

TRS-80 COMPUTING

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NEXT ISSUE: Includes complete listing, 8K Journal / Ledger program, runs in either Level I or II, put in public domain via TRS-80 Computing through the generosity of its author. Hey, that's a neat way of getting lots of TRS-80 programs: everybody write one and put it in this journal!

Here's a fix for Level II lowercase

By J. DANIEL LIKENS
Computer Control, 3001 Redhill, bldg. 1
Costa Mesa CA 92626

(Here is a hardware solution to the display of lowercase letters in TRS-80s equipped with Level II Basic. Ed.)

What we've done is try to get around the problem that Radio Shack overlooked when it wrote the Level II firmware, by allowing the machine in either its original electrical configuration or by writing a bit to a port under software control, switch-in the lowercase modification.

What this means is that whenever you're running most anything written by Radio Shack, you're going to have to have the machine in the normal configuration. When you're running your own software, or running something that's been written by another outfit, like Small Systems, or whatever, that makes use of the lowercase mod in Level II, you can write to a port, in this case it's port FF, and switch-in the lowercase mod.

How we actually do that is this: on the same port that is used to control the

As we go to press Dan has informed us that his company is offering a lowercase modification kit including all documentation, precut color-coded wires, the 2102 memory, for \$12.

cassette player, used to generate audio for the cassette, and used to control the TV screen as to whether it is in 32 or 64 characters per line, there are four bits that aren't used for anything. We've just picked up one of those unused bits.

It's the upper four bits that aren't used. What we've picked up is the first of the upper four bits, so that when you're looking at a two-digit hexadecimal number, the four bits Radio Shack used are the four bits that are expressed by the digit on the right. The bit we've used is the one that is expressed by the digit on the left.

The way to switch in the lowercase mod in Level II is to write to port FF a hex 00. The zero on the right is going to leave you with the cassette player turned

(Continued on page 2)

TRS-80 COMPUTING

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Easy switch: You can have both Level I & II on the same TRS-80 Computer

LEVEL I and II in the same machine? That is what Dan Likens of Santa Ana is installing.

With Dan's dual-Basic configuration, all the computerist has to do to change from Level I to II is reach under the TRS-80 and push a slide switch. Holes do not even have to be drilled in the case—the switch is mounted in a vent slit.

Here are instructions for performing the Likens dual-Basic modification:

- 1) Start with a computer that has already been converted to Level II. You must have kept your Level I ROM, and it must be a single, not two-piece ROM.
- 2) Cut the trace that connects Z33 pin 20 with Z34 pin 20. These are the two large ROM sockets, and pin 20 is the ROM chip select pin.
- 3) Solder a 4.7K resistor from Z34 pin 24 to Z34 pin 20.
- 4) Solder another 4.7K resistor from Z33 pin 24 and leave the other end hanging free as a solder tiepoint.
- 5) Using medium-weight wire-wrap, connect the center (common) lead of the slide switch to Z33 pin 20.
- 6) Wire one end of the slide switch to pin 20 of Z34.
- 7) Wire the other end of the slide switch to the resistor tiepoint.
- 8) Unsolder the green wire from the Level II kit and connect it to the resistor tiepoint.
- 9) Make sure Level II is plugged into Z33 and your single-chip Level I ROM

into Z34. Button it up and try it.

KITS OF PARTS are available, with complete documentation, from Likens at Computer Control, 3001 Red Hill ave., bldg. 1, suite 203, Costa Mesa CA 92626. The price is \$6.

SEEKING AMPLIFICATION of Dan Likens' dual-Basic modification, TRS-80 Computing conducted the following tape-recorded interview with him:

It is imperative that the Level I ROM be on one chip. The majority of machines have Level I in a two-chip set, but Tandy did produce a certain number of them that have Level I contained in a single 32K ROM. The single-chip versions are fairly recent, but Radio Shack is still shipping two-chip Level I ROMs. We've heard that Radio Shack has tapped-out much of the industry for ROMs.

(To check to see if you have a one-chip version, open the computer, following the instructions on the lowercase modification, page 3, and see if the sockets of either Z34 or Z33 are empty. If so, you do, Ed.)

Any problems with the Level I/II-ROM modification?

You only have so much power available from your power supply. Therefore, I have heard of people, on occasion, blowing the fuses in their power supplies.

Radio Shack put a half-amp fast-blow fuse in there. The guy whose machine I did it to who had the problems of fuses blowing took it back to Radio Shack. They gave him some regular fuses to put back in there, and these kept blowing, so I gave him a slow-blow and I don't think

he's had any problems since.

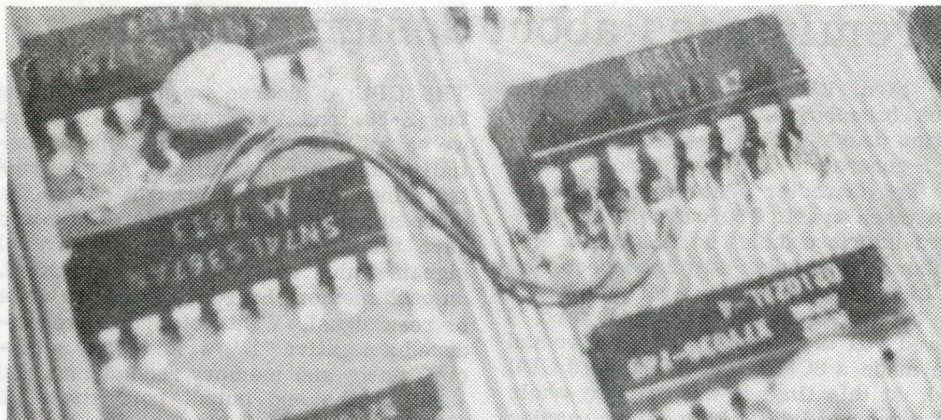
He said what was happening was if you turned it back on when it already was warm it would pop a fuse. So I thought, "Ok, it surges, so what we need is a slow-blow fuse."

What it comes down to is that power is right on the critical edge. They intended to run two ROMs, which pull around 100 milliamps apiece. The specs are rather confusing: maximum current is 100 mA, but according to the curves they run at about 60 mA.

Well, here's Level II in there running three ROMs plus a one-of-ten decoder, maybe another 30 mA, and by the time you put in another ROM (Level I), you're running four of them, so you've more than doubled the ROM current they intended.

It's not a wise idea to be switching-off the 5V to the one you're not using, because you've still got address and data lines hooked into it, and you're liable to load them unnecessarily, and you may even blow the part by shoving current backwards into the outputs. You've got to keep them powered up all the time; there's no way of putting them in a shutdown mode where they pull less current. So basically you've got to supply twice the ROM current that the computer was designed for, and that puts you right on the edge of what's available.

Enough for the problem. The nice thing about this modification is that it takes only a single-pole, double-throw switch. I've seen and heard about all kinds of things. Somebody was telling me he had modified his TRS-80 to get Level I/II, and it only took two DIP switches and a nine-pole rotary switch. Where would you put all that stuff? # #



SIMPLE MODIFICATION—It only takes two jumpers and an additional 2102 static memory IC to make a TRS-80 display lowercase.

Inexpensive memory, 2 wires and TRS-80 has lowercase!

WORD PROCESSING on the TRS-80 requires use of lowercase letters, which an unmodified TRS-80 has, but will not display.

The computer's Motorola MCM 6674 character generator contains 128 ASCII characters, including control, lowercase, numeric, uppercase and special characters. How can you use these characters?

TRS-80 Computing does not want to be known for its wild modifications, but here is a simple procedure that not only gives you lowercase, but does NOT sacrifice the computer's graphics capability.

Dan Likins of Santa Ana, CA designed this modification. For \$15, Dan is willing to install the mods on any TRS-80 brought to his home, 206 1/2 S. Birch, zip 92701, phone (714) 835-6575.

First, Dan says, disassemble case, turning TRS-80 upside down on your lap or on a non-scratch surface, and take out the six bottom screws. Note the difference between self-tap and machine, and put each screw back where it belongs.

Turn unit face up and remove top cover.

Lift keyboard from posts, trying to flex connecting ribbon as little as possible. Key board does not disconnect. Take out spacers.

With keyboard freed from the posts, lift out logic board/keyboard unit.

Component side of board should be up, and the board's white silk-screened printing should be right-reading. In the lower left corner area, locate the seven 2102 RAMs, Z45-48 and Z61-63. These are memory for the video display.

Bend outward pins 11 and 12 of another 2102AN 4L, or similar-specified part, which you have purchased for this modification. Place this additional 2102 atop Z45. We are going to call this "piggy-back" 2102 Z45A. Quickly and carefully, so as not to overheat Z45, solder all but pins 11 and 12 of Z45A to their synonyms on Z45.

Run a short (about 2") piece of wire from Z45A pin 11 to Z60 pin 5. Z60 is the 74LS367 directly below Z45. Dan uses medium wire-wrap wire.

Connect Z45A pin 12 to Z60 pin 4. Finally, locate Z30 pin 13 (on right). A narrow trace runs from it, out of

view, under the IC (a 74LS02) and out between pins 5 and 6. It is the only thin trace on the left side of that device. That trace should be cut, just slightly, so it can be easily bridged with solder should you ever want to remove the modification.

One problem is that Level II Basic has its prompts stored in ROM as control characters, instead of upper or lowercase, a mistake. An unmodified TRS-80 displays these as capitals, instead of the control characters they actually are. Thus under Level II Basic, a modified computer gives unreadable "prompts". Don has a hardware modification to correct that problem, using already-in-place spare logic gates, described in another article.

This problem is not present in Level I, but that firmware's keyboard scan does not support lowercase. The solution is to write a new keyboard scan routine in RAM. TRS-80 Computing will carry this, just as soon as someone offers it to us.

Considers TRS-80 to replace timeshare text editing link

I just received a copy of the first issue of Computer Information Newsletter and was ecstatic. Period.

You addressed the same questions that I was concerned about when I looked at the TRS-80 a while ago, namely word-processing with lowercase.

Because of the information you published about the lowercase mod developed by Dan Likins, I'm reconsidering.

The TRS-80 was particularly attractive to our corporation because our low budget necessitates inexpensive equipment.

After rejecting the TRS-80 we reverted to time-sharing at a local university for our text-formatting problems.

Since our work involves publishing directories and other business-oriented information, we are also interested in phototypesetting, which I'm pursuing with haste. We're trying to get away from the IBM Composer real fast.

Corporate Data Exchange is a nonprofit

Can't get S 100-bus adapter

I have had an order in to MiniMicroMart for their TRS-80/S-100 adapter since they first ran an ad about it.

I got a letter the other day (Pete wrote this June 22. Ed) trying to turn me from the kit to an assembled unit at \$50 more.

The assembled unit has a re-worked (not re-designed) board that is supposed to "work"???

Peter Charton, 491 Elbow ct., Weatherford, Texas 76086

Wants to keep getting newsletter

Your publication for TRS-80 users looks very promising. I would also like to continue receiving your Computer Information Exchange Newsletter.

I have been trying to obtain some technical descriptions of the TRS-80 hardware, bus, and resident software so I can do my own experimenting.

For instance, I would like to know how to interface my own peripherals to the TRS-80 bus, and I would like to know what resident software routines I can use. I hope the newsletter can provide this information.

Robert Menshaw, 4188 Brittany dr., Ellicott City, MD 21043.

(OK, we've had so many requests, we'll continue to send the freebie CIE newsletter to all subscribers. There are some good ads in the upcoming one.

(We share your thoughts about documentation, and interfacing, and hope that readers who come up with this kind of information will share it with all of us. Editor.) # #

information exchange organization concentrating on economics-oriented data of interest to community activists, church organizations, public interest groups, etc.

Peter P. Brooks, Corporate Data Exchange, Inc., 198 Broadway Rm. 706-7 New York NY 10038.

Thinks lowercase article premature

I really don't think it was a good idea to publish the lowercase piece and leave a 'hook' on the end of it (the 'prompt' problem) without an immediate solution.

I also feel that a diagram of the pertinent board components would be a great help to us duffers.

As much as I want the lowercase, I am certainly NOT going to install it until I see the solution for the 'bug'.

Peter Charton, 491 Elbow ct., Weatherford, Texas 76086

TRS-80 architect reminisces about design project

By STEVEN W. LEININGER
Engineering Manager
Tandy Advanced Products

(Transcript of presentation given the San Diego Computer Society Sept. 17, 1977. Dr. David A. Lien, author of the TRS-80 Level I Basic manual, introduced him, noting that he is a graduate of Purdue University, with bachelor and master's degrees in electrical engineering, and that he had been with Radio Shack about a year, going there from jobs in the San Francisco Bay area.)

This project started a little over a year ago, really three years ago before I was at Radio Shack, their wanting to get into the blooming computer hobby business. They wanted to build a computer hobbyist kit... When they hired me they were still looking into the kit computer.... a printed circuit board that would perhaps flash some lights.

As they were bringing me on they decided that what they really wanted was something that would work in a higher-level language. They had been working very extensively with a consultant, using the National Semiconductor PACE. As it turned out, the PACE was going to cost far too much. They decided what they really wanted was a less expensive processor, namely the National Semiconductor SC/MP.

That's where Radio Shack caught me. I was in the National Semiconductor micro-processor system design group, and I was introduced to them as the person who was working on the Tiny Basic for SC/MP. That has since been rewritten and is now distributed as Nible.

After working with Radio Shack about two months, I convinced them that the SC/MP may not be the way to go. It looked like we were taking 4K of ROM to have interger-only Basic, which was the equivalent of about 1.7K Basic which Dr. Li-Chen Wang of Palo Alto had written. So I said maybe we ought to look into some of the other processors that are available. Anything that had anything to do with 16 bits was at that time too expensive. Of the two 8-bit processors that we principally looked at were the 6800 and 8080.

We got into a hair-pulling contest with both the 8080 and 6800. It seemed that for our application they were both suitable in the programming area, but they had less-desirable characteristics, like the MOS-level clocks, and a few other undesirable traits, and I decided it might be good to look at something a little more elaborate. At that time Z-80s were being sold for about \$200 each, but I called them and they came back with something that kind of raised our eyebrows a little.

By now we had pretty well determined what our initial system was going to look like, and we had breadboarded certain segments of it which we knew weren't going to change anyway. I have some of these day-one prototypes here. This stuff is off a card rack, which has since been used for something else, typical but... We had several cards made up. This is the Z-80

CPU card. It's done on standard Radio Shack breadboard, very high-budget operation (laughs). This was the video character generator. There was another card with the character generator, which has been taken apart. The cassette and keyboard interface (holds up a \$2.99 4 x 4.5" perfboard that takes 44-pin connector). I don't have the RAM boards with me. We've got two different ROM boards here. I showed you the Z-80 CPU board, we had also made a SCMP, a 6800 and 8080 CPU card. At this time it was still my whole ball game and I did all the wire-wrapping and everything. It was sort of a one-man show. And we were beginning to get some of the existing Tiny Basics into ROM, just to show that we had a working unit.

The Z-80 decision was made, and we were planning to use 2K of ROM, with a Tiny Basic in it, and 1K of 2102 RAM, for program storage memory. Historically, this would have been maybe a lot of memory to give out with a machine, at the time, considering the original MITS Altair, which came with 256 bytes of RAM, until they figured out that they didn't even have to give you memory in order to get you to buy the machine. We were planning to give you a very workable machine.

As you may be aware, the Z-80 supports dynamic RAMs, with very little of the hardware overhead which is traditionally required. So we priced out dynamic RAMs and found out that there is a very large price differential between them and the static type. We breadboarded the thing up with the dynamic RAMs and essentially Li-Chen Wang's Basic with our I/O drivers added. We had all these boards in a little card-cage assembly, screwed under the back end of a table. We had one of the modified televisions and our keyboard on top of that plastic case, and that's when we showed it to Mr. Tandy.

He came in, and I don't think he realized we had everything under the table (laughs). What's even more interesting is that people who really knew about it were all nudging each other "heh heh, you know, it's all under the table." When we finally came out with our first pre-production units where everything was inside the case, they said "well, let's see what's under the table," and they lifted up the curtain and it's empty. We had the thing back there and he (Mr. Tandy) looked at it and I suppose he understood the, eh, he didn't understand all the technical stuff, like everyone here would understand everything that's going on there, but he I think was starting to understand the financial implications of going into the computer business, and that's when we really got a go-ahead. I guess that was in February ('77), and then I didn't get any sleep for four months.

We went from this stage here, firmed up our specs on the Basic, what we really wanted, and also firmed up a little bit of the hardware, certain things that we had to clarify for the hardware design, the CPU and its supporting circuitry.

THE CPU: of course we had decided on the Z-80, and the supporting circuitry we've got around that is: the thing essentially surrounded by buffers. All the control lines have been brought out in the most simplified form. Those of you who have the Altair bus—they've got several signals which must be ANDed and ORed, on each memory board, to produce a write or read signal. What we've got we've produced a negative "L", write strobe, memory write and memory read strobe, and input strobe and output port strobe. It simplifies interfacing.

We've brought out the signals for dynamic RAM refresh. Making a dynamic RAM interface for this computer is super simplicity. Of course you could also make a static RAM interface. That's even easier because you don't use the three signals available for dynamic RAM.

We do bring all those buffered signals to the output of the computer. We've got what we call the expansion port. It's got this clever little plastic door here. And if you look inside, there's a card-edge connector — 40-pin, and it has the following signals on it:

- 16 address outputs,
- 8 bi-directional fully-buffered data lines,
- The four dynamic-memory control signals discussed above,
- An interrupt-in and interrupt-acknowledge out,
- We've got the row-address scan, the column-address scan and the multiplex signals for dynamic RAMs,
- And we've got system reset

POWER SUPPLY—We've diverged a little bit from the standard hobbyist concept. We don't have a 30-amp selding supply built in here like some of these guys do. We've got a power supply that looks like something you might hook onto your Lionel train set or something. What it is is a little transformer box—very simple to get something like that UL approved.

We are currently working on a system where everything is enclosed, but that's our second and third generation. This (multi-unit packaging) was done essentially for the speed of getting the thing taken care of.

We had another tradeoff to look at in the area of video displays. We could have gone what might be considered the desirable route from the homeowner's standpoint of down the antenna terminals. Well, there are a couple tradeoffs we have to look at there. One is you're going to be at FCC for about five years with your computer. It wouldn't be five years, but there's a reasonable chance it would have been longer than six months. And FCC requires you to run your finalized version through FCC testing. And they've got a way of just shuffling their feet and going awfully slow sometimes.

We are looking at a version that will hook up to the television set, now that we've got something to hold our place in

Right now, we think this is the easiest entry for somebody who doesn't know everything about computers. As it's turned

out, we've found out that most of our customers know EVERYTHING there is to know about computers (laugh).

the market while we're working on that. But the other tradeoff involved is that this thing puts out 64 characters per line.

