured.

I know nothing about computers, and am looking forward to TCH, hoping it will be filled with ideas and useful hints.

Ernest G. Christensen

Make that 'hassle'

How about processing that word "hastle" to "hassle"? [You've put your foot (maybe finger!) on what got me interested in microcomputing--getting hold of a machine that could spell. That is my Holy Grail (Graile?), or Fountain of Youth. Maybe I'll be pursuing it into the next century. ED.]

Nathan Myers

What about memory?

Thanks for getting "User Notes" off the ground. It has been very useful, along with the "supplement".

Since I am a rank amateur, I need all the help I can get.

I am currently bringing up a Central Data 2650. Mike Herbach's comments on the Radio Shack keyboard were very helpful. I already own a R-S keyboard and the Excape function (lack of it) was causing a problem.

For reset, I used a toggle switch and push-button switch wired in series to ground, and this seems to work fine.

Mike Herbach's advice on timing was causing my major problems. Sockets in the timing circuit make substitution of parts a lot easier.

It would be particularly helpful if readers would pass on through TCH what memory boards work well with the S-100 expansion board.

I also would be interested in articles on software development.

Please remember that some of your readers do not really understand hardware or software. [That's hard to forget, since I too read TCH. Ed.]

Keep up the good work.

M. P. (Pete) Venema, Jr.

Reset switch a must

Since sending in my subscription, I have received my CPU, powered it up, and it works fine!!

Some comments:
- The reset momentary-contact switch is an absolute necessity.
- My system uses only 2 1/4 amps. Power supply heat-sinking or fan cooling is NOT necessary. A small fan does, however, keep CPU and power supply very cool.

Some questions:
- Very inexpensive interface boards for floppies, printers--where?
- Any circuit around using a 2nd 2650 as a controller for the above?
- How 'bout a meeting of S. Cal 2650 users?

I have laid out a PCB for the following items:
- Relay circuit to turn on the cassette player. Slightly modified from Jeff Roloff's. It uses a TO220 power Darlington (TIP 112). It is extremely sensitive and works beautifully.
- Inverter circuit to change my strobe to negative-going.
- Sixteen-pin to 20-pin DIP for my keyboard interconnect. Anyone have a circuit for "repeat" function?
- Input/Output to cassette using PCB-mount phono plugs.

Mike Kelley

[Come ahead with the art, Mike, and we'll put it in TCH 1:3. Must be positive, or I'll even have ink up my whachacallit. ED]

Best 'U N' around

If this thing gets off the ground as the first issue indicates I think we'll probably have the best user notes around.

Tony Pajnic

[We're one of the newest, and, with the TCH nameplate, the oldest hobby computing publication. Every effort is being made to make it the best. Ed.]
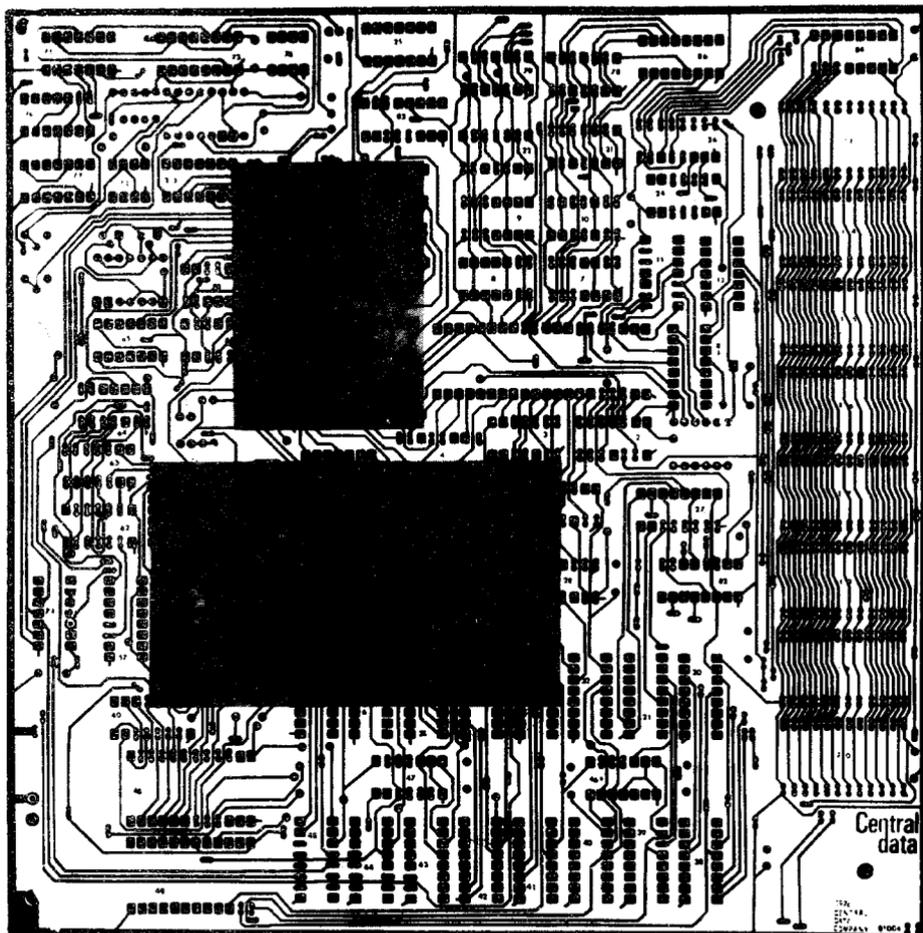
MODIFICATION AREAS--Timing section fix is within bottom shaded area on this back view of 2650 computer. RAM/Port C mod is above it.

etc. 3 2 1   1 2 3 etc.
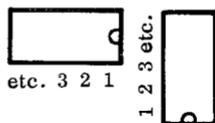
MAKES BOARD EASY TO DEBUG:

Timing section, RAM, tape mods for 2650 board

The 2650 computer board timing section corrections from Central Data can most easily be implemented as shown on accompanying markup. Do not cut lines 4-5 of IC53.

The cassette interface mod was in R-E (and thus is in our 2650 Supplement) and on Jeff's documentation.

First, be sure to use a 74132 in IC 25 instead of the 7400 originally listed.

Then, cut the trace to IC76 pin 10 and either solder lump it to pin 9 or wire it to V_{cc} at pin 14. Here is the theory behind this mod: it is not good practice to leave a TTL input floating, although it works 99.99% of the time.

IC61 MODS--The fix for IC61 pin 11 depends on use.
● For slow RAMs, it needs OPREQ instead of V_{cc}.

- For use of Port C (a printer, etc.), it needs $M/\overline{IO}$.
- For use of RAM at address 1800-2000 (hex) it needs $\overline{A11}$.
- To be safe it needs all those ANDed together.

Any fix here must be done carefully, though, because V_{cc} runs through pin 11 to get out.

You must cut the lines on both sides and jumper V_{cc} over pin 11 before hooking anything to pin 11. If connecting:
- OPREQ, use pin 15 of IC85 instead of IC6 pin 11, which is another possibility, but farther away.
- $M/\overline{IO}$ is on IC85 pin 1.
- $\overline{A11}$ is on IC12 pin 10.

[Is anybody ANDing these guys together? How you going to do it? Stay tuned to TCH. ED]

D PORT FIX--The last fix I can think of now is the D Port (the 9334) addressing.

The board enables this IC when either D Port or C Port is addressed. The circuit to fix this and add a latched output port is shown.

