

January 11, 1974

Mr. Hal Singer
Editor
Mark-8 Newsletter
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Lompoc, California 93436

Dear Hal;

First, you have made a number of tries at my last name, none correct, however. You have done a wise thing in first assigning things. That gets it all done. I have made assignments also, unilaterally, and it generally gets things done!

The cassette interface circuit in the special newsletter is full of errors, use the digital group copy!

The "Digital Group" is assisting me to distribute mine and their ideas as easily and efficiently as possible. It is an outfit whose desire is mutual help on a hopefully break-even basis. I am very actively involved in Amateur Radio Slow Scan TV design as a hobby and often average two letters per day, so this way help gets out fast for the Microprocessors. The \$7.50 figure is solely a reimbursement of expenses (reproduction, cassette, & mailing) estimate.

The "Group" is investigating making my TV readout into a PC board. One fellow priced the IC's at \$60, so your \$80 estimate (including PC board) is close. I have taken one roll of pictures of the Microprocessor "innards & outards", and after some more pix, I'll send you a set of prints.

I would recommend an additional couple of standards:

- 1) Panel
- 2) Power Supply

The front panel should be convenient to operate, and attractive. The most pitiful design I've ever seen is the Scelbi. After some considerable amount of thinking, I have decided that a meaningful panel should have:

- 1) Digital Readout of
 - a) High Address
 - b) Low Address
 - c) Memory Data
 - d) Some Output Port Data
- 2) Keyboard Entry
 - a) Octal Entry Matrix Numbers
(8 keys & common clear)
 - b) Interuppt, Examine, & Deposit Keys &
deposit enable toggle switch
 - c) Load High Address, Load Low Address, Run,
& Stop keys. (No "Jam" needed!)
 - d) Digital Readout of Octal Entry
- 3) Power Switch & Power On indicators

There must be minimal panel clutter!

The power supply should be capable of the following voltages & currents:

- 1) +5 @ 5 amp minimum. (My 1.5K system with LED readout, TV Readout, etc. takes 5.1 amps. The microprocessor takes the following current:
 - a) LED readout & latch front panel .. 1.4 Amp
 - b) TV Readout & board 1.0 Amp
 - c) Output board (7 ports)5 Amp
 - d) 1.5K of 1101 memory 1.0 Amp
 - e) Address latch & Cassette board5 Amp
 - f) Input board (6 ports now)35Amp
 - g) CPU board35Amp

5.1 Amps

The +5 supply should have overvoltage protection using either SCR or Zener.

- 2) -9V @ 1 amp minimum (my unit draws .96 amp for 48 of the 1101's in main memory, 7 of the 1101's in the TV readout, and the 8008. The -9 supply should have overvoltage protection also. An LM 320/5 with pot control works nicely. A 10V Zener with \approx 2 amp capability would work well (20W).
- 3) \pm 12V supplies, particularly the +12 for op amp use. Use LM340/12 & LM320 here.
- 4) Fan for cooling as required.

Now the rest of the world. My general impression of your port assignments is that there is just too much junk to worry about hanging onto the Microprocessor. Rather than making all of those assignments, make two ports normally used for all of the misc. applications. Anyone intending to hang all those things onto a microprocessor isn't going to take the slightest notice of your assignment. The important items should receive the permanent assignments.

The devices requiring permanent assignment would be:

- 1) Input keyboard - ASCII, 7 bits capable, 8 bit for strobe. Input port \emptyset for this one. Have at least 10 pin connector to include GROUND and +5 for keyboard logic.
- 2) TV Readout. BNC connector for video output. Port 6 output is internally connected to the self-contained TV Readout board.
- 3) Cassette input and output. Input Port 1 bit \emptyset and Output Port 1 bit \emptyset required. Serialize and deserialize under software control.
- 4) Teletype - If serial, then share Port 1 with cassette. If parallel, then Port 2 input and output.

- 5) Calculator interface - see below.
- 6) Misc. I/O can be randomly assigned to Ports 3 & 4.
- 7) Graphics operations (Oscilloscope, TV Vector/Raster Graphic Generator (I'm designing one) etc.) on Port 5 I/O. Would suggest forgetting the string & pot tablet. (I'll also be designing a TV Raster driven light pen to be interfaced to the microprocessor and amateur SSTV.

In general, forget that paper tape junk. Use cassettes. Its neater, cheaper, quieter, and simpler.

I used to repair IBM keypunches. Stay away from that junk too.

The calculator interface design has two directions. The simple, present direction uses an \$8 Radio Shack 5012 calculator chip & about another \$10 of misc. IC's for a four function, 12 digit fixed decimal readout. The interface to the microprocessor will require one input port (port 6) for encoding the 12 digit display back to the microprocessor. The 15 keys will be electronically actuated by using the Out 8 - Out 22 momentary command. The Out 23 is reserved for special reset/functions. The calculator chip will be synchronized with the CPU's clock @ a 1Mhz point divided by 24 and pulse encoded for proper operation. The interface will be software driven.