With 64 characters/line you've got an approximate video bandwidth of 6 megahertz, and on your B/W TVs you've got a sound trap at 4.5 megahertz, on a color TV it's even worse than that—you're down to a bandwidth of about three megahertz, maybe 2.5, and everything smears, you can't read it and we figured that was undesirable.

32-CHARACTER LINES—The computer can be expanded to 16 lines of 32 characters. Under software control, you can display 16 lines of either 32 or 64 characters per line. Level I Basic does not support 32-character lines, but machine language in Level I machines does, and Level II Basic gives you choice of 32 or 64 characters/line. Characters in 32-space lines are much wider, and they can be run down a standard television antenna. Of course you have all seen articles about how to connect to a TV or you can go out and buy a Pixi Verter, but I'm not supposed to tell you that (laughs). Right now we'll tell you what the video outputs are but we're not going to give you a schematic on how to hook it up to your TV. Most people are clever enough or can find someone who is clever enough to do this kind of stuff.

For video display, we are recommending our monitor. It is a monitor made by a famous TV manufacturer, to our specifications. That's a line-operated television set and to keep people from fritzing our computer or themselves or both, we've got a circuit that we did. An optical coupler inside the computer provides up to 3,000 V isolation between the computer and the keyboard (TV/110 V line? Ed.).

The monitor does have a standard 75 Ohm input, and the computer a 75 Ohm output, so if you have a standard video monitor, then you can plug it straight into the video input. The bandwidth on the monitor is approximately 6 megahertz, suitable for 64-characters/line, might be marginal for anything much beyond that.

We did add graphics to our video capability, and our graphics are very similar to PolyMorphic's. It was not an intentional—we did not blatantly copy PolyMorphic's graphics, it's just that it's a very inexpensive graphics to come up with.

So essentially, for those of you who are not familiar with those graphics, it cuts down the character cell to two across and three-down squares per character block. Under Basic control we can set, which is the command, or reset, given X, Y, coordinates, any section on the display. With those, you can draw lines and fake snow storms or termites eating up blocks of wood and all that clever stuff.

KEYBOARD—Kind of interesting, we've departed from what a lot of people usually do. Many of the existing hobbyist systems

have a keyboard scanner that does the keyboard scanning and gives you an ASCII output. We did all ours under software control, essentially setting up a matrix and having the software scan the keyboard. With one quick instruction we can see if any keys are depressed. In some people's opinion this may not seem the most desirable way to go, but it is by far the least expensive route. We have taken what might be considered a few systems shortcuts, which we feel gives us the best possible product per dollar.

LEVEL I BASIC—It's in a 4 K ROM. We started out by looking at the Li-Chen Wang Basic, it's in the public domain, of course it's interger. What we did, we went back through the Wang Basic and completely tore out about 60 per cent of it, the integer overhead and all that kind of stuff. It's got a full floating-point package in it now, add, subtract, multiply and divide, it doesn't have the transcendental functions, we've got a Level II Basic, which will be available by the end of the year.

Right now, we think this is the easiest entry for somebody who doesn't know everything about computers. As it's turned out, we've found out that most of our customers know EVERYTHING there is to know about computers (laugh). Everyone keeps calling up and saying "why didn't you do it this way..., that way". You know, nobody was there to give us input for the first time, so we did it what we felt was the best way.

HARDWARE—(Pointed out the original breadboards, which had been cannibalized, the first pre-production prototype, from which Mr. Tandy gave the go-ahead "it had a professional wire-wrap board inside it. I had ended my happy wire-wrap days. Dr. Lien has been using that unit for about six months and I guess it still functions. And we have several different versions there, up to our current production model, which is this").

We'll take a dumb look at the outside. We've got the power switch back there. We made a value judgment you don't want the power or reset switches on the front panel, because you reach a little too far into a carriage return or something like that and your machine shuts down. You could be disappointed! So we put those switches in the back. We put all connector cords on the back also.

The 53-key keyboard—contrary to a popular rumor it is not the same unit as we sell in the stores, although that's really not a bad keyboard, they're both made by the same manufacturer, Hytek.

The case is impact-resistant plastic. And the computer is held together with six screws on the bottom, and comes apart very easily. There are two printed circuit boards inside it. The processor, RAMs and ROMs are in sockets.

The power supply is kind of interesting. It was developed at Tandy Systems Design, another branch of Radio Shack. On both the 12 and 5 Volt there is foldback

current limiting. What that does protect you from is that a lot of companies use the three-terminal regulators, which do not have foldback current limiting. That is not so much a problem on S100-type boards, where you do not have that much logic on one board, but I've got a Compucolor where everything is driven off a single three-terminal regulator, which shorted and sort of ate my computer's lunch. So in our judgement the best bet was to put the current limiting and all that in there. Theoretically, three-terminal regulators will go into thermal shutdown, but that's in theory and not necessarily practice. So we decided to play it safe there.

The RAMs are in sockets. We've got a couple DIP headers (plugs) that go in to tell the computer whether you have 4, 8, or 16 K RAMs on the board.

There are two sockets for 2708-pinout-compatible masked ROMs. We've got a few machines right now that are running with 2716s, the 2 K-by-8 EPROMs, but at \$212 per whack, we can't ship those out to the Radio Shack stores.

The board is laid out for automatic insertion of components. We're not at that stage yet (Sept. '77), but there are indications we might be into that soon.

There is one other signal that I failed to mention, on the bussing. That's a signal called Test. When that signal is brought low, it tri-states the processor internally, and all its output buses. What this lets you do is go in there, and from somewhere on the external port exercise all the all of the internal RAMs, the ROMs, the keyboard, the cassette I/O, and verify proper operation of the computer. We found this to be helpful in testing our computers in the Fort Worth final assembly station.

CASSETTE—

I guess I didn't mention the cassette. We made another grand value judgment there, and we've caught a little flack from it and I thought maybe I should explain why we did what we did.

Our cassette standard is very similar to a method employed by Hal Chamberlin in a newsletter he published called The Computer Hobbyist. It's something many people are not aware of that's pre-Byte and pre-Kilobaud, but he had a method in there that's very similar to the way a floppy disk functions. It records one pulse for a zero and two pulses for a one. On Level I machines our baud rate is about 250. We've done this as the best tradeoff between reliability and being able to use low-cost cassettes. The Tarbell standard, with which I'm sure many of you are familiar, is much faster. It unfortunately requires quite a bit of hardware, and will not always run reliably with a \$40 Radio Shack tape recorder. What's a Tarbell interface go for now, \$100? That's about how much it would have impacted our system cost, so that instead of a \$600 system you would have had a \$700 system. Some people say "Well, it would have been worth it to me", but one of our judgments was that it wouldn't be worth it to everybody.

S100 COMPATIBILITY—The output port here can be adapted to the S100 bus, or the Southwest Tech bus, or just about any bus that exists out there right now, because of the generalized nature of its I/O.

Since we don't split the data bus, that can all be done externally, you can split it. S100 bus of course has two databuses, an input bus and output. You'll have to sort of fake some of the control lines or some of the control signals that, really what you're doing is un-ANDing them so that when they get all ANDed back on the computer boards it all comes up the same again.

There will be an S100-bus adapter board available. I'm not sure whether it will be available in the Radio Shack stores or not, but having worked in a Byte shop before, if there's a chance to make a quick buck out there... I don't know how many of you guys run a business out of your garages, but it's a thing I have done and I know it's something that someone will jump on if we don't, so we're going to play it by ear and see who jumps first.

Our chief concern is supplying the higher-level electronics, sort of the base to build upon.

PRINTERS—We've got two printers that will be available. One's less than \$1500, the other is less than \$700. The more expensive one will be an impact printer, 65 characters per second, the other will use electrosensitive paper and run at 2200 characters per second. There may be two versions of the latter, the one that comes out first will use paper about 4.5" wide. It can print a page off the CRT in less than a second. We are of course keeping our ear to the ground in case someone comes up with a \$100-ilk Diablo-type printer (laughs).

12 K BASIC—Our 12 K Basic is probably as outstanding a Basic as you can find out there. It's one that's been in use for two years now. Some of the more clever of you might be able to figure out whose we're using. We are using it under a license agreement, as opposed to—there are a few companies out there who would say, "Hey, that's a good Basic, we'll just..." It will again be in a ROM, which can be retrofitted into current machines, in the Radio Shack stores. The nearest competitor, one you've got this 12 K Basic in there, would be the IBM 5100. It's going to be powerful. There are two ROM sockets. We will be using, in the 12 K Basic, an 8 K-by-8 and a 4 K-by-8 ROM.

MEMORY MAP—Our unit starts at location zero:

1) We start using ROM from location zero up through the first 12 K.

2) The next 4 K is reserved for the keyboard and the video-display memory mapping.

3) And then the next 48 K is all RAM. That's the way we have it set up right now. Of course, anyone can stick RAM up in the top if they want, but that's not the system that we're supporting.

At this time we have no specific plans to support high-speed cassette. If we see the demand is out there we're going to jump on it.

We've got some high-resolution graphics coming up. First the system that hooks up to the television set, that's still in the works, there's a lot of paperwork.

Guarantee—90-days, parts and labor. Radio Shacks have 56 service centers coast to coast. We are working on an arrangement so that a maintenance contract can be purchased, similar to what IBM would supply, or Sears would supply on a refrigerator or something. We feel that this is going to be the way to go on computers.

Hardware documentation—Initially we had planned on not supplying the logic prints with the thing, and we got into such an uproar that we pretty much changed our mind on that. There was some corporate fear that someone was going to whip open his garage door and crank these things out, you know, beat us to the punch. Since then we have come to the startling conclusion that, you know, we probably get better parts on prices than they do. So the logic diagrams will be available.

Software listings, our 12[K Basic, you'll probably never see a listing of it, because it's not our Basic.

QUESTIONS:

Keyboard—In hardware, you've got 64 possible keying combinations, and you're decoding 53. Is there a way of adding some extra functions?" We're looking at adding some more. Of course we've got a 53-key keyboard there right now. As you've seen, the keyboard is on a separate board (from the computer). You can see, we can poke this thing out (bezel next to keyboard, with TRS-80 written on it, not removable in later production models), and put a board on there that has a numeric key pad. There are many things we could do. That was one of the trade-offs, by the way, that I forgot to mention. Initially we were looking at a calculator keyboard for this thing. One of our competitors is using a keyboard that is not much better than a calculator keyboard. We came to the conclusion fairly early in the ball game that the extra money spent on the keyboard is probably the smartest thing we've done. It's a much better feeling keyboard, and I think we made the right decision here.

Weird peripherals—The TRS-80 bus will support anything. Since it's really an extension of the Z-80 bus that's been cleaned up a little bit, it will support anything that you want to put out there—if you want to control your merry-go-round with it. You know, we get those kind of phone calls: one guy wanted to hook it up to his toaster. And of course every other phone call, a guy wants to hook it up to his lawn sprinkler. That's going to happen one day, but it's probably not going to be with this machine, and it probably won't be with any of the machines out there now. I venture to say nobody really wants to hook up a \$2,000 IMSAI to his lawn sprinkler. You know, just let it sit there and sprinkle his lawn. You'll have dedicated electronic lawn sprinklers some day.

Power supply—The power supply itself, since it's internal to the thing, I don't know if the specs mean too much. We don't support external devices with the power supply that comes with the unit. From just a curiosity standpoint, it draws

less than an amp at 5V, and about 200 milliamps at 12V and about 50 microamps at -5V. One reason for the lower levels of the power supply is that all the TTL possible is in low-power Schottky, it costs a little bit more but it saves a little power.

Clock speed—It's ball-park 1.8 megahertz, 563 ns on the nose. That was derived from our video timing chain. That's another big cost-saving feature. And we could also use slower memories. A key to this whole computer is that we designed around existing parts. Sure we can get a microprocessor that will run at 4 MHz, but I defy anybody to build a system like this, at the current prices, and have the thing run full speed with the type memories we've got in it. I don't believe it could be done.

Interrupts—"You only bring out one interrupt, what about external rigs?" You may be familiar with the Z-80. There are two interrupts on there. The non-maskable interrupt we use for our reset. The reason for that is that if you use the traditional reset, while that is low, the whole processor stops processing, and while it stops processing, it quits refreshing dynamic RAMs, and when you do that you lose memory, and customers. So we dedicated that interrupt to our own uses.

Teletype—"Can this system talk to...?" The current version (Level I Basic) does not support the serial interfaces. The next version (12[K) will support the serial interfaces or external devices. Converting from ASCII to Baudot is simply a software problem.

Lowercase—Right now we're not supporting lowercase, we've had enough interest that we may be looking into it, though. There seems to be quite an interest from the word processing industry. In similar manner, with lowercase we may also be looking into expanded number of characters per line, 80 or more. Again this is going to take some hardware changes. These are things we are looking at for our second and third versions. We sort of see our current computer as square in the middle of no-man's land. You know, the high-end consumer and the low-end business, and we're going to branch in both directions.

Compatibility with later models, "Will you be lost completely?" You will be for certain applications. For example, this computer, since it is limited to uppercase, is not ideally suited for word processing applications, where you've got upper and lowercase. Our upper and lowercase machine is still probably more than a year off. We're trying to maintain as much upward compatibility as possible. We're being very careful along those lines, and we feel that the person who buys one of these machines today will not be disappointed a year from now. We intend to fully support these things, as long as people still are buying them. And of course we maintain our spare parts backup on anything we sell for a minimum of 7 years—it's more like 10 years. Ten years from now, who knows what computers are going to look like?

Factory location—They're being manufactured in Fort Worth. Part of it is being sub-assembled in Austin Texas, the

whole thing though is being assembled in Fort Worth. While Tandy Corp. does have Japanese electronics manufacturing firms under its wing, we feel that the quality-control which we wish to exercise over it right now is going to require us to manufacture them in Texas right now.

Marketing—"A lot of us are confused as to how Radio Shack or anyone is going to take on something like this, which is really much more sophisticated than their other products?" We're looking at different avenues for selling product. Tandy Corp. has recently announced a Tandy Computer Store. Tandy Computers is much like Byte Shop and Computer Land, it's Don French's outfit. That's being opened on an experimental basis on Oct. 1st in Fort Worth, just so we can get a pulse on it. Fort Worth may not be the computer capital of the world, but it's close enough that Mr. Tandy can walk in and shake a few people if something is going wrong. Marketing computers is getting interesting. We feel that we have a jump over some people. For example I understand that Sears will be marketing a computer, and from what I understand it's supposed to be the Commodore unit. That's all hearsay, and I think that's all you'll get from anyone now. Macy's is supposed to be handling the CompuColor. The CompuColor, as you know, is a \$2,700 computer. We feel that's far out of the range of anything Radio Shack could sell. Up until now, the most expensive we've had is the STA-2000. That's a \$500 stereo receiver which is one of the better receivers available in that price range today. I realize that (our computer) may not be as flexible as an IMSAI or Altair, or whatever, but for \$600 we feel you are getting at least your money's worth, and we hope to make it

maybe more than your money's worth.

Market target--We originally thought our market was going to be the home consumer. That's the ideal—we said, wow, if we can get one in every home, at so much, you start seeing all those big numbers, we'd get into buying AT&T by the end of the year. Eventually we're going to be getting back more towards the consumer. This computer has generated so much business-community activity and interest that we will probably have a spin-off corporation that will do nothing but handle business areas of it. And if we keep our prices the way they are, of course the hobbyist can take advantage of the improvements we make in those areas.

Availability—We are doing everything we can to bring up production. One of the biggest problems we've had is that corporate people who make decisions—you know, we'd come in and say "we've got the greatest thing since sliced bread, a computer everyone's going to want". They didn't want to commit to it. Radio Shack doesn't climb out on a limb too often. Too many other companies have; look at Sears with its Cartravision color TV/tape recorder. They lost money on that. They're being a lot more careful, I would imagine, with their computers. We're being careful too. What we see right now is that we've been much more careful than we should have. It's a case that if we had 10,000 in the warehouse right now we'd probably have them moved off by the end of the month, with very little effort. We're not pushing this as hard as we will once we get production up. You'll see Paul Burke on television with our computer, or something like that. You're not going to see that this week, or by the end of the year. Next year, it's a very real possibility. # # #

Juge named product manager for computers

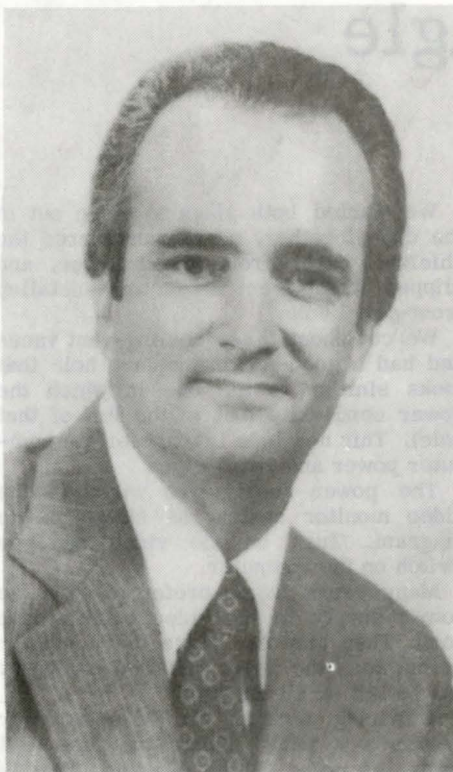
"Ed" Juge has joined Radio Shack in the newly created position of Computer Products Manager with responsibility for evaluation of new microcomputer developments, and dissemination of information through newsletters to both store personnel and owners of the RADIO Shack TRS-80 Microcomputer System.

Juge, who will report to Carroll B. Ray, Jr., Director of Computer Marketing, also will assist in selection and packaging of software and in training of store personnel.

Before coming to Radio Shack, Juge had been director of purchasing for Spinks Industries, Inc. From 1964 to 1975 he owned and operated his own electronics retailing business.

Juge has written several articles on microcomputers and has used them in business and as a hobbyist. He is an amateur radio operator, has an FCC commercial radio license and private pilots license.

He has studied business administration at the University of Colorado and at Texas Christian University. Juge lives in Burleson, Texas, with his wife Jo and son Mike, 16. # #



Computer Products Manager ED JUGE.

TRS-80 beats IBM 5100, PDP 8

TRS-80 beat IBM 5100 and 1620 II, as well as the venerable (and still not inexpensive) DEC PDP 8.

The event was the first annual Greg Dolkas benchmark campaign at the Second West Coast Computer Faire in San Jose last spring. The race was reported in the 3:4 Homebrew Computer Club Newsletter, one of the better club publications by one of the more active clubs.

Greg took advantage of the great variety of hardware at the Faire, which he called "the perfect testing ground for a benchmark."

"No where else can you find so many computers assembled and running (and mobbed by people)."