Mike Herbach,
Signetics engineering staff.
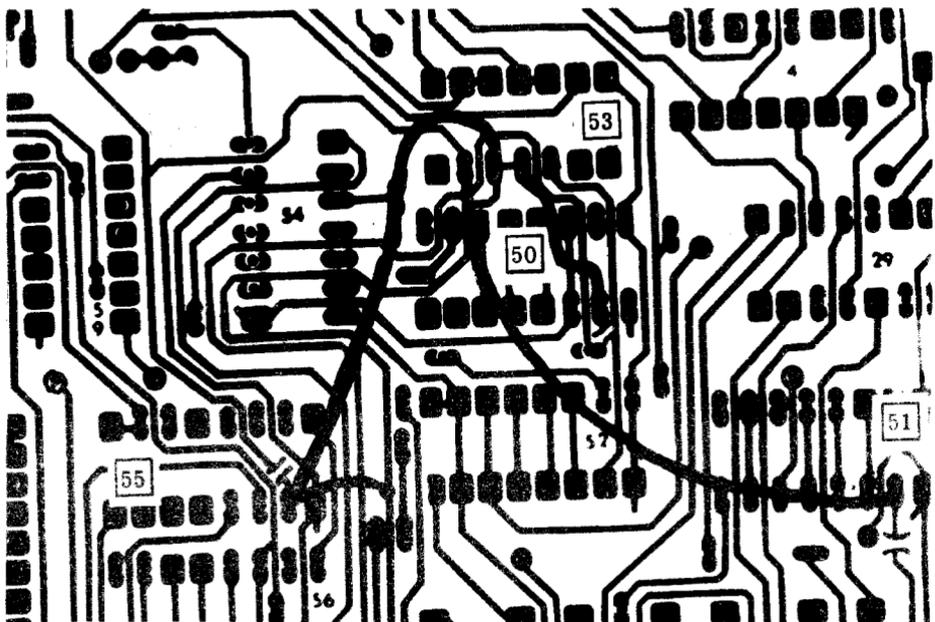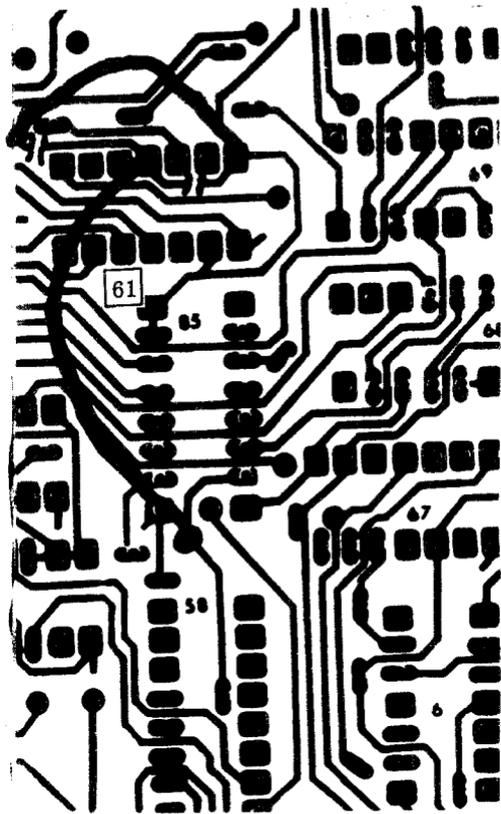
Component-side 2640 board modification, jumper and trace cut at IC76.

Mike Herbach's ANDing mod is diagramed below. More on that next newsletter.

I/O ports

"D PORT"

D_0	1	A_0	O_1 4	P6 3 TO ON
D_1	2	A_1	O_2 5	P4 14 OUT 0
D_2	3	A_2	O_3 6	P4 15 OUT 1
	15	$\overline{CLR}$	O_4 7	P4 1 OUT 2
D_3	13	D 9334 IC26	O_5 9	P6 2 OUT 3
			O_6 10	P4 16 OUT 4
			O_7 11	P4 12 OUT 5
		$\overline{ENBL}$	O_8 12	P4 13 OUT 6

IC26-a 1/4 7400

1/4 7400 IC00-b

$\overline{M/IO}$ $\overline{R/W}$ $\overline{A_{13}}$

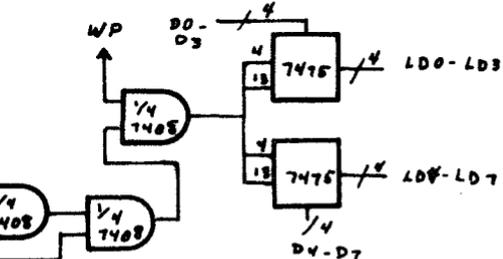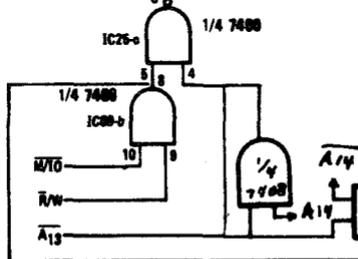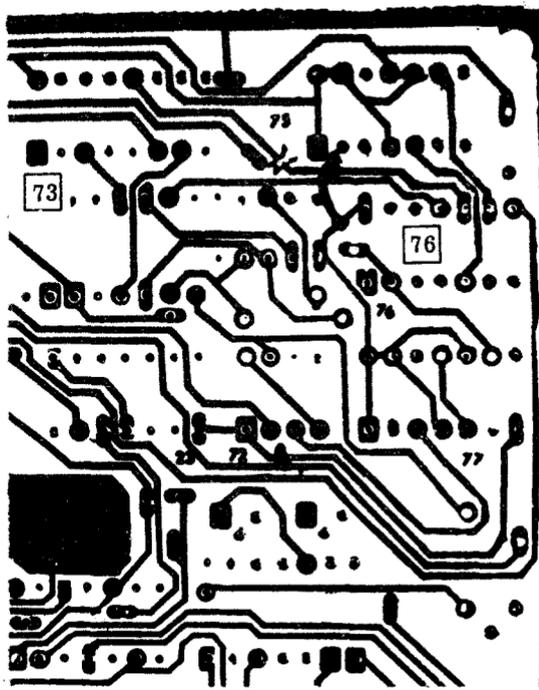1/4 7408 $\overline{A14}$ $A14$ 1/4 7408 1/4 7408

WP $D0-D3$ 7408 7475 /4 LD0-LD3

7475 /4 LD4-LD7

D4-D7
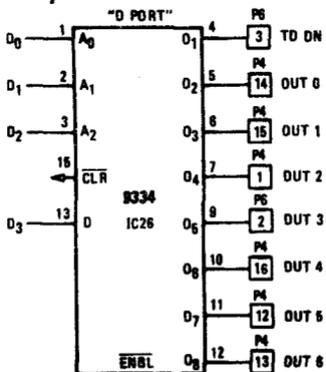
c/d 2650 audio mod

As far as timing section corrections:
- Disconnect lines from pins 2 of IC 50, 51 & 55.
- Hook pin 2 of 50 to 4 of 53.
- Hook pin 2 of 51 to 6 of 53.
- Hook pin 2 of 55 to 5 of 53.

We have found this to solve all timing jitter problems.

In the cassette interface, in order to make it load reliably, you must cut the path from pin 10 of 76 to pin 12 of 73. This takes the second one-shot out of the circuit.

Finally, if you get some slow RAMs, you may need to hook OPREQ (pin 11 of 6) to pin 11 of 61.

Cut the line to 11 of 61 first, tho. This gets rid of some spikes on the RAMs' write lines.

--Jeff Roloff

If your cassette recorder has no manual gain control, the computer audio may overwhelm the automatic level control and distort the signal, as it does my Radio Shack CTR-39 recorder.

gnd
hot
TO MIKE INPUT

P3 3 10
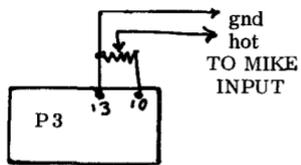
To correct this problem, a 5K pot was added to DIP plug P3

Ken Barber

BITS 0-3 OUTPUT OF Z12					000	001	010	011	100	101	110	111
								BITS 4-6 RESULT OF SHIFT LOGIC				
3	2	1	0	hex	hex 0	1	2	3	4	5	6	7
0	0	0	0	0		DLE				P		p
0	0	0	1	1		DC1				Q	a	q
0	0	1	0	2		DC2				R	b	r
0	0	1	1	3		DC3				S	c	s
0	1	0	0	4	EOT	DC4				T	d	t
0	1	0	1	5	ENQ	NAK				U	e	u
0	1	1	0	6		SYN				V	f	v
0	1	1	1	7		ETB					g	w
1	0	0	0	8		CAN					h	x
1	0	0	1	9		EM				Y	i	y
1	0	1	0	A		SUB				Z	j	z
1	0	1	1	B		ESC					k	{
1	1	0	0	C		FS				\	l	¦
1	1	0	1	D		GS				]	m	}
1	1	1	0	E		RS					n	~
1	1	1	1	F		US				←	o	DEL

SHADING INDICATES CODES AVAILABLE
on unmodified Radio Shack keyboard.