A second calculator interface uses an IC from Mostek for \$27.50 which roughly duplicates the functions of the SR-50. I don't have the specs yet, but Don Parks of North Carolina has ordered 10 of the chips and is sending me the specs. Don has had a 3 chip calculator interfaced to his original design 8008 microprocessor for perhaps a year or so. Don, being tricky, assigned the calculator chips memory addresses and treats the output like memory outputs. The calculator chips are like ROM's.

I got my Martin Research books yesterday. The circuits are great, but those red pages make the lousiest books I have ever seen. I assume that they are supposed to eliminate copies being made, but most copying machines with variable light sensitivity controls should be able to easily reproduce the copy. I would recommend the book only to those willing to suffer severe eye strain and possessing a solid engineering design background.

Keep on solderin',

Dr. Robert Suding WQI MD
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Dr. Robert Suding



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February 3, 1975

Dr. Robert Suding
370 S. Queen Street
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Dear Bob,

Thank you for your letter. It was good to hear from you. I'm really looking forward to receiving the information from the Digital Group and I appreciate your sending a complete diagram for the cassette interface. I hope that we can try it out very soon. We have used a commercial digital cassette unit from MFE in New Hampshire and it works very well. Original cost is about \$500, but we got a demo unit for about \$150. I think an inexpensive bulk storage device will be extremely useful on any microcomputer system.

We have designed a calculator interface and Radio-Electronics has the article all ready to go. I'll have to call and find out when they expect to publish it. It uses a Texas Instruments TMS-0117 BCD calculator chip and the interface has TTL inputs and outputs. Input and output ports haven't been assigned and the design is flexible enough so that people without Mark-8 computers can still use it with a PROM to build a small programmable calculator. Unfortunately, the TMS-0117 is not very fast, worst case ten digit divide is about 100 msec. It is also limited to 10 digits and the decimal point is fixed with a jumper. It still does integer math very well since the decimal may be ignored for many operations. The chip does, however, have some advantages, such as instructions to increment and decrement counts and also to increment-to-overflow and decrement-to-zero which are very useful for real-time clock programming since the cycle time of the calculator is known.

While complex functions such as sine and cosine and logs can be approximated with series, the programming can get tricky, so we are looking at scientific calculators as well. I've had some experience with the SR-50 chips, but Texas Instruments won't give you any information on how to hook them up, independent of their calculator. We are now very interested in the MOS Technology chips which are present in many of the scientific calculators. We feel that it might not be a bad idea to interface to a calculator as well as just to the chips since the complete calculator will contain power supplies, clock, keyboard and readout and while not in use with the computer, it can be used just for the calculator functions.

We have a few other things coming along for microcomputers including an inexpensive hard-copy output device for about \$300.

Have you seen the MITS Altair 8800 computer based upon the Intel 8080 chip? We have seen one and we aren't really very impressed with it. I think that it was a catch-up job and it wasn't completely finished when published by Popular Electronics. I hope that any amateurs take a good look at it since it is difficult to interface to and difficult to develop additional boards for it in its present configuration.

Let me know what your thoughts are on calculator interfaces as well as other devices for the Mark-8. I'm sorry that no one has looked into the Hewlett-Packard interface scheme which may eventually become an ANSI standard, as well as asynchronous serial interfacing.

Is there any chance that you will be traveling within the next few months. I'm headed to the Pittsburg Conference in Cleveland, OH in March, the IEEE show in NYC in April, the ISA conference in AL in mid-April, and COMPCON (Washington, DC) and possibly Wescon in September. Let me know if our paths will cross so that we can get together and talk.

Thanks for your interest.

Sincerely,



Jonathan A. Titus

Let me know if you want info on the TMS-0117 interface. H



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February 7, 1975

Richard C. Bemis
The Digital Group
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Dear Richard:

Thanks for keeping me up to date on your group's activities. Look's like Dr. Suding's productivity continues to be phenomenal. I'm finally convinced that a calculator interface will save enough memory to make it worthwhile.

The next copy of the newsletter will be out in about two weeks or less. A friend of mine, John Craig, presently with Varian Data Machines, wrote half of it and I have the other half to finish up. We have an enormous amount of information to include. Most notable are Dr. Suding's cassette and TVT and Bob Cook's offer of CREED teletype units. I think your people will be very impressed by that offer.

I've been trying to decide what to do on future newsletters. Lots of possibilities have opened up but I'm not willing to gamble away the interests of the group on any of them so present plans are to continue doing exactly what we have been doing (with offset printing or at least an improved form of printing) for the next 6 issues (an issue every 1 to 2 months) for a fee of \$5.00. That should give us an ample amount to work with to cover postage and printing. I'd like to have a little left over if possible to buy some extra goodies for the computer center to try to compensate the advanced students that have helped make the whole thing possible. Judging from the generous donations that have been sent, I don't think participants will be too upset by that charge.

I would really appreciate it if you or someone in the Digital Group would prepare a few pages of material summarizing what the group is doing and how you got together. It is very difficult for me to try to piece together your activities and do justice to all of them. We now have the Digital Group, a Chicago Group, and a Washington DC group, and exciting things are happening within all of them.

Thanks again for the information. Please continue to keep me posted regarding what is going on.

Sincerely,

Hal Singer