"I decided to try a simple benchmark; one that could be typed in quickly, but still do a bit of crunching."

"The following six-line program was chosen because of its length, the relative time it took to run, and the fact that I had used it as a benchmark before on various other machines. Their times are included here to the accuracy of my memory. Some of the times were submitted by other Homebrew members:

```
10 FOR I=1000001 TO 1000003 STEP 2
20 FOR D=3 TO SQR (I) STEP 2
30 IF I/D=INT(I/D) THEN 60
40 NEXT D
50 PRINT I
60 NEXT I
```

"The program finds the first prime number over 1 million by trial and error. A test number is divided by all of the odd numbers up to the square root of the number. If none of them divides evenly, the number is a prime. This requires a Basic with 6-7 digit accuracy and enough smarts to do For-Next loops, take square roots, etc. Some machines tested did not meet those requirements (TRS-80 Level I included). The answer, by the way, is 1000003. Some machines print this as IE6 due to the way their print routines work, but if you print I-1E6 at line 50 they will display the '3'...

"It should be noted that Big Brother (IBM) has a bit of catching up to do. Their fastest model 5100 (the 5110) can barely keep up with the Radio Shack TRS-80, which sells for quite a bit less."

Greg's timings included:

PET 2001, 6.5 sec.
TRS-80, 11.5 sec.
IBM 5110, 12 sec.
IBM 5100, 23 sec.
IBM 1620 II, 40 sec.
DEC PEP 8, 1.5 min.

"In all fairness, it should be said that speed is not the only measure of a system," Greg concluded.

"A machine that is a pain to use may not be worth purchasing, even if it is ten times as fast as the others. Unfortunately, speed is the only characteristic of a system that can be measured in numbers. The others will have to be measured by the user." Our thanks to Robert Reiling, HCC Newsletter editor. # #



LOOK MA: LESS CORDS—Power supply in this setup has been hidden away in the video monitor, just under the Radio Shack medallion. Monitor also has been raised off table with a "U" bracket, which allows it to swivel.

You CAN do something about that tangle of CORDS

TIRED OF CORDS dominating your computing environment? You can reduce the number of line cords plugging into the wall to just one.

Don't bother to do this if you plan to buy an expansion interface anytime soon. That device does the same thing.

The video monitor has plenty of space inside for the power supply. It even has screw holes for four sheet metal screws in just the right spot to hold the little beast.

Cover a table with a towel, and lay the TV face down. Remove the five sheet metal screws securing the back.

Set your power supply in the area the "famous manufacturer" reserved for the tuner, and bend some coat hanger wire to hold it in place, using sheet metal screws similar to those which hold the back in place.

To keep the power supply from wanting to slide out from under its new wire cage, we squirted some silicone sealer under it.

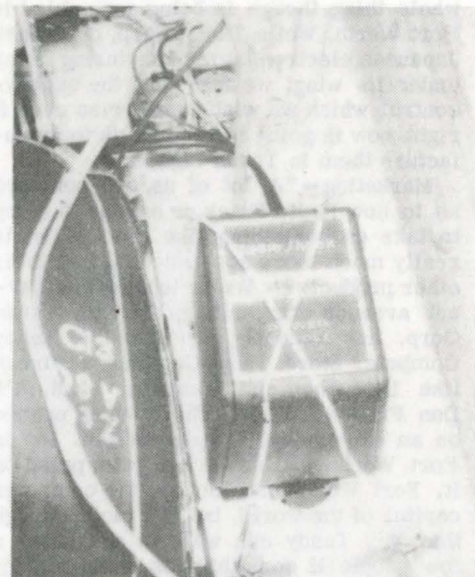
We wanted both plugs to come out of the case together, so we unsoldered the shielded cable from the monitor, and slipped it out from its factory-installed front-panel hole.

We cut about three cooling-vent vanes and had a good-looking square hole that looks similar to the one in which the power cord exits (but to the left of that hole). This new hole is used for the computer power and video wires.

The power supply was wired to the video monitor switch, as shown in the diagram. Turn on the video and you switch on the computer.

Many users would prefer to wire the power supply to the video monitor line cord. Then they can leave the computer on but turn the video off. The computer can be left on all the time.

If wiring through the video-monitor switch, you must change the fuse to 4 amps, as noted on the drawing. That is not necessary if wiring to the line cord.



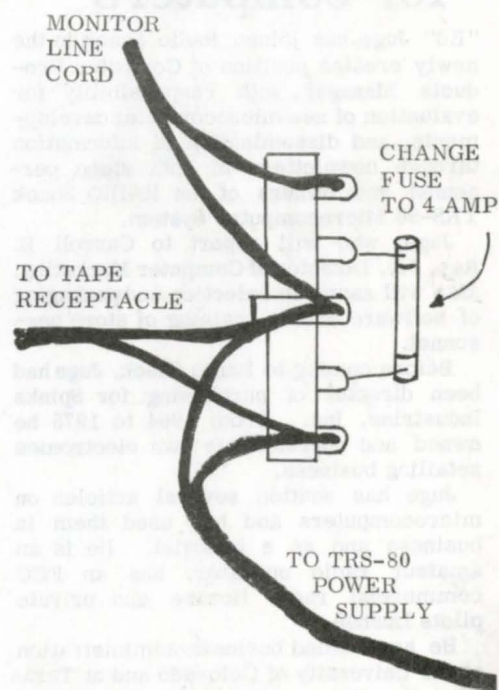
EASY MOUNTING—Holes already are in place for a tuner, and they serve well for mounting power supply.

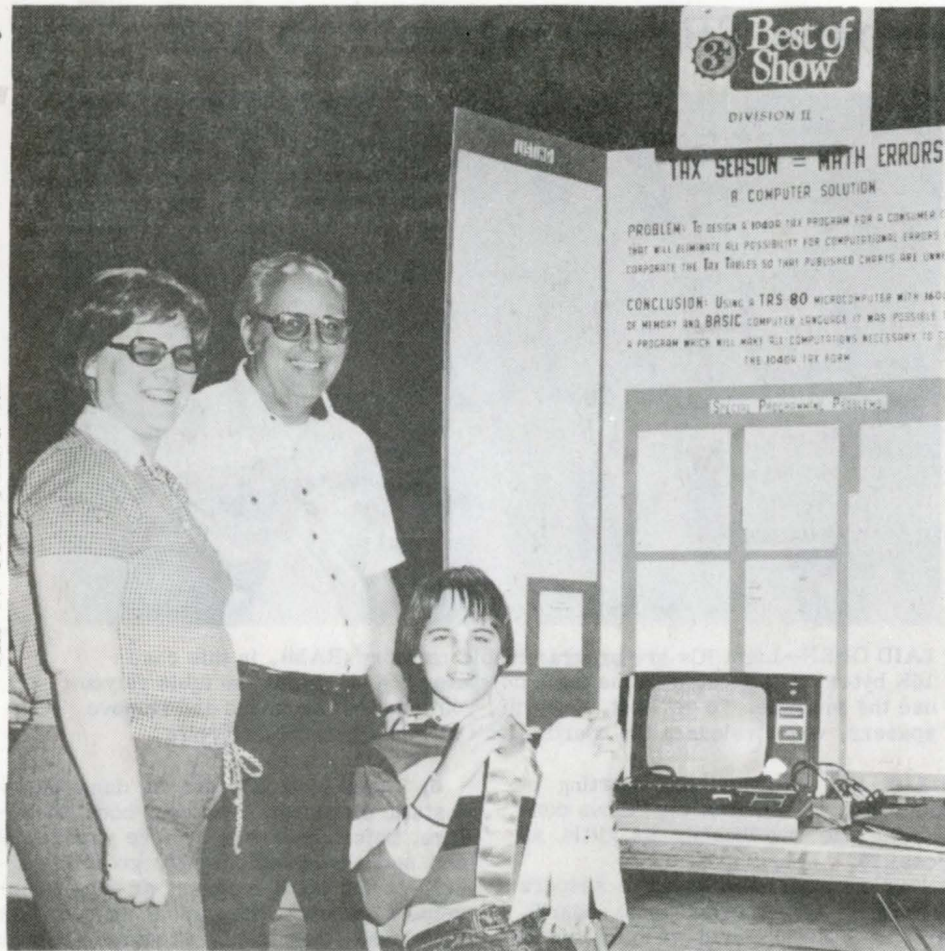
We also cut a small hole in the back of the video monitor and installed a small receptacle for accommodating the tape recorder 110 VAC line cord. This is wired in parallel to the TRS-80 power supply.

We also felt the monitor should swivel, up off the desk, like some of the expensive monitors we had admired.

A "U" bracket was fashioned out of light bar material, and placed on a wooden base.

Wood braces were added to the inside of the monitor, and the "U" bracket attached with carriage bolts and wing nuts. We're quite happy with the work, and will keep it that way even after getting our expansion box. ED.





WINS WITH TRS-80—Ralph Lipe, 14, combined his mother's professional interest in tax preparation, with his own liking for computers. The result is seen in his hands, medals won at a regional science fair.

8th grader wins with tax program

Eighth grader Ralph Lipe won Fort Worth Regional Science Fair top honors with a TRS-80 tax computation program.

Using his Radio Shack computer, Ralph wrote a program designed to guide a person, step-by-step, through the 1040-A tax form.

It took the 14-year-old a total of 60 hours to write and de-bug the program. The idea for writing it came from his mother, Jane, a certified public accountant, who assisted him in setting up some of the tax-question equations. Ralph then converted the information to TRS-80 Basic.

Ralph's project captured math-&-computers first-place ribbon and was chosen best-of-fair out of approximately 200 entries in his school's science fair.

Competing with 460 regional fair entries from 17 counties in North Texas, Ralph again won first place math-&-computers ribbon, a first place Institute of Electronics Engineers ribbon, and placed third best of show in the junior high school division.

Ralph, who someday hopes to run a computer for NASA, thinks everyone can enjoy computing, which is "almost like a sport".

His own interest in computers developed last year when his father, Gary, brought home a TRS-80.

"The computer attracted him like a magnet," his father recalls. "Before I knew it, he'd weaseled his way between me and the microcomputer and was programming it himself."

When the boy first sat down at the computer, he knew nothing about making it operate. Within a few hours, however, he'd taught himself to write a few simple programs using the TRS-80 instruction manual. ##

Wants modem, software for a terminal

I would like to see a UART/Baud-rate generator circuit that could be plugged into the keyboard expansion connector. This might produce the 300-Baud serial output suitable for connection to a modem.

Also, suitable supporting software which would allow use of the TRS-80 as an intelligent timeshare terminal, without the Radio Shack expansion box.

A light-pen input with appropriate software also would be interesting.

James D. Blackaher, 3849 Windsor Woods blvd., Virginia Beach VA 23452

Wants to buy good TRS-80 software

Creative Computing magazine is looking for high-quality TRS-80 software suitable for mass distribution.

Programs should incorporate the special features of the host computer, especially screen graphics for animation, board displays, etc. The software may be in Basic or machine language, as long as it will run on an off-the-shelf system.

Associate Editor Steve North says he expects to offer program authors royalties of 10 to 15 per cent of the retail price of the cassettes (which he expects to be about \$7.95). He plans to put about five programs on a cassette, but for the larger application, educational, and game programs, he's considering only one or two programs per cassette, at a higher price.

Software should be as bug-free and self-documenting as possible. The publisher does not want programs which require support once they are in the hands of the user. Software submissions on audio cassette should be sent with any necessary documentation and three first-class stamps for return of the cassette. Twelve to sixteen weeks should be allowed for evaluation.

While some companies, offering fewer programs per cassette at substantially higher prices, can justify royalties as high as 50 per cent, we feel that by giving the consumer more for his dollar, both program authors and Creative Computing will come out ahead", North said. He requires only non-exclusive rights, so if a programmer is presently marketing software independently, he may continue to do so, even if his work is accepted by Creative Computing.

Additionally, Creative Computing will relieve program authors of the work involved in production and marketing of software. It plans an extensive marketing campaign in computer stores, including supply of display racks, posters, and other promotional materials.

Software offerings should be sent to: Steve North, Creative Computing Software, Box 789-M, Morristown NJ 07960. ##

Wants to build TRS-80 emulator

Could you help with the following: I'm making a Z-80 system and would like to make it as compatible as possible with TRS-80.

What is the cassette format? Its frequencies, baud rate, etc.?

Who could supply a monitor routine and a Basic interpreter on tape or EPROM which does not start at location zero, which is the same location monitors occupy?

Paul R. Adams, Box 210 A, RD#4, Reading PA 19606. ##

Here's how you expand TRS-80 memory to 16K

By TOM KASPER

Reprinted from Personal Systems,
permission San Diego Computer Society

TRS-80 is a great little computer, but 4K of memory is a tad too little.

Now that 16K chips are available, you can lose those "No Star-Trek Blues" by a relatively simple conversion.

Here is a step-by-step method of converting your 4K Lilliputian into a 16K giant and keep your 4K chips to boot! If you have the conversion done by a Radio Shack dealer, he gets the chips.

The RAMs listed are available for approximately \$230, a savings of \$60 over the Radio Shack cost. (Editor's note: since Tom wrote that, the price has dropped to as low as \$144, see below).

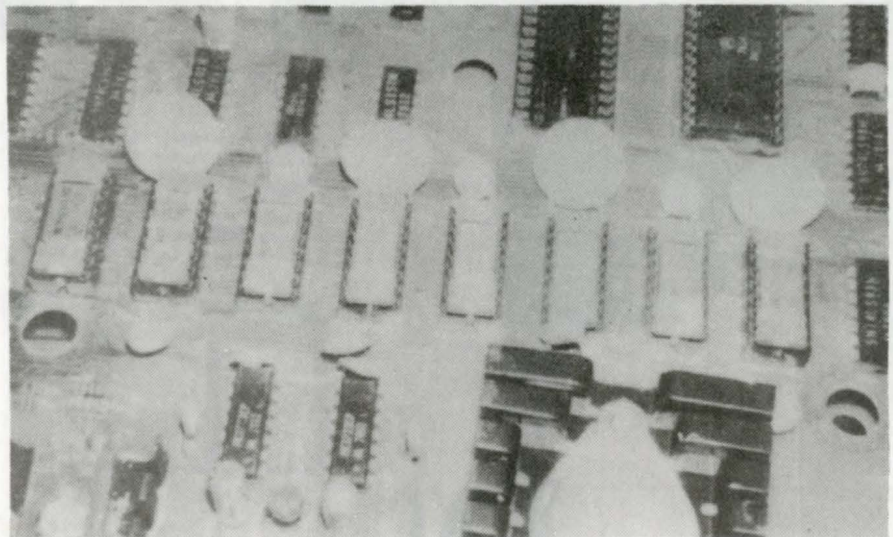
1) Required equipment: eight D416 or 4116 RAMs, a supply of jumper wire (or DIP switches if you want to get fancy), a Phillips screwdriver and an IC removal tool. (Likins' kit buyers need supply only tools. Ed.)

2) Turn off all power and remove all cables from the TRS-80.

3) Disassemble the case by placing it upside down on a towel, or other non-abrasive surface, and remove the six screws (note: there may be THREE different sizes of screws. Get them back in same locations).

(Editor's note: Likins, in the neat instruction sheet to his memory kits, adds:

a) Before separating the two halves, place the case face up. Lift off the top. The "power on" light may be connected to the top with two short wires, be careful that the wires don't break.



LAIID OPEN—Light ICs are programmable memory (RAM), in this case 16K bytes. It is located on the main computer board, facing the table as you use the machine. To get at it, however, you must lift keyboard and remove spacers, which releases the board. Don't stress keyboard connector.

b) Lift the keyboard up, starting at the rear. Try to flex the ribbon connecting the two boards as little as possible.

c) Now remove 4 or 5 white spacers and then lift out the logic board.

4) On TRS-80 main printed circuit board, locate the eight 4K RAMs, Z13 through Z20 (see figure 1).

5) Do not remove the old RAMs until you have noted the position of the notches in one end of their cases, see figure 2. The notches in the new RAMs must point in the same direction.

6) These MOS ICs can be damaged by a static discharge from your body, therefore, before handling, remove your shoes and socks and temporarily ground yourself to the kitchen faucet or other convenient ground. Then avoid unnecessary movement that could produce a static discharge. (Also, avoid electrocution: do not touch ANY electrical appliance. Ed.)

7) Remove the old 4K RAMs, they are all in sockets, using an IC extractor or, heaven forbid, a small screwdriver. Gradually pry the RAMs loose at both ends and place them on conducting black foam or aluminum foil, to protect against static.

8) Install the new 16K RAMs, being careful not to bend any of the pins.

9) Locate sockets Z3 and Z71 (see figure 1) and remove all jumper wires or DIP shunts. Install the new jumper wires..., matching the pattern shown in figure 3 A or B. Note "A" revision boards use 14-pin DIP sockets and "D" revision boards use 16-pin DIP sockets for Z3 and Z71. Also that pin 1 on Z3 and Z71 line up like all other ICs, including the RAMs.

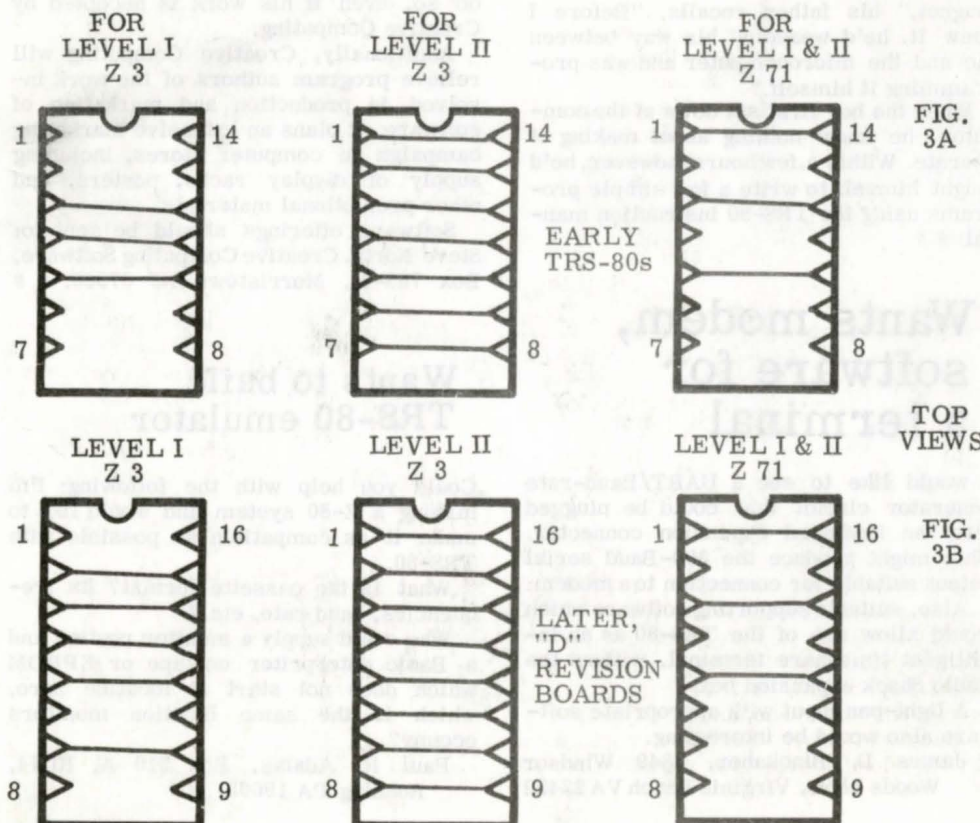
10) Carefully double-check the position of the new RAMs and jumpers.