KEYBOARDS:

Problem not solved

RADIO SHACK KEYBOARD--reputed to have better key switches than other kits, 27 pages of documentation, very low price, available in more than 6,000 stores, wow, that's the way to go!

It's so easy to think that way. Then you get into the details (after having bought it), and find:
- Documentation strangely muddled. The coding table, for instance. ASCII is quite understandable when documented in hexadecimal-output order--the way everybody usually does it. Not Radio Shack, sadly. Schematic has important details left off. Tear through the book looking for them.
- It isn't ASCII. Somebody in engineering goofed with the shifting logic. And somebody else, in marketing, goofed when they advertised it as ASCII.

If there were alternatives to buying the Radio Shack, I'd recommend them, and save lots of space in TCH.

But where else, for less than $8, can you get a PC board that fits that $19 keyboard you've been dusting for two years?

With each catalog is a coupon entitling you to half price on any project board in the house. And they offer you a catalog upon entering and leaving the store! The board is marked $14.99, so it is yours for $7.50.

In pages that follow, we have numerous solutions to the board's problems. These are not presented as final solutions, but as examples of what some people have done to "fix" a major producer's defective product.

We've written Radio Shack asking their advice, and heard nothing. Maybe that is the kind of support they are going to give their computer. Be sure and tell your friends.

Those who are satisfied with all-caps and only half the control

functions can follow Mike Herbach's suggestion and clean up that floating input, and can choose between a number of plans for adding ESCape.

Not me. It seems so obvious that the damn thing has some lines transposed in the shift-logic circuit.

At least as an option, it should normally be in lowercase, the right-most two columns above, plus column 3.

Shifting to uppercase moves you to columns 2, 4 and 5, above.

Shifting to control (you must hold it down while hitting desired control key--there is no control shift lock) gives you columns 0 and 1, plus presumably 16 codes you can simply ignore.

When we have made that shifting-logic modification, then we have ESCape, and all the control codes we need. We may still want to modify the keyboard so we can get ESC with just one keystroke, instead of control "[", but at least we're up and running.

Who will be the first to uncover the basic flaw Radio Shack doesn't discuss? Winner gets two Radio Shack winter sale catalogs.   ED.

Code conversion

SAY YOU GOT this terrific keyboard bargain, but it speaks EBCDIC...

Or maybe you have a keyboard, who cares what the coding, and you would like to move the keys around. That easily could amount to stuffing 128 or more wires into a confined space. Difficult to execute. Horrible to troubleshoot.

We would like to show you how to take any keyboard that outputs a unique code for all necessary keys, and getting a switch-selectable choice of:

● All-caps, with ESCape and all other ASCII control codes,
● Caps and lowercase, full ASCII set including all control codes,
● Dvorak keyboard arrangement, if you want it.

This is not a fix, or a patch, but conversion, which uses inexpensive 1702 EPROMS, ($3 to $5 almost everywhere, 3/$1.98 from Poly

Paks, but do they work?)

Connect keyboard output to 1702 address lines 0-6 in case of ASCII, 0-7 for EBCDIC (an 8-bit code).

With ASCII, connect debounced control line to 1702 address line 7.

Carry strobe line past converter, straight into computer. Adjust its timing, on the encoder, by changing values of resistors, capacitors (your converter/PROM introduces some delay).

Mount the 1702 EPROM on a piece of Vector perfboard, connected to the 44-pin keyboard female connector and ribbon cable to computer. Note that the 1702 requires +5 and -9V supplies.

If you have more than one 1702, you need a chip-select switch (labeled CAPS, C/LC, Dvorak, etc.)

For full ASCII, have your 1702 programmed (maybe $5, but some clubs, friends, etc., do it for nothing) as follows:

Divide a long skinny piece of paper into three column, labeled:

INPUT   OUTPUT
hex   symbol   hex

Number each line, in righthand column, hex 00 through 7F

In center column write, for your benefit, symbols for those ASCII codes.

In left column, write hex numbers for code you are converting.

For ASCII, EBCDIC codes, (as well as 6-bit BCD and Baudot) refer to Dec. '75 Byte.

Can you use the conversion to get good code from the Radio Shack keyboard?

No, GIGO (garbage in, garbage out) operates here, as elsewhere. The Radio Shack does not output a unique key for every key pressed. In uppercase, P is hex 00 (null), as is space. To get space while locked in uppercase, you hit "∅", curiously.

If the Radio Shack shift logic can be cleared up enough to encode a different unique code for each character, both shifted and unshifted (it doesn't matter what that character is), that keyboard could be converted to ASCII (or anything) with a PROM.   ED

And there's no return!

For those Radio Shack keyboard owners who wish to have the RE-TURN key function, which is a hex "0D" and are willing to give up the linefeed function of "0A", the following modification is offered.

LINE FEED

"M"

CUT

add jumper wire

After cutting the PC board land, put a jumper from LINEFEED to Z12 pin 15 (same electrical point as left side of "M" key contacts).

Ken Barber

KEYBOARD ENCODING:

Starts from scratch

I'm going to use the Radio Shack keyboard with a scratch-built encoder taken from the May '77 Byte keyboard ROM article.

It only uses a few ICs and a few resistors. The ICs are KR2376 encoder (only $6.95 from Poly-Paks), a 555 timer and three 7400s.

Gene Mullnix

[When I first read that, Gene, I thought you were Nuts, but maybe I'm going to do that too. Bet it costs less than parts for the Radio Shack board. I can use my Radio Shack board as a drill guide for making my own PC board, outlined by hand with resist. This is my chance to chuck the old "qwerty" keyboard arrangement, and lay the keys out in Dvorak. Did you make a PC board, Gene? ED]

Buys three keyboards

TCH [it wasn't called that then] makes it clear that others are having trouble with keyboards.

In the R-E articles on the 2650 this was passed over very lightly. It said, as I recall, any ASCII keyboard. [That does make it sound easy, doesn't it!]

So I ordered an assembled-and-tested keyboard from Poly Paks. That damn thing never did work! So after messing around with it for quite a while I said to hell with it and ordered a kit which I put together myself and it works fine. The only problem with these keyboards is the fact that they are not the best and you have to use a light touch or the key will stick down.

Then I saw a keyboard by Texas Instruments advertised and so I bought. It works fine but is too bulky for the setup I wanted.

So then I ordered one from Radio Shack, went thru all the misery of testing it and altho it was a much superior and better-built keyboard [better switches], it too wasn't worth anything on this setup.

As it stacks up I got a real education in keyboards... and a good start on stocking a typewriter factory.
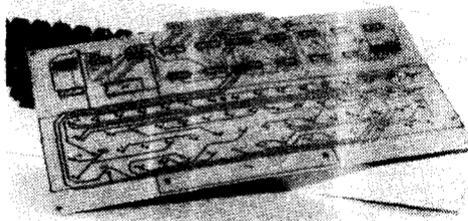
Von D. Soule

Keyboard from Ace

I bought a KB-7 keyboard from Ace Electronic Parts (5400 Mitchell-dale B-8, Houston 77092--req. free catalog).

It has all the command keys except for Backspace. I used the Linefeed (0A) key for Backspace, and the TV Typewriter program runs fine.
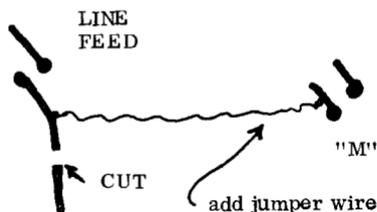
I do get a lot of question marks on the screen when I use the Delete and US keys. Anyone know why?

Mike Kelley

KBD (TOP VIEW)

Z19 ← ADD THIS IC
(7404)

Z18   Z17   Z16   Z15

FIG. 1

FIG. 2

FIG. 3

R-S just isn't ASCII

by Tony E. Pajnic

ASCII is short for American STAN-
DARD Computer Information In-
terchange code.