11) Re-assemble the case, making sure the keyboard is correctly seated.

12) Re-connect all cables, turn on the unit and check for proper operation. Enjoy 16K!! # #

EDITOR'S NOTE: An IC extraction tool can be made by bending a paper clip into a "U", forming the inside serifs with an 1/8"-or-so 90° twist. As for where to put the 4K RAMs when taking them off the board, Likens suggests the back of the foam that carries the new 16Ks.

CURRENT 16K RAM PRICES—Bill Godbout offers the chips for \$190, Jade wants \$144, the same price Likens charges if you buy at least 32K. Likens' 16K kits are \$160, with coupon reprinted on back of booklet. # #



For so long, repairmen did so much with so little, 'now we can do anything, with nothing'

By TIM HENSLER

(Introduced as "the loneliest man in San Diego County" at the initial meeting of the San Diego TRS-80 Users Group, Tim works for Radio Shack, repairing TRS-80s. Editor.)

Several weeks ago I was asked to talk about some of the problems we have encountered with the TRS-80. How many of you tell your friends that computing is one of your hobbies, and get weird looks? You're not alone.

How many of you go around muttering weird words like Gosub, Goto. Of course there are the ones that always get attention, like Peek, Poke, Kill. You'll find that when you are learning just the language part of it, that even the instruction manual, which seems to be written pretty well in-depth, raises questions. The only suggestion I have is to sit down and see what you can do with the machine. There isn't a single button on the computer that you can push that will destroy anything inside. A wrong combination could wreck a tape., but nothing will hurt the machine.

About November or December we got our first schematics to the TRS-80, those big blueprints. About a month or month and a half ago we finally got in our first technical manuals. You start reading these and you think that maybe you're in the wrong business, because maybe technical writing is a little more interesting. I want to read you a little of the introduction they have in one of these technical manuals:

We've done so much, with so little,
for so long, now we can do anything,
with nothing.

Any software in these manuals? All the manuals do is tell you the hardware end of it—what line goes to what pin and IC, and it is assumed you already know about addressing, data bus lines and all that.

WHAT GOES ON? Our technical writers in Fort Worth have given a pretty neat little example of what goes on inside the computer when you want it just to count to 10,000.

The ROM (Read-Only Memory) is the brain. The heart of the system is the Central Processing Unit (CPU); that's the Z-80 chip, a long monster with 40 legs on it, that does all the work. The third, and largest portion of the computer is Random Access Memory (RAM), and when we put something in the computer, via keyboard or cassette, that's where it goes. If you decide to do something with it, such as count to 10,000, here's what happens:

"CPU tells ROM somebody wants in. ROM tells CPU to go to the keyboard and find out who. CPU finds out and tells ROM that it's the boss. ROM tells CPU to find out what he wants. CPU tells ROM that the boss wants us to Run. ROM tells the CPU to go to RAM to find what the

boss wants done. The CPU says the boss wants to count to 10,000. ROM tells the CPU how to do it, and after it's done ROM tells the CPU what to do with it. CPU informs that 10,000 has got to go on the display, and must be saved. ROM tells the CPU how to put it on the display, and to put it somewhere in RAM, but he'd better remember where it is. CPU tells ROM that the job is done. ROM tells CPU to monitor the keyboard in case the boss wants something else."

Those of you who are interested, these manuals will be available in the fall. If you order it now, you'll get back notice that we don't stock it. The manual is written for someone who knows digital electronics. Someone who just knows electronics, and not digital, is going to have a heck of a time.

32-CHARACTERS. A word about the program to go to 32 characters/line, in Level I: In Basic I it is impossible to make the computer display 32-character lines, simply because the commands are not in ROM. In machine language, you can make a Level I machine do anything it is possible to do in disk Basic, simply because you're talking directly to the CPU.

By the way, Level III does not exist. There is simply Level I, II and disk Basic. They struck Level III a long time ago, because they decided to go to disk Basic.

DEFINED FUNCTION, why was it left out of Level II Basic? I don't know. They're confined to 12K, so I guess they would have had to have bumped something else out. The Defined Function is included in disk Basic.

DISK BASIC is the disk operating system. In a hardware sense, what it does is replace the tape recorder. However, what they did was give you a more powerful language. Everything that is in Level II Basic is in disk Basic. They've added maybe a half dozen, or a dozen-and-a-half commands. Disk Basic, 10K bytes, is dumped into the computer, and how they work it, if they're still using the ROM that's in there, I don't know.

Any advantage to going to 32K when you add a disk? The program can be larger, and the data you're working with can be resident in the system. You can have tremendously large data in the disk, but the system has to go to disk to find it. That only takes—probably the longest disk access time is 7.5 sec., which includes the time to get a disk up to speed.

Do you have to send your keyboard unit in to upgrade to disk? No, just plug your disk unit into the back of the expansion unit, and run.

Can I mask out my ROM right now and load machine language? In Level II, when you type in System, it shuts off the ROM. Essentially, when you type in System, it's in the Monitor mode, and you can load in a machine language program from tape.

Can I load into memory location zero? No. The only way you can start at zero is

with the On button. The closest you can get to that is hit the Reset button, which starts at hex 66, I think, and it's just a reset switch and doesn't do all the house-keeping...

FILE NAMES, does it maintain an index? It prepares a directory and you can, when you are in disk command mode, look at a list of all that is on the disk. What about when you are in Basic? No, you have to be in disk mode. There's actually three: command, disk basic, and Level II.

MAINTENANCE PROBLEMS. Probably about 75 per cent of the TRS-80s coming to the repair center are there for conversions. Most of the problems people are having are software, of one kind or another (points to head).

Tape should be low-noise. Don't use those cheap little tapes you get five for a dollar, or so. I use the Realistic Low-Noise tapes, and I haven't had any trouble. They also recommend the Supertapes, and we'll be having special tapes in the stores for computers. These are the same as Supertapes, except that they have been tested for dropouts.

The only thing I can say about software problems is: read the manual. So many times you find that people are not reading the manual. They open up the Level II book, and they see that it starts out like Level I. It's even laid out like Level I. They say, "Oh, I don't have to read that." So then they come along and find a little user notes on tape recording, and they say, well, that looks just like in the Level I manual. The setup is the same, but the tape is different.

The problem we're having is volume control. In Level I, the set is pretty wide, anywhere from 6.5 or 7 up to 9 or 9.5. Generally, if you hit it at 7 or 8 it is good for all programs, prerecorded as well as your own user programs.

Level II is different. The baud rate, in other words the speed with which data is transferred from computer to tape and tape to computer, is twice as fast. Those who understand, it's a baud rate of 500, as opposed to 250 for Level II. Because of this, the level is much more critical, and for other reasons the level must be lower. The volume for Level II is between 4.5 and 6. That variance is the difference between individual tape recorders and computers. With your tape recorder and computer, you're going to have a range of maybe one volume unit on the control dial. It is very critical both because of the faster baud rate and, on the CTR-41 tape recorder that comes with the system when you have both ear phone and auxiliary plugs inserted, because of a non-common ground.

GROUND-LOOP SOLVED. Last week we solved that, and the stores will be offering that modification. Cost, the regular service charge for this tape recorder is \$12.50. Radio Shack works on the flat rate. Anything that comes into the shop

has to be warrantied for 30 days on the whole thing. If I replace a head, I have to guarantee the whole machine. If there is something else wrong, we'll repair it. So if there is something else wrong we'll let you know, and it may cost you more. If you say just do the modification, then we'll do the modification and just guarantee the work we did, not the whole machine.

Also, there's probably three dozen other modifications: bypass the remote, bypass the speaker. We're offering one modification: it gives you a switch that, in the up position, shorts across the remote jack, allowing you to manually operate your tape recorder. In the other position, your computer controls the tape. A resistor is added so you can hear when you are Clodging. Both hum and switch modifications can be done for a single \$12.50 service charge. There is a \$2 parts fee for the latter mod.

With this hum modification you're going to have less problems with saving and loading tape. The hum gets put on there when you save the program, and when you play it back you get not only the recorded hum, but that picked up on replay. It goes away with this modification, and we've found too that with Level II machines you don't have that critical volume level. It's not as wide as on Level I, but you do have a decently wide contro. You'll have more successful loads and saves. Do we recommend the mod for everyone? If you have problems, do it, if you don't, wait and if something happens and you send it in for repair, have the modification done then. It won't cost you any more.

TAPE RECORDER. Use only a CTR-41 or CTR-80, which was supposed to be delivered this month. (CTR-80 is one that is designed specifically for use on the TRS-80, that's all I know about it. I know nothing about features, price or catalog number). The reasons for using only those two recorders on the TRS-80 is that the number one failure on computers is a little three-legged relay that turns the tape recorder off and on. The CTR-41 and CTR-80 are not going to burn up the relay. The hungriest tape recorder we've used on TRS-80 so far is the CTR-21, a nice tape recorder but it eats relays. Because of this we recommend you not use other tape recorders. The other reason for not using other tape machines is that in order to have good loads on tape you have automatic level set. If you have a manual-volume-setting recorder your levels are going to go up and down every time you have power line fluctuations. Also, trying to find proper volume level on other tape recorders is a headache. Also, other tape recorders are quite critical on recording levels.

Question: "In the manual, it said before making a Csave, check volume level and position of tone control, and I got to thinking, it doesn't make any difference what your tone control or your level is

set at." Answer: Tone and level controls are only for playback. They did that so that twice during your operation you'll be checking that tone control and level.

LEVEL II TAPE PROBLEM. "I have no trouble saving and loading programs. Only one little problem. None of my Radio Shack Level II tapes work. Another thing, all my old Level I tapes, even the Blackjack, don't work. I've tried every last thing on my tape recorder, and so I've just contented myself with programming in Level II. I'd still like to have my Level I back, and save nine-tenths of my programs, because they just won't work on Level II."

When you make a tape it is a lot more accurate than the mass-produced tapes. We have also found that you have to turn the volume down as low as "4". There is another problem, apparently sometime between when the tapes are made and they get to the store, they get close to a magnetic field, because we find the volumes are dropping and there is a trace of AC field. Sometimes you can hear the level go up and down. This could be caused during copying of the tape, getting near magnetic fields, or some of the CTR-41s have a faulty pinch roller, and the tape is going up and down. One trick you might try is disconnect your TRS-80 from the tape and put it on play. Leave the tape-access door open and wiggle the cassette while it is playing. You'll hear the tone go up and down. What you want to do is find where the tone is high and rewind it with the other hand, and get plugged in, and hold it in that position throughout the load. You're in an awkward position, especially if you've got a 16K machine and the darn program is 15K. You've got to suffer a little while, but that's how you can baby-in a program that won't go in.

DUPLICATE LETTERS going onto screen. Ninety per cent of the problem is oxidation of the contacts, or alignment. If it is the latter, the only thing you can do is send it in. Sometimes we have to replace the contacts.

"Is there a spray cleaner?" What we have to do is take the keytops off. They pull off and if you are careful you can do it. Get the little burnishing tool, which we sell in the stores, and very carefully clean the contacts. If you use any chemical cleaners at all, turn a key cap over, put a drop of the material on the plastic, and when it dries see if it distorts the plastic, or there is any residue, don't use it. If it is in warranty, bring it in, because the store pays for the work.

COPYING TAPES. You can copy cassette-to-cassette, but maybe 50 per cent of the time it is not successful. The recorder is going to have to have automatic volume control, just like it is coming from the computer. You have to get the volume setting right on the player, and you just have to play with it until you get it. **TIGHT CASSETTE.** The best way to cope

is to fast forward and rewind it. Sometimes you use a cassette on one machine and the guide on one is a little bit lower or higher than on the other. When it does that, it puts a lot of drag on the tape. So if you find that happening, fast forward and rewind it, and that gets the tape riding up where it belongs for that machine.

READING CONVERSION TAPE. "I've got a quick comment: I had trouble running the conversion tapes for Level II, and I was very successful turning the tone down to low, and the volume up two or three notches extra and it loaded perfectly." The thing to do is play with it.

REUSING TAPES. "Some of the tapes that I had Level I Basic programs on, I tried erasing them and using them for Level II, and it freiks-out my program." The best thing to do is bulk-erase (holds up a Radio Shack bulk-erase device).

BAD LOAD, WITH EXPANSION interface hooked up. First of all, the expansion interface is not just there to hold more memory, or to accept bunches of light-cords from all over. Back last fall they figured they were going to have an expansion interface to be able to branch out. For the floppy disk systems, they were going to have a disk controller unit, and the floppies. But they thought about the cost of that and they figured that most people who were going to get an expansion interface sooner or later are going to get a disk system. For that reason they combined expansion interface and disk controller in one unit. That saves you maybe \$50, I dunno. What that means is when you hook the expansion interface to your TRS-80, and you turn it on, the first thing TRS-80 does is ask, "do I have disk?". If the interface is connected, it gets the signal that tells it the disk controller is there, even if you don't have the disk. The next thing it does is say, "hey, where is that disk?", and it goes a step farther and looks for that disk. And what happens when you turn on a TRS-80 with disk, it automatically loads the disk software in the computer. Without a disk there you turn it on and all you get is garbage. You have to hold down the break key when you turn it on. That suppresses the computer from looking for that disk system. Now, the same thing happens when you hit the reset button. You have to hold the break key when you hit the reset button. That overrides the system for looking for disk information. However, you lose whatever is in memory.

Suggestion: any time you are generating a program in a unit that has expansion interface, with or without a disk, before you do anything, run it or anything like that, save it, either on disk or cassette. That way, if it crashes, you have a copy of it.

Use only a CTR-41 or CTR-80 tape recorder. The reasons...is that the number one failure on computers is a little three-

legged relay that turns the tape recorder off and on. CTR-41 and CTR-80 are not going to burn up the relay.

Suggestion: any time you are generating you do anything, run it or anything like a program in a unit that has expansion that, save it, either on disk or cassette. interface, with or without a disk, before That way, if it crashes, you have a copy.

As first aid, if you have an unsaved program in an expanded system, and it crashes, turn off the expansion interface and hit the reset button. You don't have to hit the break key then. About 75 per cent of the time that works. However, if you have any data or program in the expansion interface, you've lost it. However, you've saved 16K of it.

RIBBON CONNECTORS. The one to the disk unit, and especially the one to the expansion interface—they are fragile. The one between the keyboard unit and the expansion interface: keep it "U" shaped. It comes out of the TRS-80 connector, down to the table, and back up into the expansion interface. A lot of people are scrunching these together, and getting a kind of hump in the middle. It's going to pull on those and break. I don't know the cost of those connectors, but it is going to be expensive.

DUAL-TAPE command error. There is a typo in the manual that might mess you up when you use the expansion interface with two tape recorders. The command is correct, except they left off a hyphen. There has to be a hyphen between the "#" and the tape recorder number. Type Cload#-1(or 2),filename. The computer will only recognize the first letter in the file name for tape recorder use, so if you have two file names beginning with the same letter, in tape mode the computer will not distinguish between them. Note: do not put any spaces in the Cload command, or you will get an error message. You have to have the comma, but the file name is optional.

READ DATA STATEMENTS. Some of you are having problems with the thing reading only the first elements of these. I've talked with Ft. Worth a couple of times about this. They're trying to find out exactly what the problem is and what we should do about it. A temporary, maybe permanent solution is to put a Poke statement at the beginning of the program. This should read Poke 16553,255. If you have any restore statements, that command should be out in front of them.

UNKNOWN BASIC FUNCTIONS. "There are some functions in Basic that are not covered in the instruction manual, and I was wondering how you get information on them." There are very few that are not in there. There are a few. Sometimes you find two different commands do the same thing, but in the manual you'll have just one. Usually the one they don't tell you is the easier, too. That's the breaks, I guess.

LEVEL II. I'm sure you'll have Level I mastered by the time you go to Level II. When you go to Level II, you'll feel like you have gotten pushed back 50 yards to start over. The abbreviations that are used in Level I are not used in Level II. There are only three abbreviations in Level II.

TEST PROGRAMS. Throw away the test programs in the back of the Level I manual. There are typos, and there are a lot of corrections out that will make the programs run beautifully. If the programs run right it doesn't mean there is nothing wrong. And if they don't, it doesn't mean anything either. The best test is: do your programs run without crashing? If they do, don't worry. Just because one of these Level I-manual programs shows you have a bad RAM or ROM, it doesn't mean anything, believe me. The machine-language diagnostics we use will tell if anything is wrong.

WARRANTY. That little orange seal on the bottom of your computer. If you have the technical knowledge of what's going on inside there, if you run into problems you can probably fix the thing yourself. If you have basic knowledge, can recognize an IC and know which way to put it in, that seems to be all you need to know to install 16K and Level II. The warranty period on TRS-80 is 90 days. During that time, no parts, no labor charge. If the seal is broken, it's considered out of warranty. If two years from now the computer comes in, and the seal is not broken and it has not been tampered with, you pay only labor and not parts. Even though out of warranty, no parts. If the seal is broken and it is out of warranty, we charge for parts. That is the way it stands now. In the future it might change. These memory chips are sensitive. They're called CMOS, and improperly handled they will zap.

So, if you're technically-minded enough to be able to repair this thing, enjoy it. You can do a lot of things to it that would make it do stuff it otherwise can't do. To keep the cost down, Radio Shack did

not put a lot of stuff in there. If you just have enough knowledge to do the installation and not repair, keep what I've said in the back of your mind, because it can be expensive.

Flat-rate for repairing the TRS-80 computer is \$24. If in warranty, you don't have to worry about it because your store pays for it. If there is extensive damage, flat rate does not apply because I say, "Oh, no! I've got to check that whole board, piece by piece, and I've got a lot of work to do." In that case we will send you an estimate. The video monitor flat rate is \$17.50, expansion interface is \$24, floppy disk is \$24, tape recorder is \$12.50. On printer, the first hour is \$30.50. Each additional hour is \$20.50.

POWER SUPPLY. They run warm. What's too hot? When the fuse blows. Can you leave the computer on all the time? Yes, that won't hurt anything.