There cannot be a non-standard
ASCII since ASCII is a standard in
itself.

If all the keyboard characters do
not meet the code then the keyboard
is something other than ASCII and
manufacturers should point this out.

The Radio Shack keyboard puts
out a hexadecimal 7E for the Es-
cape function rather than the ASCII-
standard 1B. This important key
function may be modified on the
board with the addition of one IC
and some wiring changes.

Compare the Radio Shack key-
board layout with that in Figure 1.
Note that one IC, Z19, has been ad-
ded. This is a 7404 Hex inverter
chip. There is room on the board,
in the approximate position shown
in Fig. 1, to mount this. To make
sure you do not cut a track, check
both sides of the board before drill-
ing holes.

Drill the holes and insert the chip,
orienting its pin-1 the same as the
others on the board. Bend the IC's
four corner pins to hold it on the
board.

Cut the track in two places:
- between pins 2 and 4 on Z17
- between pins 10 and 12
  on Z18, on the bottom side
  of the board.

Now carefully unsolder the ESCape-
button pins from the bottom of the
board. These pins will have to be
isolated from the other circuitry.

You will have to use small wire
(No. 26 wire wrap wire) and spa-
ghetti (insulation from No. 22 sol-
id wire) to accomplish this. Tack
solder the No. 26 wire to the pins
and push the insulation into the ho-
les.

The rest of the modification in-
volves making connections between
the various IC's. Using wrap wire
make the following connections:
- One of the wires from the
  ESCape button goes to Z12
  pin 13.
  The other wire goes to Z19
  pin 1 and Z18 pin 12.
- Connect Z19 pin 7 to Z17
  pin 7.
- Connect Z19 pin 14 to
  Z17 pin 14.
- Connect Z17 pin 2 to Z15
  pin 4.
- Z17 pin 4 to Z19 pin 3.
- Z19 pin 2 to Z15 pin 6.
- Z19 pin 4 to Z15 pin 5.

Check your wiring with the schemat-
ic in Fig. 3. A few drops of glue
from a glue gun will make the wires
adhere to the board and stay in place.

If you built the HEEP tester as
outlined in the Radio Shack keyboard
manual, you can now connect it to
the board and check to see that you
have the 1B code when you press
the ESCape key. Be sure you are
not in the Shift Lock mode or you
will get the wrong output.

You can also use the CLEAR key
as a RESET if you wish. Unsolder
the pins of the CLEAR key to the
bottom of the board as you did with
the ESCape key. Using No. 26 wire
wrap wire and spaghetti, isolate
this key from the rest of the cir-

cuitry.

Connect one of the wires to any convenient ground point on the board and the other wire to Plug No. 1 pin 15 of the Central Data board or to the RESET pin on the 2650. This completes the modification.   -30-

Resistor fixes input

DON'T FORGET Mike Herbach's modification, from his letter carried last issue:

... The addition of a 1 K Ohm resistor from Z11 pin 5 to Vcc (+5V). This eliminates a floating input that sometimes causes unwanted repeat functions.

And, unintentionally cut from last issue:

"These may seem like a lot of changes but the Radio Shack keyboard is still the   only easily-available, inexpensive keyboard sold with a guarantee.

"The one in my system works well after the above modifications have been made."
                      Mike Herbach
                Signetics Engineering staff

NO ESCAPE: :

Problem common

Bookie, yesterday I received my very first copy of 2650 Computer User Notes (TCH) and I was very happy to see that other people have problems too. [Sadist! ED]

You see, I was one of those unfortunate people that, on the strength of Jeff's remark in Radio Electronics, couldn't wait to go out and buy a Radio Shack keyboard--just to find out, after many frustrating days:

It doesn't work!

Anyhow, I solved the ESCape-key problem the quick and dirty way--cut the foil going to pin "N" (the output connector) and inserted a SPDT switch to disable bit 7. Then I push my special switch and the "[" key for ESCape.

Of course I have to push two switches, but it works.

Eventually I will buy another keyboard, and send a nasty note to Radio Shack.   Johannes Oelke

ESCape fix easy

The Radio Shack ASCII encoder board outputs a hex "7E" for an escape character. With a couple of diodes and two cuts into the PC board, the ESC key can be made to output a hex "1B", the standard ASCII ESC code.
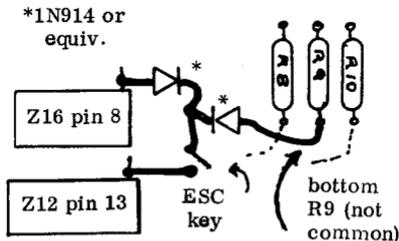
In cutting the board, the idea is to free up the switch to look like a SPST push switch. The PC land that is visible at the ESC key is cut and the visible connections are cut by drilling thru the board with a small drill until you sever them.
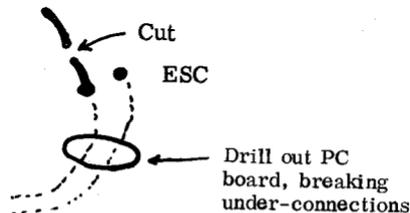
After cutting and wiring is complete, the ESC key will now output a hex "1B".

Wait, you're not finished yet. Cutting the under-connections have disabled the [⋎] and [⋝] keys. To restore these keys, run a jumper between Z12 pin 16 to the common land connecting [⋎] and [⋝] keys.
                      Ken Barber

COMMENTS HELPFUL

Mike Herbach's comments on the Radio Shack keyboard were very helpful, since I already own a R-S keyboard and lack of the ESCape function was causing a problem.

I installed a normally-open switch to ground the "S" output when the semicolon key is pushed. This gives normal ESCape.
                      Pete Venema

Switch, gate added

Cut the foil at the edge connector pin N, and put an AND gate across the cut and a normally-open switch to the other AND gate input, along with a 4.7K Ohm resistor to Vcc (+5V)

When the switch is open, pin 2 of the 7408 is high, so whatever comes from the keyboard goes through unchanged.

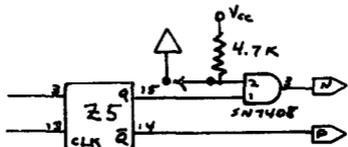The [key has a code of 5B, or 0101 1011. Escape is 1B, or 0001 1011. So, if you close the switch on the above circuit, pin 2 of the 7408 goes low, so the output pin 3 is low. So if you push the [key while the switch is closed, bit 6 (first bit is bit 0) gets changed to a 0 and you get 0001 1011, or hex 1B, shich is ESCape.

Although one may not like the idea of having to push the switch and a [keyboard key in order to get ESC, it does work and is inexpensive.

David Locken

TV can be monitor

WHATCHA doing for video? That is one of the most-asked questions whenever two 2650 hackers meet.

TCH has an old-style Motorola monitor, dating from about the same period as the Merrimac, and a Vamp conversion board, which we lock up at night. We can't report anything on that except that it is supposed to make any tube or solid-state TV into a high-quality (well!) monitor. More in a later issue.

On the same track as Vamp is the Pickles and Trout $20 conversion board, which is designed specifically for the Hitachi SX chassis.

The Vamp claims 10MHz bandwidth, the P&T up to 96-character/line definition, either of which would certainly be adequate for the Central Data 16x80 display.

Mike Kelley has the P&T/Hitachi monitor, which he describes as working "fairly well".

"The display itself is rock stable. Character definition is fair to good." He complains that his horizontal lines in the characters are brighter than the vertical lines.

TCH passed this complaint on to P&T, doubting that we would hear anything from them, and in about 10 days had the following from Gregory M. Pickles. Before we get into that, let us note that P&T has moved to a new post office box, still in octal, one zip code away. They are at Box 1206, Goleta, CA 93017. Now Gregory:

Regarding the problem with the horizontal strokes of characters being brighter than the vertical strokes, we have two suggestions:

First, be sure that the video generator is putting out a true "white" level for the vertical strokes. Since the lines are only one dot wide, many video generators do not have an output stage capable of driving a 70 Ohm load to the white level for only one dot. The result is a spike which never reaches the final value; hence the vertical strokes are really a grey level rather than white.

For a horizontal stroke, the output has more time to settle so the slow rise and fall times are not so noticeable. We have discovered this problem on at least one well known video generator board and suspect it occurs on others, to some degree.

[What's everybody say--do we have grey vertical strokes? If so, designers, how bout a Miricle Whitener!]

Second, there is a change that can be made to the set which will help to increase the transient response. There is a slew-rate limiting capacitor on the output of the video amp, IC2. It is labeled C222 and has a value of 180pf. On most sets it can be removed from the circuit with no ill effects. However, in some sets without the capacitor, the video amplifier will oscillate for a while after the horizontal retrace. This is evidenced by either a "salt and pepper" effect or a series of dark and light bands at the left edge of the screen. If the oscillations occur, install a ca-

pacitor of less than 180pf (50V) in place of C222. Trying various values will determine the correct one. Use the smallest capacitor which will stop the oscillations.

-30-

LIKES PICKLES, TROUT

I'm using the Hitachi PO-5 TV with Pickles & Trout monitor modification, and it works fine.

Pete Venema

Pans 2650 article

The November Interface Age ("Interface Design with Signetics 2650") was quite disappointing. Did you realize that the article is a verbatim copy of Signetics Application Note MP54? Hardly good editorial policy, from my point of view.

[Signetics does not automatically send me applications notes. Hardly good public relations policy, from my point of view, but perhaps indicitive of its opinion of the hobbyist market. I have to request applications notes, and most of my requests are ignored. However, subscribers have sent me most of the notes. ED]   --Randy Sebra

Add Z-80 to system?

Multiprocessing anyone?

SD Sales has an S-100 Z-80 board for $139.

[That board requires front panel for "booting up", Nathan. The Ithica Audio, from Jade, Base2, etc., does not, thus could slip in the Central Data S-100 interface board with minimal problems.

If anybody has ordered the SD Sales board, however, Jade and Sargent Distributing have front panel boards.

We've seen the Ithica Audio kit for as little as $110 (Base2). Jade has a 8080 board for $100, but I don't know whether or not it needs front panel.

TCH's S100-Bus edition will support the Ithica Audio, MiniMicroMart, SD Sales, and other Z80 and 8080 boards. ED]

--Nathan Myers

TV FOR DEBUG:

Regarding using the TV for debugging a board, notice that the timing chain circuit will display more than one screen if you have a bad 74163.   L. Cliff McDonald

FOUR MISSING:

76 Rows on screen

Ken Barber, one of the ones who did a super job on Radio Shack keyboard modifications, offers the following questions:

● Did I get a prototype ROM with my Central Data 2650 or does the supervisor limit the display to only 76 characters on all Central Data ROMS?
[We've heard the supervisor count to 80. I won't tell you where it was I worked for a supervisor who couldn't count past five. ED]
● An old ad from Central Data said "exceptional Basic in a 4K package". A recent ad says "ex-...in 6K". If anyone has Central Data Basic, how big is it?
[Have you heard the one about the traveling salesman who built a boat in his basement? Maybe that isn't fair. From reports I have, Central Data Basic is exexceptional, in a good way, and is indeed 4K--but a slightly-abbreviated editor (otherwise same as on Assembler) brings it up to 6K--quite a bit of power for a modest $20 bill.]
● Did that Hangman program in UN 1:1 actually work?
[Yep, but there are mods in 1:2]
Ken has the Central Data 2650, Radio Shack keyboard, 12" Conrac monitor, Radio Shack CTR-39 tape recorder, and Lambda 5V supply.

He plans to install the Central Data S100 bus interface that just came in the mail, build DC supplies for the S100, assemble and test Base2 memory (two 8K 250ns kits), try out Central Data Basic (your comments, please), figure out correct installation of Mini-MicroMart TVT-2540-AS1 UART board (wow, this board is also made by Central Data--Ken), get Carterfone model 318 modem ($25 from Rondure Co.) working with UART. [We look forward to hearing more about this neat system. ED]

New 2650 Basic

Maybe you could ask Jeff why there's no INT command in his Basic--does it use the Fortran format in that function?

Nathan Myers

Basic has INT and FRC.

Jeff Roloff

[Hmmmm, he doesn't advertise those goodies. Maybe we ought to list Central Data Basic comands and functions. ED] Here goes:

ABS	CALL	COS
DATA	DIM	END
ERASE	EXP	EXTIN
EXTOUT	FOR/TO	FRC
GOSUB	GOTO	IF
INPUT	INT	LET
LN	LOG	NEXT
PEEK	POKE	PRINT
READ	RESTORE	RETURN
RND	SGN	SIN
SQR	STOP	TAN

Basic/assembler?

How about combining Basic and Editor/Assembler programs? They could share subroutines and might reside within 8K.

Bit 7 of the display memory could be used as an extremely fast serial output (maybe!). I don't know enough electronics to know whether it's feasible, but... [Whatcha thinking of, a really inexpensive floppy system, Nathan? Shame on you. None of us 2650 hackers want to save money! What's everybody think?]

How about a short supplement to the exec that would be at the front of each program tape, allowing us to put the block anywhere in memory? We would load the first block, which contains only this, and then execute it, loading a block of the big program into the same place each time, and then moving it to wherever we want it. (I'm not too hot on software, either, but...)

Nathan Myers

How do you divide?

I see in a user notes (not TCH) to start a program at 0000.

This may sound dumb, but how can you do this when 0000 is al-ready loaded on the ROM?

As you can probably see, I am not good on programs, a situation that I am slowly correcting--but I thought Jeff's explanation in R-E left much to be desired in educating us dummies who are trying to learn about this.

I am sure there are others who have questions and probably are trying to stumble thru them the same as I am.

Von D. Soule

Program at 0000?

Now I have a question:

Does anyone know how to divide? It's not that I failed grade 3, but I am still running a Central Data 2650 on machine language, and would like to know how to divide with hexadecimal numbers.

David Locken

This is not an expert opinion, but the editor's--the Blind Self-Help Association. Rich Didday says nothing about division in his 2^{10} Questions and Answers, but we imagine what you want is in the following Signetics application notes:

AS53 Binary arithmetic routines
AS54 Conversion routines
AS55 Fixed point decimal arithmetic routines
AS56 Sorting routines
AS57 Binary floating point routines
AS58 BCD Floating point routines
MP51 Initialization

We do not know whether or not Signetics is meeting requests for these or not. We queried them and were not given an answer, which is not unusual to us.

Total pages is 89, eliminating title pages, and even if we reduce pages to TCH size, we would have to charge about $5 if we were going to reproduce them. And readability is low enough now that we would hesitate to attempt the job.

Only really useful way to put out such a package would be combined manual and tape. Even then I'm not convinced many people could use it.

Best bet is to add enough memory that you can use Central Data Assembler/Editor, or Basic. ED

TVT can scroll

ADDING SCROLLING to the TV Typewriter program in June '77 Radio-Electronics and in Central Data's computer manual is actually rather simple.

The TVT program and any other programs using the monitor routines KBIN and LFCR handle the end of the sixteenth line in the following manner.

When a carriage return is generated, the top line is erased and the cursor is placed at location H1040.

This is fine, because the top line would be lost in scrolling, anyway.

The scroll routine is called after calls to KBIN and LFCR.

The position of the cursor is tested for this condition by the routine, and if it occurs, scrolls the display. This is accomplished as follows:

The routine merely transfers the lower 15 lines in memory to the upper 15 lines, erases the last line, positions the cursor to location H104F (lower left of screen), and returns control to the TVT program.

TEXT EDITING and word processing are obvious uses of this program. Another possibility is as part of a data communications pro-gram. However, since scrolling takes approximately 29 msec. (using Central Data's 1.18 MHz clock), buffering of input would be necessary.

Incidentally, to any readers having access to a Tektronix 4051, this program was written using an assembler I have written for the 4051.

It allows large programs to be assembled in even the minimum 8 K configuration, and has built-in editing.

I am making the program available as a listing with documentation, for $10. For an additional $1.50 to cover postage, along with a user-supplied DC300 data cartridge, I'll put it on tape.