MONITOR INTERFERENCE. The monitor does not have a power transformer, just a voltage-divider/multiplier circuit. It is susceptible to picking up power-line noise. One guy had a refrigerator on one side of the wall and his TRS-80 on the other. Moving it over to the other side of the room took care of it. If you're just determined to get rid of it you can go out and buy an isolation transformer. That may take care of most of it. Some times these line filters will help.

REPAIR RELIABILITY. If you have a problem and you send it in and I say it works fine, I'm sorry, but the theory that they quoted in one of my great technical manuals is Murphey's Law, which says: "The device will function properly whenever the operator is in a position to correct the malfunction."

Plans 'hard' copy service

Daniel Eisenberg of Tallahassee, Fla., has a typesetting shop and is interested in offering a service of converting magnetic media to type-quality written form.

Eisenberg has not firmed up which computer systems he will support, so it is not known when he will serve TRS-80 users. His address is 1507 Sharon road, zip 32303. # #

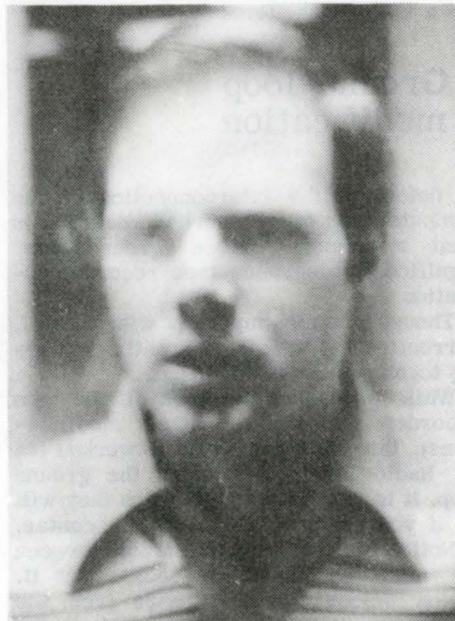
Has software for trade

I am looking for all types of software for the TRS-80 16K, both Levels I & II.

I have an assortment of games, a general ledger program and a great circle navigation program, (input latitude and longitude or origination and destination; output distance and heading).

I am interested in buying or swapping for all types of programs.

Richard S. Moore, 3935 South Oneida street, Denver CO 80237.



AUTHOR Tim Hensler repairs TRS-80s at the Radio Shack San Diego regional repair station.

'CLOAD' magazine's tape recorder modifications eliminate plug pulling for rewind, 'blind' loads

THE VELVET-VOICED people at Cload magazine have proposed two modifications that make the TRS-80's CTR-41 tape recorder much easier to live with.

One, an audio modification, allows you to listen to the tape, at a comfortable volume, while loading data into the computer. When the cord to the computer is disconnected, speaker volume automatically returns to normal, for listening to music or voice.

The other modification changes the "tone hi-lo" switch to motor off/on, in parallel with the Remote jack. After modification, when the switch is toward the computer plugs, the computer has control of the motor. When it is away, the motor is on—handy for fast forward and rewind. This modification permanently sets the tone control to "hi".

AUDIO MODIFICATION:

- 1) Unplug all cords and plugs from the recorder. Don't forget the black plastic Mic-jack dummy plug. Take off the battery cover and if batteries are installed, remove them.
- 2) Turn the recorder upside down on a soft surface, such as a towel, with the battery compartment facing up and away from you.
- 3) Remove five #2 Phillips (cross-point) screws. Three are on the main chassis, and two are in the bottom of the battery compartment.
- 4) Lift off the black plastic chassis (bottom of case) and put it aside (lift rear up first, then slide chassis forward about a half inch to clear volume and tone controls).
- 5) Remove the chrome carrying handle (at the front of the recorder). Note: the "sharp" edge faces up.
- 6) Solder a 62 Ohm (not critical, we used 75-Ohm—Ed), 1/4 Watt resistor from point "X" to point "Y", figure A on the circuit board. Keep leads short, and the resistor against the board.

Wants inexpensive Selectric conversion

I am not an electronics technician, but have about 15 years experience in data processing management and programming. This is why I went for an assembled system when they became available.

I have a Radio Shack TRS-80. I find it very interesting to program and "play" with, but without a printer you can't do much.

I guess I am like most people and want a decent printer, but can't afford to pay \$1,500 or so for it.

I do have an IBM Selectric and it would be real helpful (for me and I am sure other TRS-80 users) if you could come up with a simple and inexpensive way to hang it on a TRS-80.

George R. Ramsey, 534 South 13th East, No. 6, Salt Lake City UT 84102

MOTOR MODIFICATION:

- 1) Cut the two circuit traces, figure B, which are connected to terminals 2 and 3 of the tone hi-lo switch.
- 2) Solder a 5 1/2" piece of insulated wire to point "U" of figure "A". Route the other end forward, slipping it underneath the wires crossing the circuit board at its center (if you forget that point, you can untape those wires from PC board, and drop them back down on top of your newly-installed wires, Ed). Solder the other end to terminal 2 (center) of the switch.
- 3) Solder a 6" piece of insulated wire to point "T" on figure "A". There is a yellow wire to this point, which should remain. Route new wire parallel to one installed above, and solder to terminal 1, figure "B" (one on left, previously unused).
- 4) Reinstall the chrome carrying handle, oriented as before ("sharp" edge up).
- 5) Reinstall the black plastic chassis/bottom. Hook the front edge over volume and tone controls, and then lower the back. Ensure that it fits correctly.
- 6) Reinstall the five screws. The two pointed screws go in the battery-compartment holes.

CLOAD Magazine, bills itself as a "truly unique, independent magazine written especially for users of the TRS-80 microcomputer."

Its subjects are: "thrills, education, games, practical programs, pictures, fun, trivia."

"This magazine is the ultimate in computer magazines. You can't read it! (Your computer can.) Now, for the first time, you can be assured that a program will run without 'light editing' — without debugging — without even typing the stupid thing in!

"Each month, CLOAD Magazine will arrive by first-class mail, written entirely on a C-30 cassette. Just pop it in your

Ground-loop modification

A defect in the interconnection of the computer and tape recorder resulting in what technicians call a "ground loop" significantly degrades tape recorder operation.

Though not too important with Level I, correction of this fault greatly reduces the touchiness of Level II tape.

While you have the back off the tape recorder (doing the CLOAD modifications), this simple procedure worked out by Radio Shack eliminates the ground loop. It is the same modification they will do if you return it to the repair center.

Notice the wide ground trace between the mike and auxiliary jacks. Cut it.

Now solder a jumper wire from the ground lug on the ear phone jack to the ground lug on the auxiliary jack. See figure C, at right.

TRS-80 computer and go. You can read it, modify it, run it, or ignore it.

"Some regular features:

Games — some of them 'learning oriented' and all of them downright fun.

Practical programs—such as loan computations and insulation planning for your home.

Education — spelling, math, even computer programming.

Trivia — how many ping pong balls would it take to cover the ocean? How many ants would it take to lift a Volkswagen? How many dollars will the government spend this year?

CLOAD subscriptions are \$36 a year, for 12 C-30 cassettes, US only. First issue was March, 1978. Address is Box 1267, Goleta CA 93017. # #

'CLOAD' MAGAZINE'S

CTR-41 TAPE MODIFICATIONS:

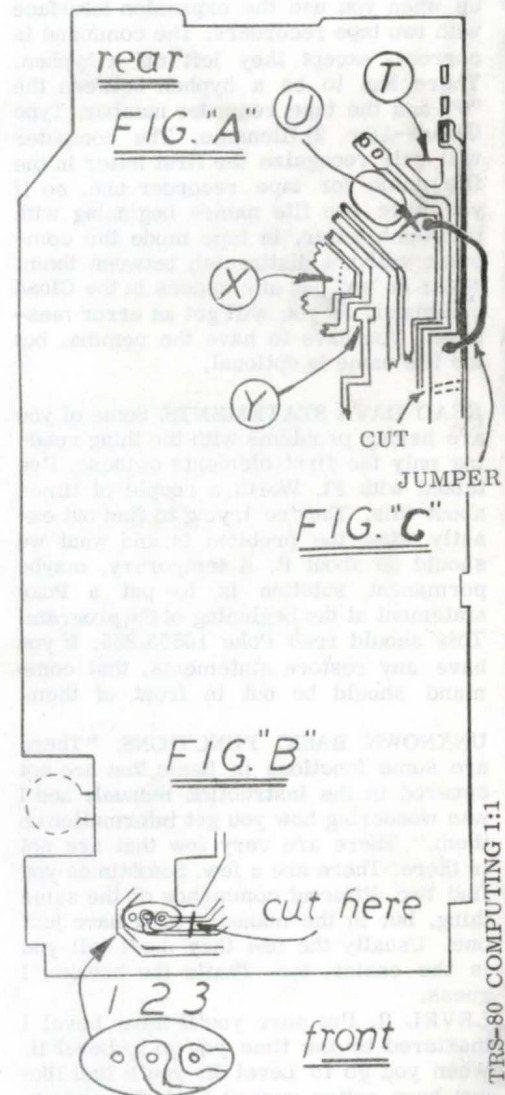


Figure A and B, courtesy CLOAD Magazine. Figure C drawn by staff.

DISK: Everything doesn't work on DOS Version I, but then Version II will be coming, maybe soon

"SO MANY unanswered questions!", Irv Schmidt of Tacoma, Wash., writes.

"After a wait since January, I finally got 48K, the line printer and two disks.

"Documentation with the line printer was non-existent. The documentation with the disks consists of about 15 pages of Xerox copy, most of it telling you about things that will not work.

The DOS disk has on it 12 files, 8 of them password-protected but Radio Shack didn't supply the password.

"The Copy utility does not work.

"Nor does the Route, List FS1, or Print FS1.

"Neither does the Chain or Append work."

QUESTIONS: "For example, how does one make additions to an existing file?

"How does one save on disk a machine language program?

"Ask these questions through Radio Shack dealers and they call Ft. Worth and tell you it is a matter of 'priority' and that they can't keep up with the demand...

"As you probably know, schematics and software documentation also are not available.

"Hopefully, your newsletter will answer some of these questions, and if I find answers to any I will be happy to send them to you." Irv's address is 3110 N. 31st street, Tacoma WA 98407.

What is happening with the disk? To answer that question, we interviewed the San Diego-area resident experts on the subject, Gerard Anderberg and Chuck Welborn, who work at the Carlsbad (CA) Radio Shack. Chuck and Gerard say they will be happy to answer peoples' questions if they phone the store Monday or Wednesday-through-Friday from 3 to 5 p.m. That number is (714) 729-2602.

The eight missing passwords? We've tried to find that out too. Perhaps they are copyrighted subroutines and you shouldn't get into them anyway. They don't want you in there fooling with their DOS on a system you can take back and they have to guarantee.

The reason the Utility Chain, the Route, etc. don't work is because the second DOS will be out—I can't say when but they're working on it and the reason they put out the first DOS without that on it is to at least put a working DOS into customer hands.

What is the cost, to Version I owners, of DOS Version II? That will be mailed free.

The reason they didn't give you a long explanation of how to use the Route, the List and everything in the DOS manual is for the same reason, they didn't work.

HOW DOES one save on disk a machine language program? We don't know.

How do you make an addition to an existing file? You can merge two files together, and you can use Append, when it works. Or, you could run a program and just add more data to the file, like you normally would, via keyboard or by crunching numbers and adding and all that and then putting that in data, the way you'd put more output to a cassette.

You've got two kinds of files on a disk: a sequential file, which is pretty much like a tape file, where you start at the beginning and work your way through. You input a certain amount of data and you do what you want with it and then you input some more. The only way to get back into it is to close the file and open it again. That puts you back to the start. A random file is almost like memory, where you can specify which file number you want to go get or which you want to put out and you can change any file that way without having to go through all of them. We mostly use random files in our programs.

A neat thing about the sequential file is that you can open up a program file as a sequential file, and use the line input to input one line of the program at a time. You can change anything you want, and then output it into another file, and do it a line at a time, and you've got a new program in the other file. We've written a program to renumber your programs for you, using that technique, so that it will space the line numbers in even increments of 10, changing all the GoTo, GoSub and Then statements so that they all point to the right place. This leaves you with both the old program and the new. The new program is outputted into a different file.

We've also written a search program that will scan any particular program for any given character string. Whenever it finds a line that has whatever it is you're looking for it outputs that line to the line printer. That's good when you're converting a Level I program to Level II. The conversion program changes "Print At" to "Print@" for a printout statement, but Level I has print statements followed by a ";", and in Level II they are followed by a ",". The conversion tape doesn't change that. You have to do that yourself. So you can search for the "@", and it will print out all the lines you have to change. We also could write the program so that it will change the punctuation for you. I just haven't gotten around to that yet.

ADVANTAGES OF DISK. With the disk, you can randomly pull out parts of programs, change them, and put them back. It's pretty powerful that way. Perhaps more important is the fact you can chain them together. You can actually have the computer on fire-up automatically call-up the program and run it, and from that point chain onto other programs. So you can have a dedicated system so a guy with a floppy disk can have programmers like Chuck and me program it so that

when he comes in in the morning all he has to do is turn it on and answer the questions. He doesn't have to worry about "Run, Cload#-15", you know, "Filename", etc., all he has to do is turn it on and it works.

And of course there is huge amounts of storage on disk, at least large in comparison to 16K of RAM. You should know that if you have just one disk, you can only store 55K bytes of information around the DOS and other files in it. If you have a second, third or fourth, you can store 89K in each of those. But drive-number-one will only hold 55K.

Does the disk system utilize the Level II ROM? I know the entire Level II will not fit into the 5K of Basic which is contained on disk, so they must be using everything in the ROM, just adding more.

What kind of access speed do you have with disk? If the disk has to be turned on, about three seconds.

How long does it take to copy a full disk? You would use the Backup command. There is a Copy command, you specify the program and the drive number that you want to copy from and you specify program and drive number that you want to copy to. That just copies one file. Or you can use the Backup command, which produces a backup disk. Then it asks you which source drive number, which destination drive number, and the date of the backup. I'm not sure exactly how long it takes to reproduce the whole disk—a couple minutes, I think. The Backup mode copies the whole disk, not just selected files.

SAVE. You can save-out a program in two ways. If you just tell it to save the program onto disk, it saves it in the compacted form, which doesn't take up much room. But you can specify that it keep it in ASCII code. You have to do that when you're going to open up a program later as a sequential file to call in a line at a time. If it hasn't been saved in ASCII, then it's not going to work, it's going to dump the whole thing in at once. You also have to save it out in ASCII whenever you're doing a merge. You can merge a program in on a program that is already in memory. The new program coming in from disk replaces any lines with the same line numbers, and merges those line numbers that are different.

LOAD COMMAND, used to call the program in. You can have Load"filename",R and that specifies that you want to run the program after it's loaded. So you can use that to chain programs together too.

RUN. You can run a program from the disk. You can tell it to Run "filename" and if there happens to be any files open at the time or anything like that all files are closed, all variables are cleared to zero, etc.

Or, you can use the Load command, which is Load"filename",R and it loads

the program and runs it. It clears out all the variables too, but if you happen to have any files open at the time, they stay open. So you can use the load command from inside a program to hook onto the next program, and it keeps the files open so you don't have to reopen them. Is this chaining? No.

CHAINING. With chaining, your variables are not cleared out. It will just dump the new program in and run it, but it won't clear out the variables from the previous program. Right now, without the chain function, any variables, pointers, etc. that you want to save you have to dump out into a file first, so you can call it back into the new program. That gets to be a pain sometimes when you have 16 different delimiters going into a formula, and the formula is in the other program.

LOWERCASE: Likins modification sounds too good to be true; thought it couldn't be done

The note about Dan Likins' modification to the TRS-80 to add lowercase characters, published in the August Personal Computing, sounds too good to be true.

Radio Shack has been saying they gave that up in exchange for graphics.

Apparently it was a designer's slip, as they couldn't have left it off just to cut production costs.

—JOHN F. SPRAGUE, 143 Myrtle ave., Allendale N.J. 07401.

(They slipped up in gauging people's interest in lowercase, John, figuring that since people didn't need lowercase, Tandy could save 40¢ or so, per computer.

Working on PILOT, joy sticks

Our company deals mainly with TRS-80 and Apple II software. We offer several interpreters that run on TRS-80, and many programs.

We also write programs to customer specifications.

We are planning to offer joysticks, analog devices, and music interfaces for the TRS-80.

Our company sees the importance of small computers in education, and is currently developing a machine-language program that allows you to program in PILOT, a teaching language. It will run on a 4K Level I, as do all our programs.

We also are writing a short book called "What Tandy never told you", which is about using the TRS-80 to its fullest advantage.

—SANDY SIGAL, Two S Enterprises 6851 Mammoth ave., Van Nuys CA 91405.

(We'll bring you more news from Two S next edition. Sandy's letter came the day before we go to press, and he said he enclosed a catalog, but none was there. That PILOT is big news. Ed.)

Here are some goodies not in the Level I Basic manual

By EDGAR LOUITT

First the good news: the format of the so-called AND and OR operators suggests that these are in fact ordinary multiplication and addition. This is so, and after some experimenting I found that the relational operators and IF statements work in the following way.

RELATIONAL OPERATORS, expressions of the form:

expression, relational operator, expression
(that is: $A > 5$, $B = C$, etc.) evaluate to zero if the condition is false, and to 1 if it is true. Expressions containing rela-

tional operators can be used anywhere an expression can be used.

That is, the statement "LET $A=B=C$ " will store 1 in A if B is equal to C and B in A if B is not equal to C.

IF STATEMENTS. IF statements in TRS-80 Level I can have the form:

IF expression THEN statement
where "expression" is any expression, "statement" is any statement or a series of statements separated by colons, and the THEN is optional.

The computer evaluates the expression to a numerical value and treats it as "true" if it is not zero.

That is, IF A THEN PRINT "TRUE" will print if A is not zero.

NOW THE BAD NEWS: You have probably heard about the INT bug and the "bad DATA statement" bug. (If not, try IF $INT(-7) + 1$ PRINT "I'VE GOT THE INT BUG").

I have also found that FOR-NEXT loops behave strangely:

FOR A=1.5 TO 5.1 STEP 1.2: PRINT A;
NEXT A

should print the numbers 1.5 2.7 3.9 5.1 but instead (on my TRS-80) it prints 1.5 2 3 4 5, which is pretty weird.

61 Aintree rd., Glen Iris, Victoria 3146 Australia.

MicroSystems firm to offer TRS-80 programming

Gerard Anderberg and Chuck Welborn, who we interviewed about the disk (elsewhere in this issue), have started a company to do TRS-80 programming.

They will contract to do Level II or disk programming, and could do Level I but prefer not to. They guarantee their work, which remains the property of the authors. Purchasers buy rights to use the program, and to copy it for their own use, but not to give or sell to others.

Chuck and Gerard will do just about any kind of programming, as long as the client can communicate his needs.

Off the shelf, they have ready for delivery mail-address and cost estimation programs, and are working on a general ledger program.

The partners, doing business as MicroSystems, are interested in selling other person's programs, and in having others sell theirs. Their address is 1720 Redwing street, San Marcos CA 92069.

Upgrading to Level II, 16K

I have had a TRS-80 since the first of the year, and am now getting Level II and 16K of memory.

—HERMAN DeMONSTOY, 2 Pioneer road, Painted Post NY 14870.

(So if you are willing to give up your TRS-80's graphics capability, you can convert it to lowercase with just a couple of pieces of wire. You must add the eighth 2102 video memory chip, however, if you want lowercase without sacrificing graphics. That is the Likins modification. Ed.)

I am looking forward to seeing the lowercase modification. I did not think it could be done. Thanks, Dan.

—RONALD J. SKINNER, 920 Sixth ave. Des Plaines IL 60016.

In a recent issue of CLOAD magazine your establishment was mentioned as having information on modifying the TRS-80 for upper/lowercase. This capability would GREATLY increase my computing capability, along with adding to my program flexibility.

—PAUL DEINES, USS Ben Franklin G40 gold, FPO New York N.Y. 09501.

Civil engineer awaits Level II

I recently purchased a 4K-Level I TRS-80 and have on order the Level II modification.

I am a civil engineer working for the sanitary district here in Tucson, in operations. I use my computer in solids balance computations for sewage treatment.

My interests lie in graphic and matrix manipulation and any additional information on these subjects would be welcome.

Of course I also am interested in program exchange.

—DAVE BORODAWKIN, 4756C Massingale rd., Tucson AZ 85704.

President calls TRS-80 'most important Radio Shack product' ever made; may lead to new marketing fields

GAINING AN IMAGE of leadership in electronics had a lot to do with Radio Shack's decision, in 1976, to enter the microcomputer market, according to Radio Shack President Lewis Kornfeld.

"Too many people think of The Shack as a place where you can buy low-cost consumer electronics items made by others," Kornfeld said.

"The reverse is really true—we manufacture nearly 40 per cent of our goods in company-owned factories, and most of our other equipment is designed by us and custom-made for us under contract. We take almost all the output of several of our most important outside sources.

"So the image Radio Shack seeks," he added, "is one of higher-than-average technology and innovation.

"For that reason we are building our TRS-80 microcomputer system in one of our 16 Fort Worth factories, and letting the whole world know that our capability goes far beyond \$100 CB radios and even \$500 hi-fi receivers which are, incidentally, things we also make ourselves."

Why has he called TRS-80 "the most important Radio Shack product" ever made?

"Because it's new state-of-the-art technology, demonstrating Shack's vaunted ability to do-it-ourselves.

"And because it opens all sorts of future—and I'm talking about near-future, months not years—horizons for related sophisticated products and spin-offs from microprocessor know-how. We already have one such item, our Realistic Pro-2001 microprocessor-circuit scanner radio.

"And for another thing, TRS-80 may very well lead us into new (for us) marketing fields."

How does Radio Shack intend to market the TRS-80?

"Our basic plan calls for one immediate method—via selected company-operated stores worldwide, plus franchise and dealer stores. There are four alternative methods—mail order, direct-selling by salesmen, wholesaling beyond our established system, and discrete 'computer stores'."

Who are the customers? They include small businesses, schools, labs, computerphiles or hobbyists, plus anyone interested in learning computer programming."

What about home users? "Every user lives in a home, but we can't immediately hope to see products like TRS-80 used widely for such in-home things as recipes for cooking, appliance control, games and so on, although we'll do our best to interest the 'average man' in our system."

What about software? "We certainly agree on software as a basic need.

"We also feel that software prices we've seen around the industry are far, far too expensive. Mind you, we're not out to undersell but to give value and reliability. That's what Radio Shack is all about."

Why did Radio Shack choose to market a microcomputer system at so low a cost?

"We decided to skip a few rounds of the price-erosion tactics we've been subjected to in such categories as calculators and electronic watches, where immediate profits were quite obviously sacrificed in the interest of ultimate market share.

"But I can assure you that TRS-80 as it stands today is not, repeat not, a loss leader. We will expense our R&D rapidly, that is we won't lay it off against distant potential sales. The same sensible pricing will apply to peripherals."

Why did you brand TRS-80 "Radio Shack" instead of "Realistic" or one of your other well-known brands?

"Now we're back to where we started, back to our image.

"When we put the words 'Radio Shack' onto a brilliant new device in a new category of goods, we felt it would definitely enhance our image in the public's perception and that this would rub off onto the rest of our line.

"From the start we instinctively branded the TRS-80 with our company name. We already have awareness in an enviable amount—the result of billions in sales, millions in advertising, and thousands in locations.

"Now we desire to elevate that image from a qualitative standpoint, to raise it

not to ridiculous heights, but to precisely the height we actually deserve. Not enough people know we have over 4,000 employees exclusively devoted to company-operated manufacturing, even though we don't keep it a secret.

The TRS-80, if nothing else, should bring us the extra glamour you can't buy with advertising and sales promotion, or with claims and promises. Radio Shack as a technical company, a techniques company, a state-of-the-art company...that, quite aside from potential profits, is one of the fundamental aims of our microcomputer division.

"So you may rest assured that we did not approach this project opportunistically, as for example, a lot of companies did with things like electronic watches and CB radio.

"Again, aside from mere profits—how much is image worth? Millions, we think.

"And how much is a new business venture worth? I think 'incalculable' is a proper word.

"And why microcomputers instead of something else? Because, without any question, this device is inevitably in the future of everyone in the civilized world—in some way—now and for as far ahead as one can think. # #

Intention not to skim hobby market

Speaking before the Morgan Stanley first annual Personal Computer Conference in New York, Kornfeld later reaffirmed Radio Shack's computer intentions:

Many people were surprised at Radio Shack's first public announcement and demonstration of its TRS-80... Perhaps they would have been less surprised had they known that we own and operate 21 factories employing more than 5,000 people in over one million square feet of factory space in five countries and yielding over \$150-million in sales (mostly to ourselves)...

We build or have built such diversified items as 120-watt hi-fi receivers, TV games, 40-channel CB radios, crystals, magnetic tape, and so on—about 50 per cent of our sales derived from self-built equipment and electronic accessories, the rest coming from custom contract-manufactured items mostly designed and tool-ed by us—not merely "name-change" purchasing.

SO WHY THE SURPRISE? The TRS-80 was in the creative stage for at least two years before its introduction. Like so many of even our most "look-alike" items, it was NOT a copy of anything. The timing was not a knee-jerk reaction to tapering-off CB sales. It just so happened that it was ready. The styling had nothing to do with competition: it just so happened to be our personal choice well before we ever heard of any competitors.

The intention was NOT to produce a "home computer" for hobbyists, but to

produce a system which could be used at home or indeed at any location with an AC outlet.

The intention was NOT to skim off the hobby market and then quit, but to explore and enter the market for computers to serve small business, small parts of large business, labs, schools, professional people, students and, yes, hobbyists. We have the know-how, the financial muscle to do this; and perhaps, most importantly, almost exactly 7,000 locations supported by a mailing list in excess of 20,000,000 active customers, probably unduplicated in size anywhere in the world. At these locations we can display and sell TRS-80 equipment, peripherals, software and systems just as soon as production catches up with demand... As of now, most of our sales have been made without this unique advantage...

Analysis will show we are dedicated and committed to being an important factor in the business and—if not a Cadillac, at least the VW Rabbit of micros—swift, fundamental, complete transportation without bulk, bells and whistles or overkill. It's our way of doing business and it has brought us from \$12-million to over \$1-billion since our takeover by Tandy Corporation in 1963.

A MICRO SYSTEM may be compared to a camera. In professional hands its output can provide a living. Even in amateur hands it can provide entertainment, memory and knowledge. Like a camera, it can capture and record and playback its input and can be programmed to do certain

tasks — be it a Leica or an Instamatic. Its output can be duplicated, refined and edited. The same may be said of a tape recorder, be it audio or video.

Who uses these somewhat analogous devices? Pro's, amateurs, government, businesses, scholars, students and so on. All of them are people with a concept of benefits. This is the "personal" micro-computer market. Our mission is partly to remove the fear and mystique and cost of computers and their users, and to at least partly replace these with touchability, understand-ability, use-ability and afford-ability.

TRS-80 is NOT a loss-leader, nor a grandstand play. It is a leader, perhaps THE leader in its field in terms of systems in the field.

Our intention, without flashing lights, fancy games, colors, claims and promises, is to be ourselves...and this in summary means to be serious, progressive, aggressive and NUMBER ONE in our market. #

PET WATCH:

Documentation still a problem

By GENE BEALS, editor
PET User Notes

COMMODORE RECENTLY began sending a "Revised Introduction to Your PET" with PET shipments. The booklet is about the same as the previous version, but does omit the memory map and edge connector designations. I hope Commodore gets some decent documentation out soon. I know they can do it — the KIM and 6500 Hardware and Programming manuals are very good.

The PET main circuit board has changed several times since last year. Commodore has been using 2114 RAMs instead of their own 6650 chip, and is apparently going to be an alternate source for the Intel memory IC (the Commodore version will be the 6114, with additional plans to produce a 6316 16K RAM as an alternate source for the Intel 2316).

The Commodore printer (PET Formatting Printer) should be available in late July. Although the specifications are a little sketchy, the unit appears to be an excellent value at \$595. Features include 80-column width on 8 1/2 inch paper at 120 characters/second. All PET characters (upper, lowercase, and graphics) will print using a 7 by 8 dot matrix print head. The printer will be assigned physical address 4 on the IEEE-488 bus. The secondary address specified in the OPEN for the device will be used by the printer to determine how the data stream is processed. Some of the options are: print data exactly as received; print data per format; set up a format; and set number of lines per page. Characters may be double width (7 by 16). Formatting includes left, right, or decimal-point alignment, as well as leading zero, floating dollar sign, and trailing minus sign.

Nothing much is happening as far as correction of system bugs, with the exception of losing the cursor when hitting

AN EASTERN VIEW:

Factories seen catching up on home computer orders

By SOL LIBES

Reprinted from Amateur Computer Group of New Jersey "News"

Both Radio Shack and Commodore will soon have caught up on their back-order situation. It is rumored that both companies will soon be delivering from stock and that stores will have units on the shelves for immediate purchase (this was the May issue — ED).

Radio Shack expects that about 300 stores will be in a stocking position by early summer. In the meantime, RS is having difficulty in delivering those add-ons that were announced back in January. This includes Level II Basic, floppy disks, printers and add-on memory.

Commodore has just opened its first East Coast retail outlet, in Philadelphia. It is part of the Mr. Calculator chain. It reportedly will soon have PETs "in stock".

Commodore has announced two add-ons: a second cassette and printer (with PET graphics capability). However, going by past experience, do not look for early delivery.

Also Apple, in an attempt to meet competition, has reduced prices 15 to 23 per cent. The basic 4K unit now will list for \$995 (down from \$1,298). The company will also soon have available an intelligent printer interface and intelligent communications interface. The company has received additional funding from Venrock Associates, Capital Management, Inc. and Arthur Rock, all venture capital operations. The original financing for Apple came from Bank of America and individuals within the company.

Meanwhile, TI and Altair are in development of their home systems and may possibly be in production for the Christmas season, although things appear tight, at this time. #

New handbook of BASICs aids program 'portability'

If you would like to make Basic programs found in magazines run on your machine, the new "Basic Computer Programming Handbook" could help.

Written by Dr. David A. Lien, who has to our knowledge received universal praise for his Radio Shack Level 1 user's manual, a \$5-off coupon is printed on the inside back cover of this issue.

Dr. Lien says that with the Basic Handbook you can make those magazine programs work, or know the reason why they can't.

Not a dictionary, not a text, the new handbook is said to be a virtual encyclopedia of the Basic language, detailing more than 250 Basic statements, functions, operators and commands.

If the magazine program doesn't run, it is probably because the Basic it was

written for is different from the one on computer in which you are implementing it.

The handbook explains how to substitute for Basic words not resident in a given system. If it is a function that is missing, the handbook gives a subroutine to accomplish the same thing.

From nearly a hundred Basics in use today, Dr. Lien has selected 25 of the most used dialects for complete coverage.

The popular minicomputer and mainframe dialects are dealt with, as well as the proposed ANSI standard Basic which may be required in military contracts, and Radio Shack, PET, Apple, Ohio Scientific, Altair, Imsai, Heath, and many more.

A long-time technical author and college dean, Dr. Lien's specialty has been making complicated things understandable. #

Sees printer as necessary

One of the most necessary things for use in my '80' is a good printer with interface, serial or parallel, so that I don't have to buy the expansion interface.

Can't a simple interface be driven off the port output of the unit?

Peter Charlton, 491 Elbow ct.
Weatherford TX 76086

Looks to me, Pete, as though you should be able to connect a printer to an S100 I/O board, which should interface to your system through that MiniMicroMart adapter board you're awaiting. Anyone out there with experience in this, let's have your thoughts. Ed.

return. This can be corrected with a ROM replacement at a cost of \$10.

Commodore Software still isn't being distributed yet, although an announcement was mailed in April indicating the first batch release was imminent.

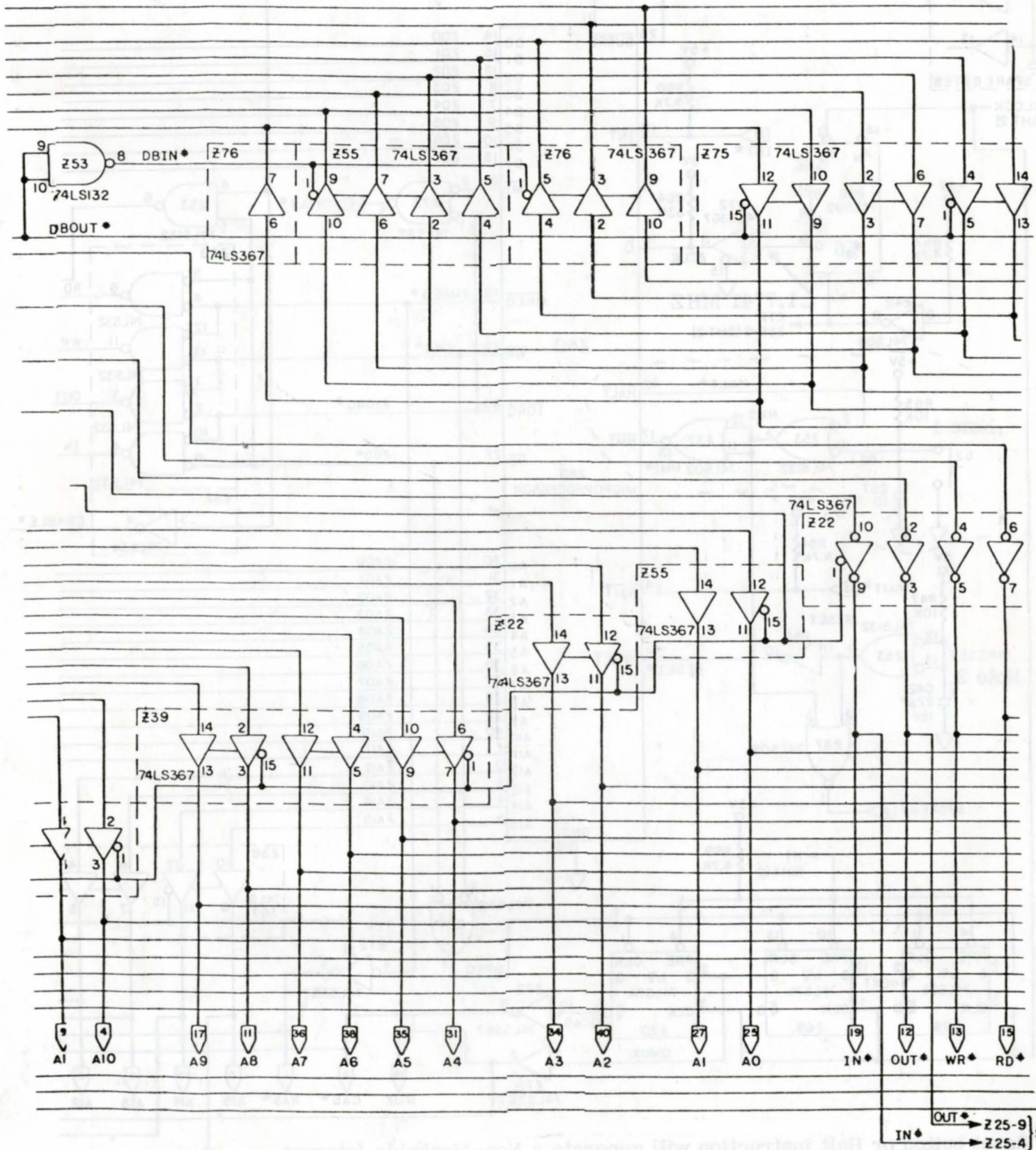
Several users have written that their keytop surfaces are wearing off on the more heavily used keys. Does anyone know a preventive measure for this? Also, many questions about adding a previously-saved routine on cassette to a program in memory...

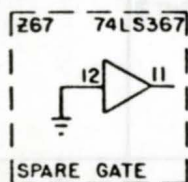
In general, comments about PET have been very favorable. In fact, the response range seems to be favorable to ecstatic, with no one yet indicating they are dissatisfied.

Reprinted from PET User Notes, Box 371, Montgomeryville PA 18936; \$5 year.