--Randy Sebra

[Randy has promised to keep in touch with things on communications and word processing. Fantastic! With our 80-character video, interest should be heavy. How 'bout everyone out there getting active on activating the lowercase, and using the Central Data as intelligent terminal?

I'll bet there is good market out there for word processing software for this 2650 machine, Randy. Got anything? Assembler customers should write him at: 54 Krouse Court, Aberdeen, MD 21001. UGH, brings back memories of Navy boot camp (Bainbridge, class of '54). ED]

TVT WITH SCROLLING
assembler version 1.0
by Randy Sebra

```
 1  1600  00  1600            ORG      1600     START PROGRAM AT 1600
 2  1600  75  08     TVT      CPSL     08
 3  1602  3F  030F            BSTA,3   030F
 4  1605  3B  2B             BSTR,3   SCROLL   BRANCH TO SCROLL
 5  1607  E7  08             COMI,3   08
 6  1609  18  09             BCTR,0   BACK
 7  160B  E7  0D             COMI,3   0D
 8  160D  3C  0024           BSTA,0   0024
 9  1610  3B  20             BSTR,3   SCROLL   BRANCH TO SCROLL
10  1612  1B  6C             BCTR,3   TVT
11  1614  07  20     BACK     LODI,3   20
12  1616  CF  97FE           STRA,3   *17FE
13  1619  0F  17FF           LODA,3   17FF
14  161C  A7  10             SUBI,3   10
15  161E  CF  17FF           STRA,3   17FF
16  1621  77  08             PPSL     08
17  1623  0F  17FE           LODA,3   17FE
18  1626  A7  00             SUBI,3   00
19  1628  CF  17FE           STRA,3   17FE
```

```
20  162B 07 5C           LODI,3  5C
21  162D CF 97FE         STRA,3  *17FE
22  1A30 1B 4E           BCTR,3  TVT
23  1632 0C 17FE  SCROLL LODA,0  17FE.      |-
24  1635 E4 10           COMI,0  10         |CHECK FOR CURSOR AT
25  1637 98 3A           BCFR,0  RETN       |LOCATION H1040 . IF
26  1639 0C 17FF         LODA,0  17FF       |ELSEWHERE , RETURN
27  163C E4 40           COMI,0  40         |TO MAIN PROGRAM
28  *63F 98 33           BCFR,0  RETN       |-
29  1640 20              EORZ
30  1641 C8 34           STRR,0  SB+1       |-
31  1643 04 01           LODI,0  01         |STORE STARTING MEM-
32  1645 C8 2E           STRR,0  SA+1       |ORY ADDRESS AT LOC-
33  1647 04 10           LODI,0  10         |ATIONS SA & SB
34  1649 C8 29           STRR,0  SA         |
35  164B C8 29           STRR,0  SB         |-
36  164D 06 04           LODI,2  04         SET COUNT FOR LOOPB
37  164F 05 01   LOOPB   LODI,1  01         INC. FOR MEMORY
38  1651 07 00           LODI,2  00         SET COUNT FOR LOOPA
39  1653 0F F674 LOOPA   LODA,3  *SA,0      |-MOVE 256 BYTES UP
40  1656 CF F676         STRA,3  *SB,0      |1 LOC IN MEMORY IN-
41  1659 DB 78           BIRR,3  LOOPA      |-DEXED,INDIRECT
42  165B 8D 1674         ADDA,1  SA         |-
43  165E CD 1674         STRA,1  SA         |SET UP NEXT 256
44  1661 05 01           LODI,1  01         |BYTE BLOCK OF DIS-
45  1663 8D 1676         ADDA,1  SB         |PLAY MEMORY TO BE
46  1666 CD 1676         STRA,1  SB         |-MOVED .
47  1669 FA 64           BDRR,2  LOOPB      LOOP FOR 4 BLOCKS
48  166B 04 0E           LODI,0  0E         STORE CURSOR AT END
49  166D CC 17FF         STRA,0  17FF       OF LINE 15
50  1670 3F 0024         BSTA,3  0024       DO LF , CR
51  1673 17      RETN    RETC,3             RETURN TO MAIN
52  1674 00 02   SA      RES     2          IND. ADD. #1
53  1676 00 02   SB      RES     2          IND. ADD. #2
54  0000 00 2            END
```

Here's Hangman fix

The listing of my Hangman Game, TCH 1:1, has a few semantic errors I would like to explain.

First, though, there is one hex code error. On the bottom line of page 8 at address 1591 the code should be 1F 16 0C, not 1F 18 0C.

The messages at address 1700 must be entered in ASCII, one letter at a time, and each message is terminated with 00 code. There are a few blanks (ASCII 20) around MSG 3 & 4 to space things out. They should fall into place if the starting address of each message is observed.

The semantic errors are where I have STOZ R3, and LODZ R3. These should be STRZ, R3 and LODZ, R3.

Also, my indexed commands are in the Signetics assembler format. The Central Data assembler format is more concise and easier to interpret.

Therefore, STRA, R0 ARY1, R1+ becomes:

  STRA, R1 ARY1, + with R0 assumed.

Of interest to efficiency-minded programmers is the command at address 154A.

This indirect relative command uses the absolute address at 154F. This location is not accessible to an assembler so the command at 154A would then have to contain an absolute address, costing one extra byte!

Finally, a modification. The computer will go bananas if line feed is pushed with no letters in the field. To fix this, change address 1553 to 1F 16 62 and change 1662 to:
```
01             HDNG  LODZ, R1
1C 15 10             BCTA, Z  setup
CD 17 B7             STRA, R1 wdcnt
1F 15 56             BCTA, UN 1556
```
Of course, when you dump this back to tape, change your second dump from L52 to L5C or round up to L60.   Mike Herbach

This fixes assembler

Central Data Assembler/Editor
program fixes, version 11/18/77,
by Mike Herbach "with tons of co-
operation from Jeff Roloff of Cen-
tral Data":

This applies only to tapes ship-
ped from Central Data prior to
11/21/77.

1   Find end of program RAM--
    3277 on most tapes.
2   XXXX indicates first avail-
    able RAM. Leave room to
    change 3277 from 17 to 1F
    XX XX for jump to print rou-
    tine. First RAM is now 327A.
3   Change 2E FE from CC 0E B4
    to 1F 32 7A and change 327A to
    CC 0E B4, 20, 17 to clear
    R0 after use.
4   Change 2AD5 from 41 to 4E
    to fix type.
5   Change 2B7C from E1 to B4 to
    fix bug caused by using hex
    code for label.
6   Change 3179 from 3F 32 10 to
    1F XX XX and change XXXX to
    3F 01 70, 3F 32 10, 1F 31 7C
    to have curser move after res-
    ponse to "binary output" mes-
    sage.
7   Change 2DBF from 3F 23 16 to
    1F XX XX and change XXXX
    to 3F 01 70, 3F 23 16, 1F 2D
    C2 to have curser move after
    response to "data input" mes-
    sage.
8   Change 22B2 from 05 FF 3F to
    3F 23 21, 15 FF, 1F XX XX,
    16, 1B 78 and change XXXX to
    3F 22 66, 0C 85 52, 1F 22 BA
    to allow more than 256 lines
    of assembler program.
9   Change 3150 from 1C 31 E4 to
    1C XX XX and change XXXX
    to 01, 1F 31 E4 to fix setup
    for "print" command.
10 Change 322D from 02 06 02 to
    1F XX XX and change XXXX
    to 98 02, 06 01, 02, 06, 02,
    1F 32 30 to fix tape dump prob-
    lems from "tape" command.
11 When using "tape" command
    and the dumped tape does not
    put you back in the Exec after
    loading, increase the BSB
    area by decreasing the value
    at 2006 or increasing the value
    at 2007.
12 When adding a printer, change

3277 from 17 ** ** to 1F XX
XX and put print routine for your
printer at XXXX. Start routine
with 77 10, 0D 0B 9F, 98 03,
75 10, 17 to protect register
bank 0 and check for a "print"
command before printing. Then
print what is in R0. Don't for-
get to return to register bank
0 with 75 10, 17 at end of rou-
tine.
13 Fill unused RAM to 3300 with
    00s to help find end of RAM for
    future fixes.
14 After making the above changes,
    if the assembler works more
    poorly than before, start sub-
    stituting "3"s for "B"s, which
    look exactly alike on Signetics'
    cheap printer.
15 Never buy the Expandor "black
    box" printer.
16 For the editor's views on all-
    caps writing, and Teletype in
    general, see December Kilo-
    baud (chocolate cover).

NEW TAPE ROUTINE:
"Also, in the assembler, there is
a problem. It only shows up when
you have over 255 lines of text in
the text buffer, but here is the fix:
"Change the FINDND routine
(line 340) to:

FINDND	BSTA, UN	MTDA
FINDN2	LODI, R1	FF
	BSTA, UN	FWDX2
	LODA, R0	*DUMA
	RETC, LT	
	LODA, R0	DUM2
	BCTE, UN	FINDN2

Note that this woutine is linger than
the original one, so the user must
put it outside of where the assemb-
ler is and put a branch to it at ad-
dress 22B2 (the location of the pre-
sent FINDND)"   --Jeff Roloff

The letter from Central Data
mentioned a tape dump routine. The
version Jeff sent me did not reliab-
ly dump the first time. It did the
second, etc.
I found it needed to have the
WITH CARRY in the PSL cleared
to work the first time every time.
This stems from the fact that a
bug in the executive program does
not properly set the PSL and PSU.
They are set to a random value un-
til the user uses the I command and
sets them with a C. __Mike Herbach

It appears that some people are
not aware of all that Central Data
offers. [OK, I'll reprint part of
Jeff's price list. ED]

Jerome Vitner

Assembled and Tested Boards	Price
2650 Computer System Board	$325
S-100 Bus Board	$110

Parts to Make Your Own

2650	$ 27
3624-4	$ 27
Three required: two for the supervisor and one for the character generator.	
Unprogrammed 3624-4	$ 22
Custom programmed 3624-4	$ 35
made from cassette tape supplied by you	
Optional lower case character generator	$ 27
9334	$ 6
14.192640 Mhz Crystal	$ 8
S-100 Cables	$ 22
For connection between the two boards.	
2650 System Circuit Board	$ 40
S-100 Bus Circuit Board	$ 40
All parts carry a 90 day warranty.	

Manuals

2650 Computer System Manual	$ 5
2650 Microcomputer Manual (Signetics)	$ 5

Software

Editor/Assembler	$ 20
Basic	$ 20
All software comes with a cassette tape, an operation manual, and a program listing.	

Illinois residents must include 5%
sales tax on all products.
Orders which include assembled
boards are postpaid. All others
(except manuals) must include $3
to cover shipping and handling.
Manual purchases are refundable
upon purchase of an assembled
2650 computer system board.

Central Data, Box 2484
Station A
Champaign, IL 61820

That "damned little zenier" is also
available from Ancrona Electronics.
Digi-Key sells a 9334 for $1.90,
a price which knocks $4 off the us-
ual price of the Central Data.

Nathan Myers

I noticed a question on power sup-
plies and can suggest Delta Elec-
tronics as a source. They have a
5V 8 amp supply that I am using,
and have no problems.

Pete Venema

[According to ad in Nov. Kilobaud,
includes ±12V 2 amp, ±6V 75mA,
15 lbs shipping, $34.50 from Box
2, Amesbury, MA.
Interesting, but untested, the 5V
6 amp regulator card, $4.95, from
Diamondback Electronics, Box 194,
Spring Valley, IL 61362. ED]

My power supply uses a transfor-
mer from IC Electronics, 4361 Con-
voy St., San Diego CA 92111. It
has 12 volts at 8 amps and cost
$4.95. They might have some left.
[Not when I tried it, Gene. Of
course they may have more in.]
Concerning regulators, with the
price at Poly-Paks, 3 for $1.19,
it's cheaper to parallel LM309Ks
than to use pass-transistors. [Is
that right, experts? Can you get
away with that? Unless you know
you can, don't anybody do that un-
til we get confirmation. ED]
As for Central Data computer
board parts, readers might send
for catalogs from the following
sources I used:
● Tri-Tek, 6522 N. 43rd Ave.,
Glendale, AZ 85301
● IEU, Village Square, Box 449
Carmel Valley, CA 93924
● Quest, Box 4430, Santa Clara,
CA 95054.
If there is sufficient interest, I
could make up or have made up a
kit of hard-to-get parts for the
Central Data computer board.

Gene Mullnix

[I don't know whether or not you
know what a thankless job that could
be, Gene, everybody griping be-
cause some supplier sold you bad
parts! Anyway, whatcha think,
readers? Maybe just getting sour-
ces and order sheets in print will
be good enough. Everybody keep
telling us your best buys. ED]

Selectric, cont.

We've also heard that they are good typewriters, but mechanically can't stand up to the high speeds the computer will require of it. Let's examine that one.

When anyone presses a key on the Selectric keyboard, that respective character is selected and printed at the rate of 15-characters/second. Whether you depress the keys at the rate of 15-characters/sec., or 1-character/hr., the mechanism operates at the same rate.

Properly interfaced to computer, however, the mechanism has much less work to do than when operated from the keyboard.

Through feedback from timing switches C1 and C2, your computer knows when the Selectric is ready for another character. If the computer gives it one within the "window" period, the typing element does not home back to the rest position but goes directly to the next character selected. This greatly reduces wear on the cycle clutch, the guy you most have to look out for if you want long troublefree operation.

Installation of non-print cams in the print head further reduce cycle clutch operations to one-per-line. Interface improperly, or type from the keyboard, and you are cycling with each character. Clear that up and you are cycling only once each word, plus each space and carriage return. Add the non-print option, and you cycle only once each line, plus each carriage return. From a reliability standpoint, we are talking about three different machines! Pay no attention to the broad-brush statements about Selectrics!

Word Processing Letter took the case off an old correspondence Selectric, and cleaned it up. We considered three locations for adding

---

Getting parts is half the fun

I now have a working 2650 board. Like you said in TCH 1:1, getting the parts is the biggest hassle.

I have enclosed copies of my order forms and have made notations of the bad parts I received.

Poly Paks was the only company from which I received a few bad ICs, and taking into consideration the price, it was not that bad of a deal.

James always processed the order fast and I had no problems.

SD Sales, from which I purchased 21L02s (500ns), are working but if I could do it again I would buy the faster RAMs

Dig-A-Key has or had the zener that is hard to find. Also, the 9334.

Since reading the first Radio-Electronics 2650 article, I heard of a high-speed 2650 that clocks at 2.5MHz. I can't find anyone who knows anything about it. Have you found anyone? [Nope. Thanks, the order forms. I think that was a great idea! ED]

L. Cliff McDonald

POLY PAKS INC. 222 ORDER BLANK

Satisfaction Guaranteed or your money back

P.O. BOX 942, SOUTH LYNNFIELD MASS. 01940

DATE 8-27- 1977

If You Have Moved Since Last Order Write your old address here

JUN 30 1977
PROCESSED

L. C. McDonald
Street Address: 5134 B. Alpharetta ct.
City: Norcross
State: Georgia Zip: 30093

2 Ship to Another Address? Give directions
Charles S. McDonald
Street Address: 4478 Intersem. 85
City: Norcross
State: GA. Zip: 30013

4 If This Is Your First Order To Us, ☐ Check

5 My Order Is:
☐ Paid in full ORDER $14.08
☐ C.O.D. ORDER deposit (We will ship balance C.O.D.)

My Order Is From:
Poly Paks
Catalog No.:
Name of Magazine:
Issue:

MINIMUM ORDER $6.00 PLUS POSTAGE

DO NOT USE THIS COLUMN	STOCK NUMBER	HOW MANY	NAME OF ITEM	PRICE Each Set Pair Pkg. etc	TOTAL PRICE Dollars	Cents
3✱	92041981	3	SN 7414 — OK	.61	1	83
3✱	''	3	SN 7432 — OK	.24		72
2✱	''	2	SN 74132 — OK	.83	1	66
10✱	''	10	SN 74163 — 3 BAD	.87	8	70
2✱	''	2	SN 74166 / BAD	1.15	2	30