NOTE:

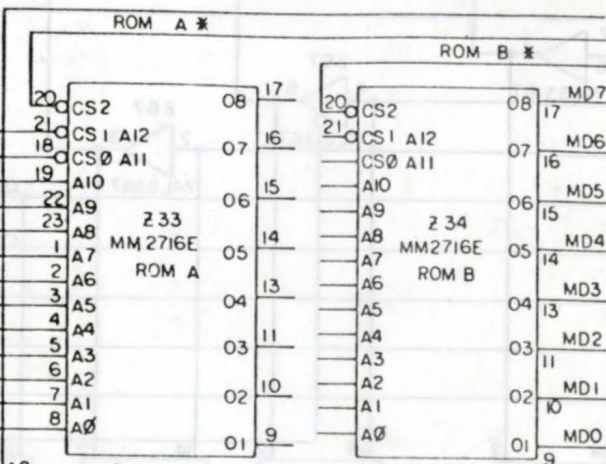
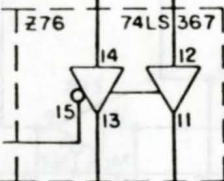
1. Z13 THRU Z20 ARE RANDOM ACCESS MEMORIES (4K, 8K OR 16K FRAM'S)





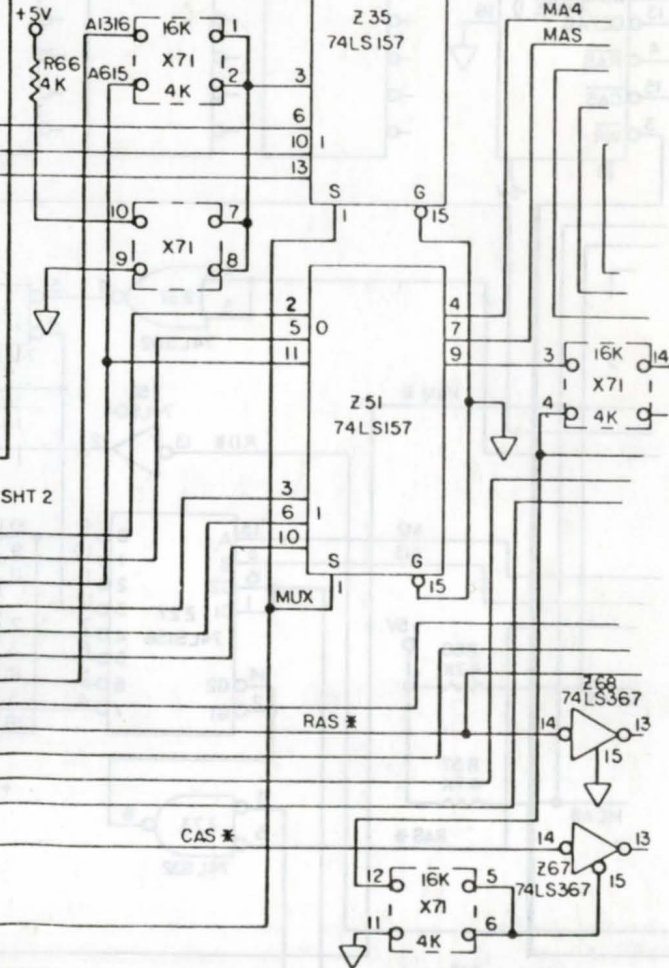
A0 → Z52-5
A1 → Z54-11
A2 → Z54-2
A3 → Z54-1
A4 → Z54-4
A5 → Z54-12
A6 → Z54-3
A7 → Z54-5

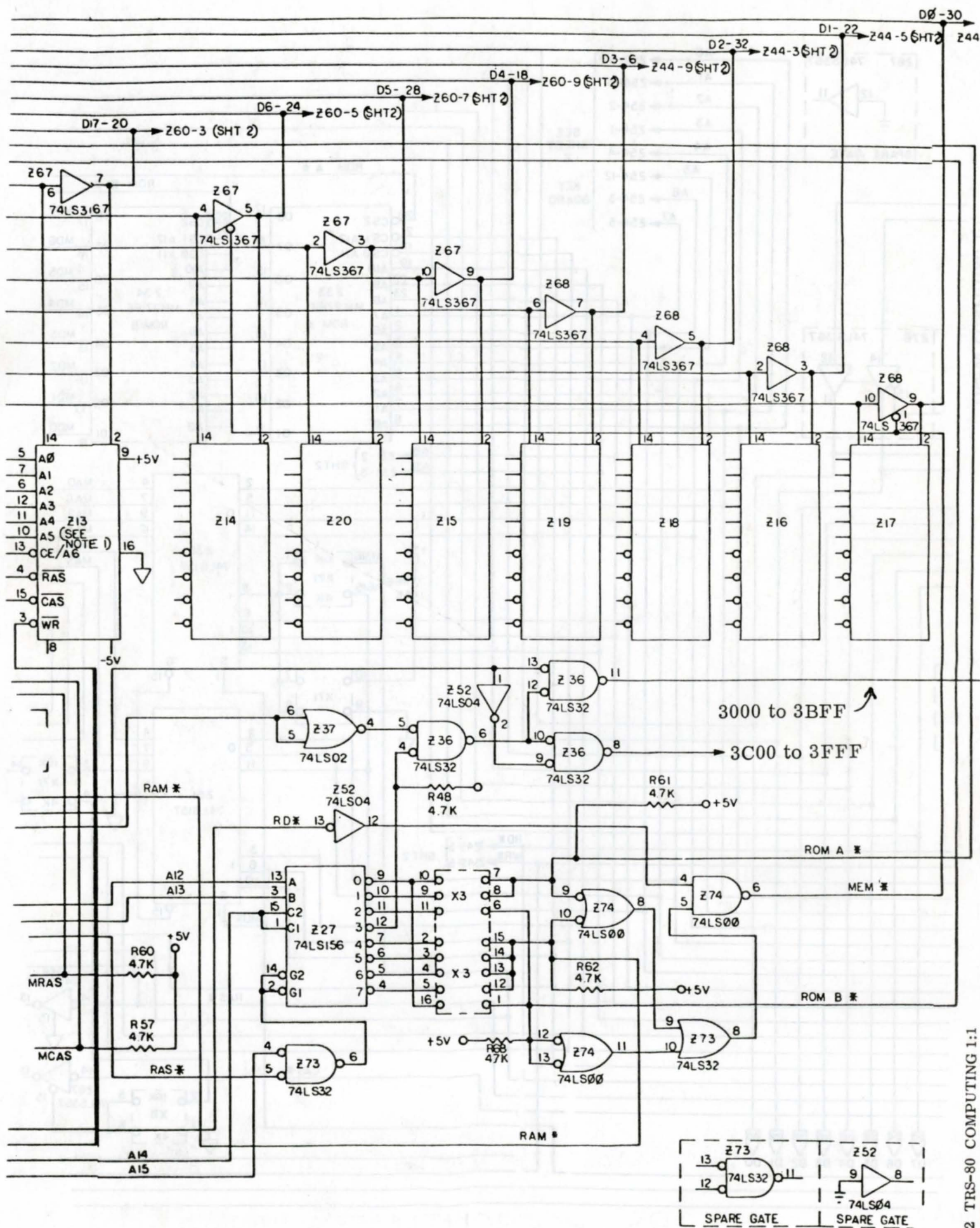
SEE
SHEET
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KEY
BOARD

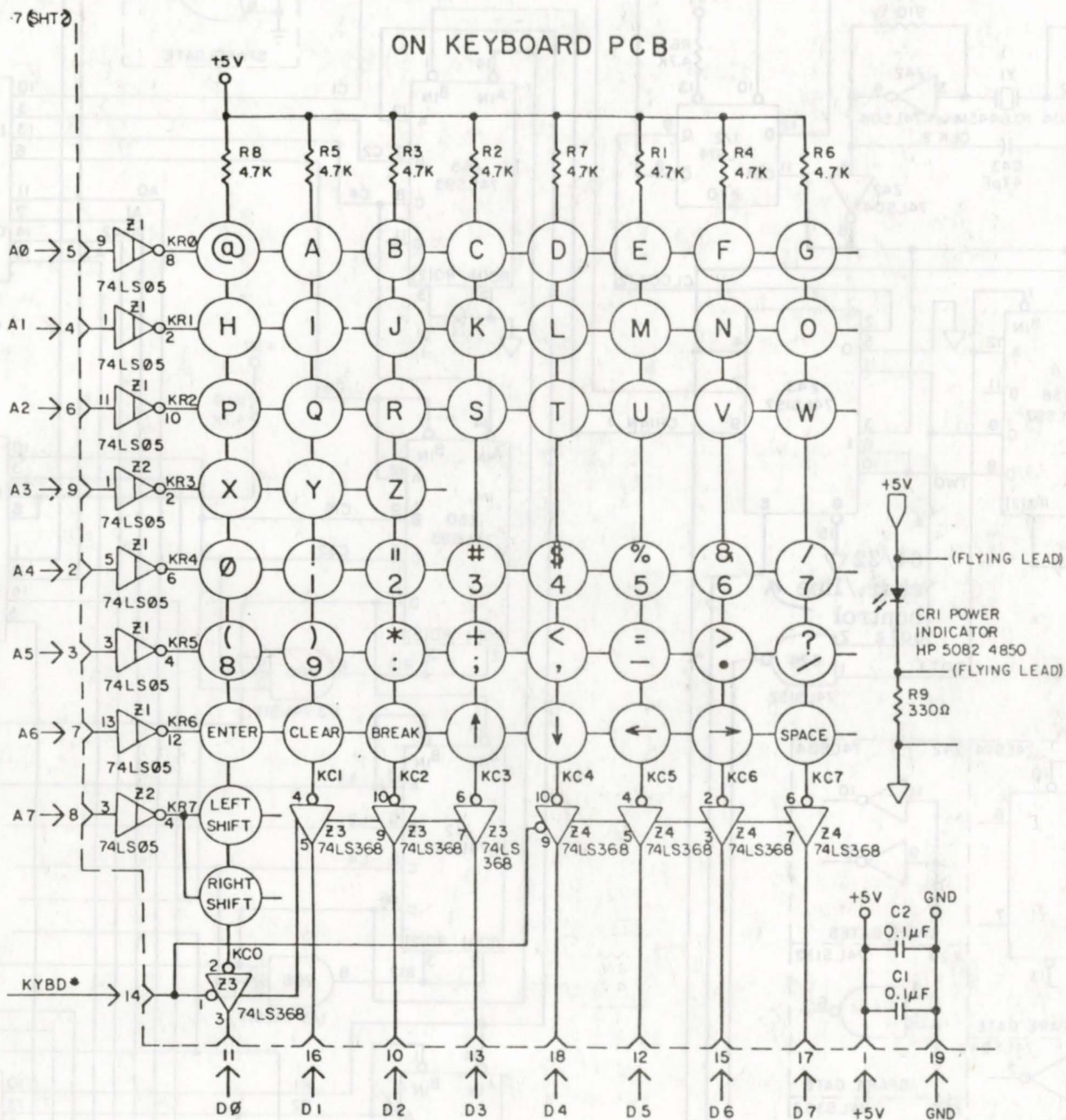


A8 → Z31-2
A9 → Z31-5 } SHT2

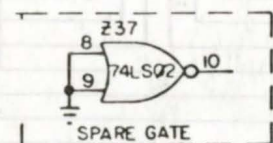
RD → Z49-5
WR → Z49-5 } SHT 2

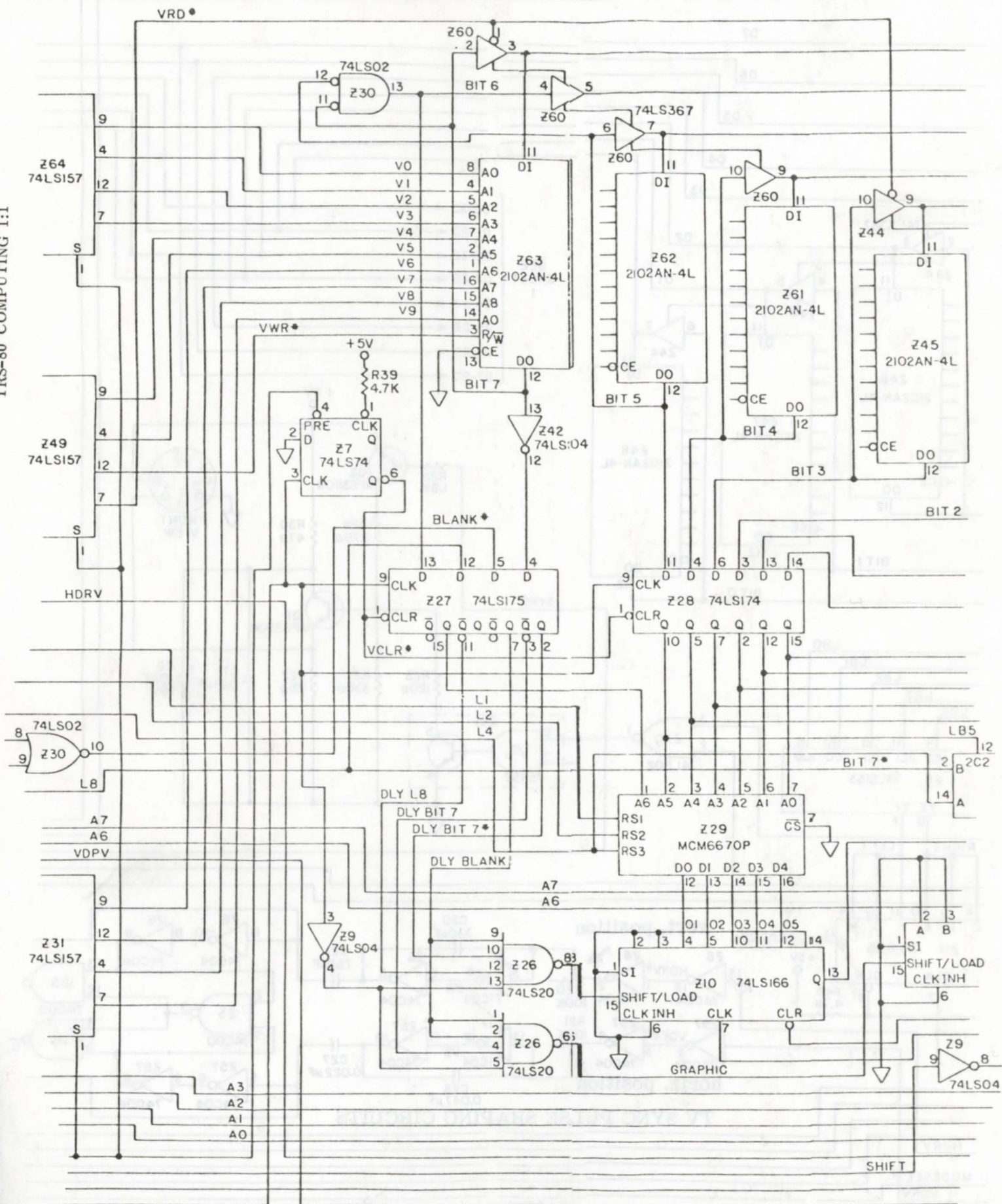


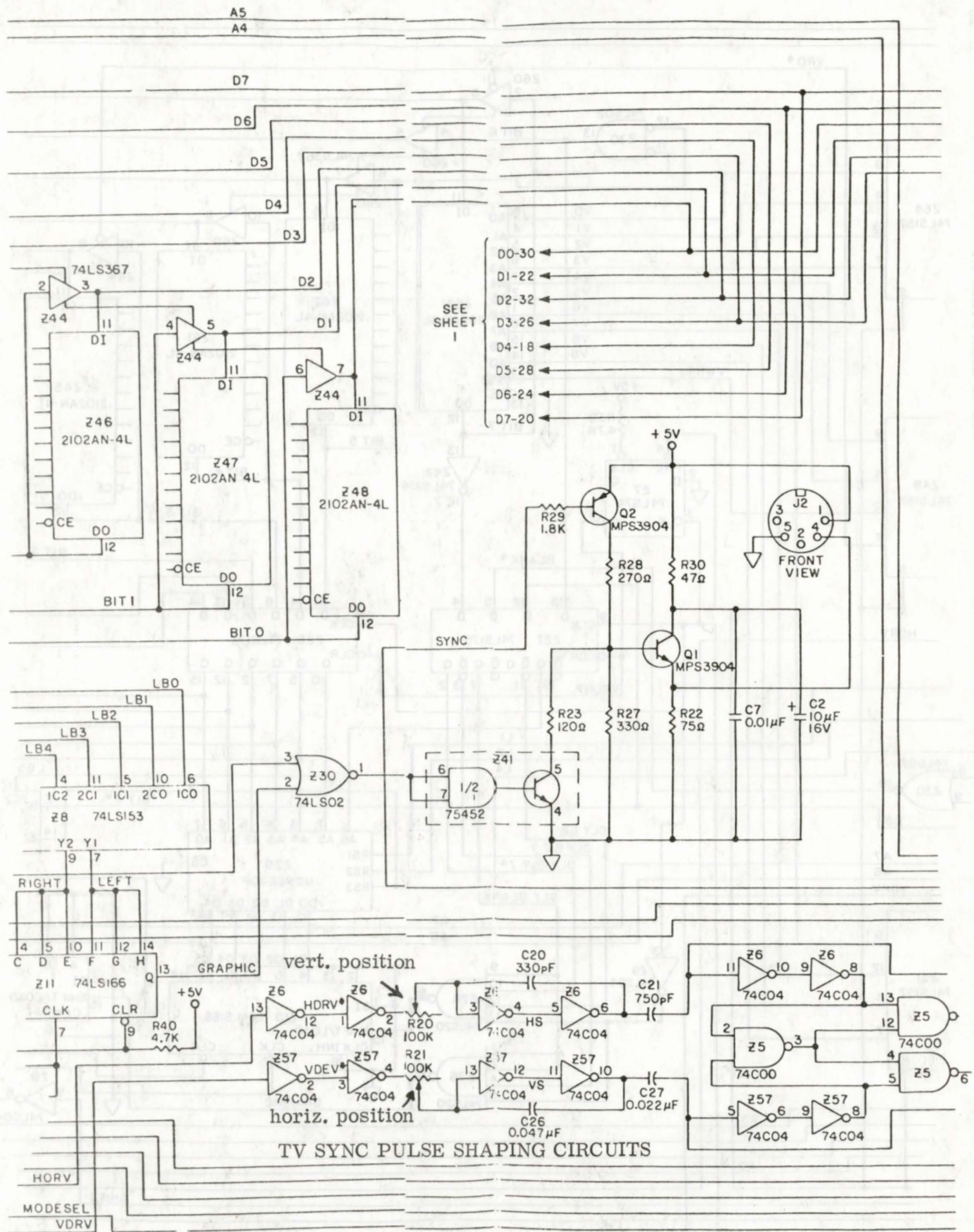




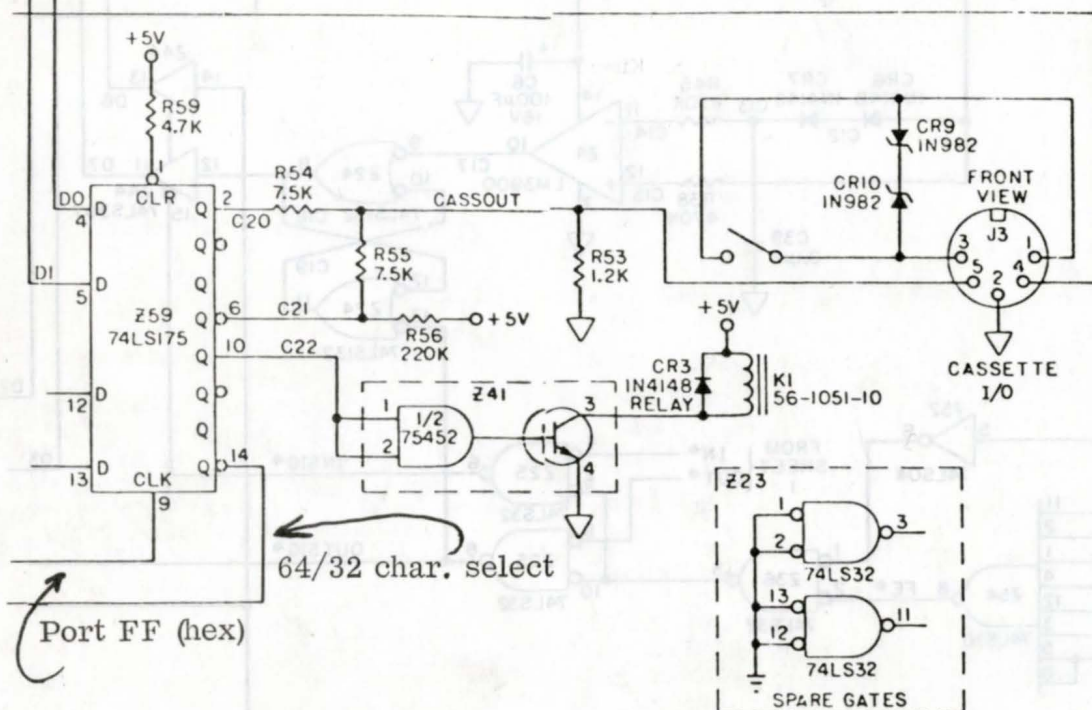
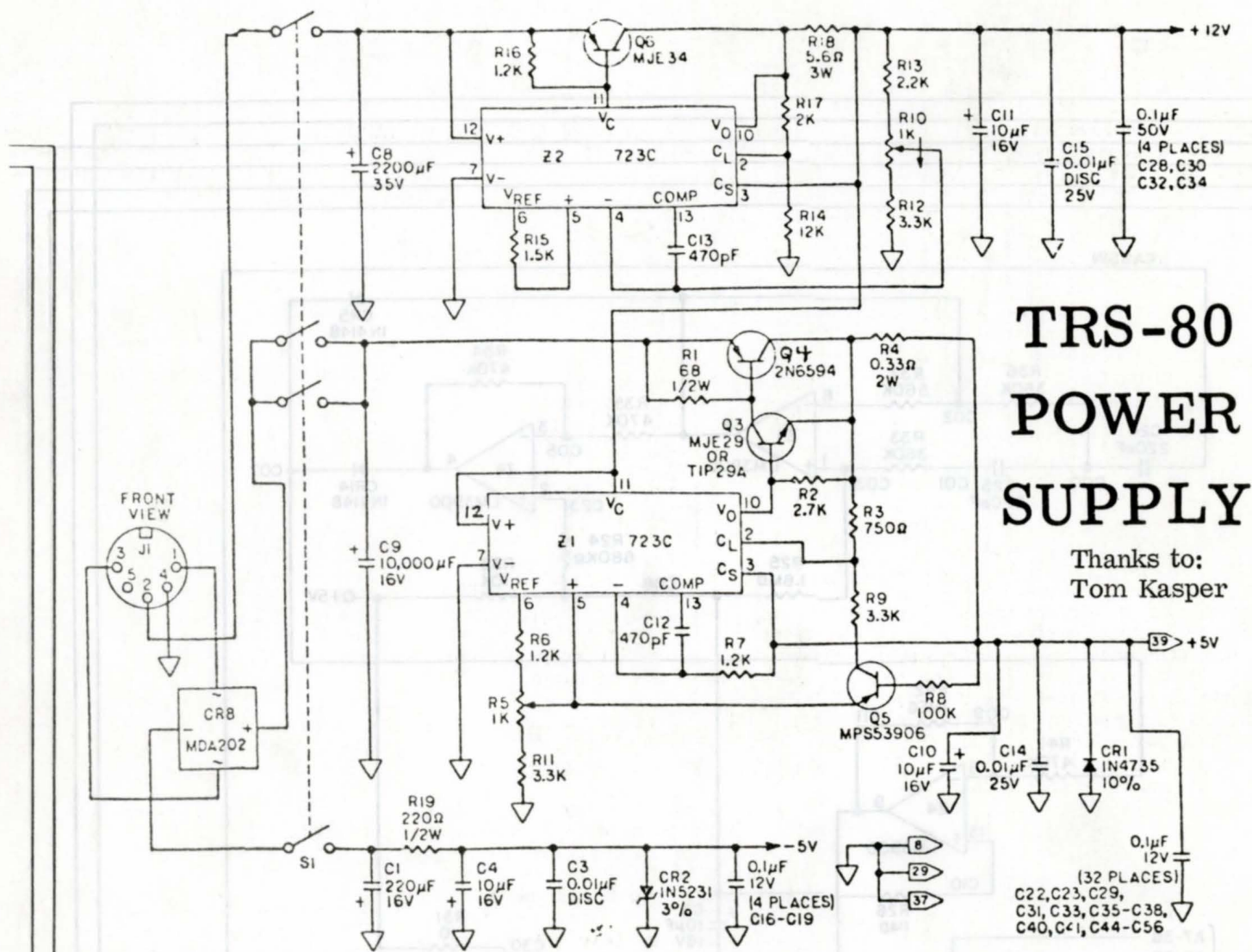
ON LOGIC PCB



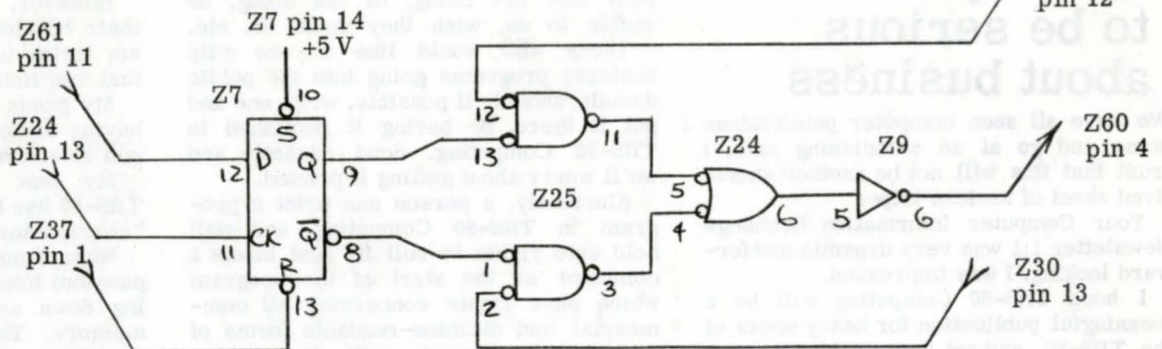








TRS-80 COMPUTING 1:1



HERE IS HOW to make the modification. As you complete each step, check it off and in colored pencil trace over that circuit on the diagram. All but steps 18 and 19 are done on the non-component side of the main TRS-80 board.

- 1) On IC Z7, pins 10, 11, 12 and 13 are soldered together. Using an Exacto-knife type tool, or a high-speed motorized Dremel-type device, electrically separate the pins (disconnect all pins from each other). These are electrodes leading to elements of unused logic, which Radio Shack has grounded out. Also cut ground trace. Thus you separate, unground them.
- 2) Cut ground trace at IC Z25, pins 1, 2, 12 and 13, and disconnect all pins from each other.
- 3) Cut ground trace at Z24, pins 4 and 5, and disconnect pins from each other.
- 4) Cut ground trace at Z9, pin 5.
- 5) Connect a wire from Z25 pin 7 to Z5 pin 7.
- 6) Connect Z7 pin 10 to Z7 pin 14.
- 7) Connect Z7 pin 13 to Z37 pin 1.
- 8) Connect Z7 pin 12 to Z61 pin 11.
- 9) Connect Z7 pin 11 to Z24 pin 13.
- 10) Connect Z7 pin 9 to Z25 pin 13.
- 11) Connect Z7 pin 8 to Z25 pin 1.

- 12) Connect Z25 pin 3 to Z24 pin 4.
- 13) Connect Z25 pin 11 to Z24 pin 5.
- 14) Connect Z24 pin 6 to Z9 pin 5.
- 15) Connect Z9 pin 6 to Z60 pin 4.
- 16) Connect Z25 pin 2 to Z30 pin 13.
- 17) Except for connecting, steps 18, 19, perform lowercase mod on page 3.
- 18) Connect Z25 pin 12 to NEW RAM pin 12 (instead of connection suggested on page 3).
- 19) Connect new RAM pin 11 to Z60 pin 5.

Note: Use of desoldering techniques, iron and solder sucker, can help in trace-cutting stages. Move quickly and avoid overheating board or components.

I've heard of someone who will install a DPST switch to allow one to switch from Level I to Level II. I've ordered Level II and have intention of making this modification myself if I can find out how.

I've heard that the Level I to Level II tape isn't all it should be and switching in and out the chip sounds much preferable.

-LEWIS MARK, 164 S. Kingsley dr.
Los Angeles CA 90004.

I have a level-II, 16K system, with expansion unit. I am waiting for my disk. Perhaps someone can help me with some of my questions:

I just acquired 16K of RAM, which can be added to my expansion unit so that my system will be 32K. I'm looking for a R-S service manual which explains how to do this.

Can assembly language programs and/or machine language programs developed on Level I systems be adapted for Level II? (I believe they are identical, Anthony. Ed).

I'm also interested in Fortran/Basic conversion, which can be memory-protected in the TRS-80, giving it the ability to use Fortran DO statements, computed GOTOs, Fortran subroutines, etc., which expands its ability so it can use Fortran statements in addition to Basic.

Does anyone know of Basic programs in advanced multivariate statistics? I am looking for multiregression, factor analysis, and discriminatory analysis pro-

I just finished the installation of my Level II Basic upgrade. Turned it on and a screen full of garbage.

I went over the installation to check for errors, and found none. &#*+&#=&#.

Then by luck, trouble-shooting, or whatever, I found the problem: Pin one of my DIP cable was open!!! On opening the plug I found the wire going to pin one—loose. Reassembled, power up—"Memory size?"

As you can see I have cut my first trace on the TRS-80 and am ready for the second.

—RONALD J. SKINNER, 920 Sixth ave.
Des Plaines IL 60016.

I am interested in a digitizer for graphics. Also, analog-to-digital and digital-to-analog input/output for the TRS-80.

Also, instructions on how to change the 4116 memory, for 16K, and how to install the Basic Level II ROM.

—MURRAY SHEVICK, M.D., internal medicine, 3838 Jackson street, suite B, Riverside CA 92503.

Can anyone tell me how two or more persons using their TRS-80s can play games over the phone lines so each person's video shows the same thing and reacts identically?

We would like to know how to make or where to buy any additional hardware that may be required.

Also, it's really frustrating to want to use a Level I program and be unable to because you have Level II. In most cases, I don't know how to re-do my Level I tapes so they'll run on Level II. I've got 16K, but most of my converted Level I tapes still come back with "program too long".

Can anyone tell me how to easily change my Level II back to Level I and vice versa or know of anyone who has developed an inexpensive device to do this without having to bother with Level I-to-Level II tape conversions?

Sharon Jackson, Box 621, Fenton MO
63026.

Wants journal to be serious about business

We have all seen computer publications come and go at an astonishing rate. I trust that this will not be another short-lived sheet of useless tripe.

Your Computer Information Exchange Newsletter 1:1 was very dynamic and forward looking. I was impressed.

I hope TRS-80 Computing will be a meaningful publication for heavy users of the TRS-80, and not just a hobbyist magazine. Lord knows there are enough of them.

What would truly be useful is a record of TRS-80 applications and users, so that people trying to use or adapt one to suit their purposes might have an easy reference of other people with similar goals.

An on-going account of applications in REAL-LIFE problems is what's really lacking on the new micro-market.

The sort of articles I would like to see are concerned primarily with how small business can use a TRS-80 to handle their inventory, their accounts, or any number of other needs.

The TRS-80 is the lowest cost, most capable micro currently being offered that any small shop keeper can easily use with little or no training. This is what the market is hungering for.

Of course, hobby applications are an important way to diversify a publication of this sort. Hobby uses appear on the surface as so much tasty frosting on the cake. But, as you well know, the genius of a determined hobbyist often leads to an innovative way of handling a heretofore unbeatable problem.

Hobbyists also have their place in any publication dealing with TRS-80 applications.

I wish you the best of luck with your endeavors. We shall all profit from them.

—SAMUEL R. DICK, 300-226 Holly Hills rd., Columbus MS 39701.

(Very well put, Samuel, we agree 100 per cent. We hope readers will keep

us—and thus everybody—informed about what they are doing, or not doing, or unable to do, wish they could do, etc.

Those who would like to see nifty business programs going into the public domain should, if possible, write one and put it there, by having it published in TRS-80 Computing. Send cassette and we'll worry about getting it printed.

(Curiously, a person can print a program in TRS-80 Computing, and still hold onto rights to sell it. Just insert a comment at the start of the program which says rights concerning all commercial and machine-readable forms of the program remain with the author.

(You might also use that space to note something like "Cassettes of this program available for \$__ from..." Ed.)

Cassette labels

Miller Microcomputer Services is offering plain white cassette labels, press-on style.

These are priced at \$1 for 36, ready to write-on, Xerox or photo-offset print. Add 50¢ shipping/handling; Mass. residents add 5 per cent tax. Address: 61 Lake Shore rd., Natick MA 01760.

Fascinated by TRS-80 potential

I have had my TRS-80 system for a couple of months now and I am fascinated by the potential of such a system.

I knew nothing about computers five months ago and I have found, after hours of reading and more hours of experimenting, that I still know very little about a very complex new field.

However, I am trying to learn to drive as one might have learned to drive 60 years ago after acquiring one of Henry's new Fords, with a crank in one hand and an owners' manual in the other.

As you can see from this letter (printed on the Radio Shack Centronics) I have at least managed to put together a type of word processing program (I rewrote the

Scientific Research Inc. program).

However, the program they sell in their booklet is still line oriented, and I am trying to rewrite the MITS program that was listed in Kilobaud.

My guess is that I will probably end up buying something like the Electric Pencil and Selecterm.

My one major complaint with the TRS-80 has been the uncontrollable double "charaaacters".

When I upgraded with 32K and an (expansion) interface my system kept breaking down as I used up my first 16K of memory. The local repair facility corrected the memory problem within their forty-eight-hour down-time goal, however, the double character problem continues to irritate me to no end.

Until I can correct it I will wait before I make up my mind regarding further purchases.

TRS-80 Computing will be filling a real need in a fantastic new hobby-business field.

—LEROY COOPER, M.D., Alvarado Medical Center, 6505 Alvarado rd., Suite 202, San Diego CA 92120.

Magazines want TRS-80 material

TRS-80 OWNERS are undoubtedly in top position if they wish to sell programs or articles to magazines. Radio-Electronics, Modern Electronics, and Calculators/Computers have contacted TRS-80 Computing about their interest in the computer.

"A series of features centered on the TRS-80 is being developed frequently, if not in every issue, of this magazine," Mort Walters, Modern Electronics editor recently wrote.

"I am interested in all kinds of news—programming tricks and shortcuts, new peripherals, unusual uses in the home environment, and so on.

"Also of interest are programs for Level I and II.

"Anyone having any that they would like to submit for publication, please send them along in printout form with your signed statement that they are original and are available for publication. They may be business, home, or amusement oriented.

"We will pay for published programs up to a maximum of \$100. Actual amount will be determined by the ingenuity of the program and its length." Modern Electronics is at 14 Vanderventer ave., Port Washington, N.Y. 11050.

Calculators/Computers submissions should be sent to Don Inman, ...editor, DYNAMAX, box 310, Menlo Park CA 94025.

Radio-Electronics contributions should be addressed to Larry Steckler, ...editor, 200 Park Avenue South, New York NY 10003.

One way to have your material brought to the attention of all the editors is to publish it in a newsletter such as TRS-80 Computing. Since newsletters are of relatively small circulation, editors generally will buy material, even though it has been printed before.



QUALITY PRINT POSSIBLE—This expanded TRS-80/Selecterm system produces work that looks as though it came off an office Selectric typewriter. For many uses, the film ribbon, capitals and lowercase letters make this configuration superior to the rough, caps-only dot matrix obtained on competing units. Easy modifications allow TRS-80 to display lowercase letters on video, and Electric Pencil software is now rolling onto TRS-80 cassettes.

—Photo courtesy Cybergrafix

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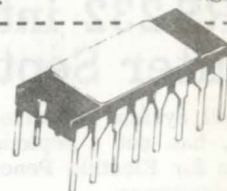
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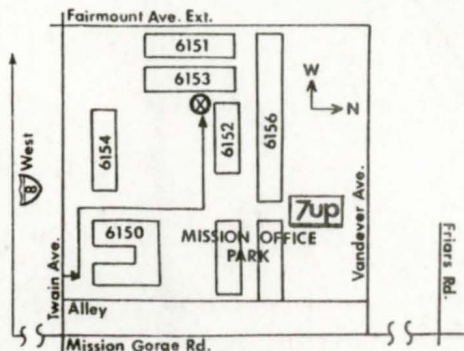
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'Electric Pencil', RS 232 interface after Sept. 10

Small System Software of Newbury Park, CA, has set a September 10th delivery date for Electric Pencil editing, formatting software.

Written by Michael Shrayner, and in use on other systems for some time, The Electric Pencil is the best known and most popular editing system for small computer.

The Small System Software adaptation requires 16K, either Level I or II, and loads at 500 baud. It operates on either lowercase-modified or unmodified machines, and sells for \$100.

The firm also offers a RS232 printer interface which operates out of the cassette interface, for \$40. For information write box 366, Newbury Park CA 91320.

Software Exchange offers news, classified ads

A new magazine, "The Software Exchange", tells where to get programs for business, recreation or other uses.

Classified advertisements allow computer users to match their application and machine type with what is available.

"Wanted" ads are available to help people search the market.

Sellers can list their programs for \$5 per program. Readership is said to be more than 4,000, in the U.S. and abroad. Display advertising space also is available.

The Software Exchange is bi-monthly, and available at computer stores for \$1 per issue, or by subscription for \$5 per year (six issues). Address: box 55056, Valencia CA 91355.

New quarterly lists cassette TRS-80 software

Robert Purser of Dorado, CA, is continually compiling a list of all cassette software for the TRS-80, PET and Apple II.

Robert will publish his list quarterly.

The August '78 and November editions will sell for \$1 ppd. Later editions will be \$2 ppd. One-year subscriptions are available until November, for \$6.

Robert will try to find and list all software available for sale or for trade.

"Since most people who own a small computer have written at least one unique and useful program, my task is very difficult," Robert writes.

"Do you know or does anyone you know have any original programs for sale or trade? Please let me know."

His address is box 466, El Dorado CA 95623.

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