CHECK HERE ☐ FOR POLY PAK'S OWN $25 SURPRIZE PAK ADD 25c FOR HANDLING .25

SHIP VIA ☐ PARCEL POST, ☒ UPS, ☐ AIR MAIL | TOTAL FOR GOODS | 12 | 93 |

TERMS: If you are not Listed and Rated in Dunn and Bradstreet, forward check, money order, etc. and include sufficient postage. We accept phone orders from rated firms, schools, colleges, etc. We also accept COD phone orders. All prices are FOB, Wakefield, Mass. **IMPORTANT:** Please use a separate sheet for all correspondence on orders other than the one you are including and address it to "CUSTOMER SERVICE DEPARTMENT". This assures you prompt response. Like all department stores we must have your original order & a copy of it to expedite your correspondence

Mass. residents please add 5% sales tax

| POSTAGE AND INSURANCE | 1 | 15 |
| AMOUNT ENCLOSED | 14 | 08 |

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211779

P.O. BOX 822   BELMONT, CALIFORNIA 94002   (415) 592-8097

PAID
MAY 19 1977
JAMES ELECTRONICS

All Good
PAID

QTY	DESCRIPTION	PRICE	AMOUNT
2	840P 20k	.99	1.98
5	82 1/4 w res.	.05	.25
5	100 1/4 w res.	.05	.25
5	330 1/4 w res.	.05	.25
5	470 1/4 w res.	.05	.25
10	1000 1/4 w res.	.05	.50
5	10k 1/4 w res.	.05	.25
5	20k 1/4 w res.	.05	.25
8	68k 1/4 w res.	.05	.38
5	100mfd elect	.19	.25
5	.01mfd disc	.05	.25
5	100pf disc	.05	.25
10	.1mfd disc	.12	.60
5	.0022mfd mylar	.12	.05
5	.047mfd mylar	.21	.41

POSTAGE & HANDLING

| | | TOTAL | 8 | 62 |

FOREIGN CUSTOMERS: U.S. MONEY ORDER OR CERTIFIED CHECK ONLY.
PLEASE KEEP THIS COPY FOR REFERENCE
ALL CLAIMS AND RETURNS MUST BE ACCOMPANIED BY THIS SLIP

NET 30 DAYS

QTY	DESCRIPTION	PRICE	AMOUNT
2	7425	.43	.36
2	74109	.95	.90
2	74504	.35	.70
5	7408	.18	.25
1	7474	.25	.49
2	555		.78
	CA 3130	1.39	

TAX

POSTAGE & HANDLING

| | | TOTAL | 10 | 07 |

FOREIGN CUSTOMERS: U.S. MONEY ORDER OR CERTIFIED CHECK ONLY.
ALL ORDERS SHIPPED F.O.B. SHIPPING POINT.

NET 30 DAYS

Selectric, cont.

solenoids for computer operation. These were in the back, where IBM puts them, in the front, where the Sharp & Assoc. interface puts them, or over the keys, where Viatron, Stoutprinter and others put them.

Any way we looked at it, we were opting for a sardine sandwich. We came up with a fourth location, and discovered CPT, a moderate-priced word processing machine manufacturer, does it that way too. The keyboard has about two-thirds of the complexity of the whole machine. It is a separate module, and can be removed by loosening two bolts and one shaft.

With its keyboard removed, Selectric is a whole new machine. Most typewriter intricacies are now out in the open, where adjustment should be easy. And you can see what's happening, and easily understand the machine.

Where do you put the solenoids on your new keyboardless Selectric? In just a fraction of the space once taken up by the keyboard. Connect them to the little dangles that the keyboard used to pull.

Sockets all ICs

Am planning to use sockets on all ICs. Expect to shell out around $235 for all components and board. Already have fabricated a power supply and ASCII keyboard and have a Panasonic 9" video monitor.

Plan on adding 8 K memory.
Jim Haworth

Report memory buys

Just received the Base2 8 K 450ns memory, board not yet built. Quality seems good, PCB solder masked both sides. Standby capability not practical unless you have a car battery next to your system [how 'bout that, readers? You going to let that stand unchallenged? Let's hear some more on both sides on that one. ED] The engineer at Base2 says they will have a 16K board soon. [What about that, John?]
Mike Kelley

You say you don't want to spoil the Selectric, for ordinary typing. You don't have much faith in your computer. With the computer, you don't need direct, hands-on typing. No more!

We said proportional space is a possible option, and Selectric does not have proportional space.

Oh, but it does. There is the $5,000 Selectric Composer--Kilobaud and probably half the magazines you read are typeset on it--and one of the MSTs have b-e-a-u-t-i-f-u-l eight-increment (this machine has only five) spacing, and a wide variety of type styles.

These machines use something called "leadscrew escapement". We are investigating ways of adding it to our conversion project. Parts for everything we want to do with the machines are available at modest price from IBM. Anywhere into the project, full documentation is available, and should we goof or give up on something, we can get that done professionally, at reasonable cost.
ED

[Central Data announced, Dec. Interface Age, a 16 K RAM board for $289, with additional 16 K for $250. Is dynamic, S 100, assembled. ED]

SD Sales has a $139 8k RAM board, expandable to 32K by adding $96 chip sets. That's $331 for 24K, compared with $375 for the Base2 Ithica Audio 8K static RAM board.

Trouble is, the 32K SD Sales board has dynamic memory. They have hidden refresh, though.

Would they work in the Central Data, Jeff?

If so, the only major problem is the +16V, -16V, +8V power, a thrifty 800mA each.

[Dec. Byte ad has board plus 8 K for $151, with $475 for 32 K, or $367 for 24 K, only $8 less than $125/8 K static. Has the price dropped? Lots of dynamic boards are coming out, prices will continue to drop. ED]
Nathan Myers

By the way, have you seen the latest SD Sales ad: 8 K memory boards for $139, with $96 for 8 K add-on, giving you 16 K for less than $250. But is it fast enough?
L. Cliff McDonald
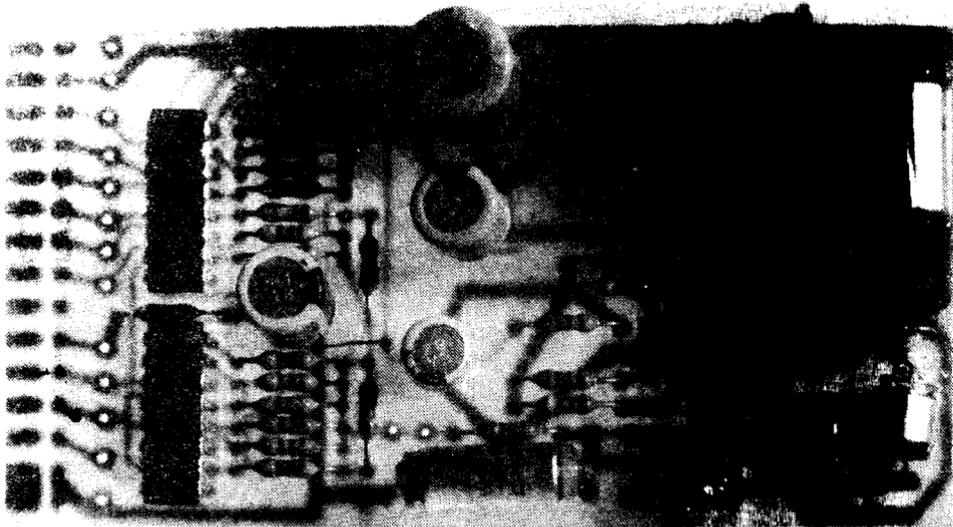
MUSIC BOARD--Four-part harmony, when used with 6502, is built into this Hal Chamberlin bargain, just $35 assembled/tested, or $6 for bare board. See end of his definitive article in Sept. Byte for details. Software is in 6502, but translation should not be too difficult. Hal has offered to check someone's work on that. Needs 8-bit output port, which Central Data board has. Let TCH know how you're coming. Board is from Micro Technology Unlimited, 29 Mead St., Manchester, NH 03104.

THE COMPUTER HOBBYIST 2650 Computer User Notes is published bi-monthly, Bill McLaughlin editor. Subscriptions--payable Bookmakers --are $5 U S, $10 overseas, via air.

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