MICRO-8 COMPUTER USER GROUP NEWSLETTER
Hal Singer & John Craig -- Editors
Cabrillo Computer Center
4350 Constellation Road
Lompoc, CA 93436

August 28, 1975
Volume 1, #10

Surprise! Another NL in less than a month. Camera ready copy is coming in fast enough to rush another issue out. Believe it or not, the roster of 1500 plus people will appear in one or both of the next issues. Ten issues in 12 months isn't really too bad!

COLOSSAL LEAK

As the newspapers would say, we have it from a "very reliable source" that Radio Shack has firmed up their plans and will announce a modular microcomputer system built around the PACE. (Better write National Semiconductor, 2900 Semiconductor Drive, Santa Clara, CA 95051 (408) 732-5000 and request the PACE technical description, publication #420000784 and the PACE glossy. You might as well ask for full IMP-16 literature at the same time. It looks like we are going to see a lot of National products in the future.) Look for it about January.

Present plans are to set a new trend in pricing with the basic box selling very very cheap to get you to buy reasonably priced expansion modules. Support plans include the complete National support software library and a BASIC.

Word is that National is very anxious to provide support to Radio Shack which only makes sense with the thousands of stores and the potential market they might represent. Can we persuade some of you software experts to take a close look at the PACE instruction set and see whether it will be realistic to modify D-G NOVA software?

MITS & M6800

Rumors are floating about regarding MITS and Motorola M6800 chip development. Rather than repeat some of the ones I've heard, let's quote from Computer Notes, August 1975. The editor Dave Bunnell says, "Yes MITS is working on developments around the M6800 chip. However, it is absolutely not true that we have any plans, notions, thoughts, or intentions of replacing the 8080 CPU with a 6800 CPU. The ALTAIR 8800 is our most powerful processor and it will remain so for a considerable length of time. ALTAIR 8800 development programs are in high gear and ALTAIR owners can be assured that we intend to support them now and indefinitely into the future."

Subscription Information

The MICRO-8 Newsletter is a non-profit publication produced by the students and staff of the Cabrillo High School Computer Center as a student body activity. It is devoted to providing a forum for getting hobby computer enthusiasts communicating with each other and to promote the formation of local hobby computer groups. Issues are published when sufficient worthwhile material has been sent in, preferably every one to two months. Newsletters are sent first class mail to insure that they reach you in a reasonable time. Prices are for U. S. and Canada. Please add $6.00 for foreign delivery.

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				Issues 7 - 12 $6.00
Total		$9.50		Total $9.50

Heathkit

Wouldn't it be neat to know what Heathkit has on the boards. Word around the Bay area was that Heathkit engineers were making the rounds of the semiconductor manufacturers recently looking at microprocessors.

The Future

What To do after issue 12 still looms ahead. I have to get back to serious school teaching this Fall or I can expect to be fired and John Craig will be in intensive training courses for the next three months but we are still tempted to continue for another 6 issues. Three letters have already been received regarding the NL's future. Please let us know whether we should continue and if so, what kind of changes you'd like to see. In any case, remember that we are not publishing a monthly magazine with our own original work. It is a newsletter that contains your contributions that might be of interest to fellow computer hobbyists.

Sy Lieberman
1489 Durango Avenue
Los Angeles, CA 90035

Dear Hal & John,

It is very gratifying to see that the computer hobby field has grown as rapidly as it has within the last year, resulting in the many low cost hobby microcomputer hardware options now coming out. I am sure that your NL has played a great part in this.

In answer to your request for inputs as to the future of the NL in NL #9, I think you should not stop it with NL #12. As previously stated by Julie Woodman in Volume 1, #8, even if it would require an increased subscription rate (about $10). Her mention of accepting advertising as a possibility for covering required secretarily help appears tempting. However, it would tend to defeat the goal of being completely unbiased source of information for the microcomputer hobby field. Even with such commerical enterprises as BYTE coming out to fill the gap, I am sure that there is room for the NL as they can only handle a limited amount of material in any one issue. Radio Electronics is only doing a very mediocre job in this area as their title covers too much ground. They won't even start a column as Popular Electronics has. The latter is expanding in this area after much letter writing, as the last issue makes note of. I personally think that the unbiased NL provides a sort of hobbyist protector from the "fast buck" artists and their freewheeling advertising and sales staff and that its demise would leave a very large gap. Please consider not stopping the Micro-8 newsletter after issue #12.

Sy Lieberman

August 23

Micro-8 Computer User Group
Cabrillo Computer Center
4350 Constellation Road
Lompoc, CA

Dear Hal;

I received my first copy of BYTE yesterday and was very excited with the content. I think this is a great idea and was badly needed; however, I feel it is important that we do not let a comercial magazine supplant this consumer based information exchange. It is my intention to contribute to the NL every shred of semi-reliable information that I come across.

In that regard, I have received and built the Processor Technology 3P+S I/O board, which should be of interest to all Altair owners. I can think of nothing but superlatives in describing the quality and packaging of the components in this kit. The delivery was a little over a week behind schedule which represents an astounding improvement over the other suppliers I have dealt with. The construction was fairly simple despite some contradiction concerning the orientation of IC 5(the directions and component layout chart are correct, the schematic and pc board are wrong). The completed board has two parellel I/O ports, one control port for talking to the UART, setting flags, software control of baud rate, and controlling peripheral drivers, and one port connected to the transmitt and receive sections of the UART. As you can see, it is a very versatile addition which replaces three I/O boards from a company which shall remain nameless, and all for $125.

There was one area which could be improved upon as regards this product. Suprisingly enough for a firm which advertises free software, there was almost no advice on the possible software options in processing data which moves to and from this device, especially in the area of software control of the UART and using the various flags available. Also, where provision is made for the addition of vectored interrupt capability, there was no mention of pulling PINT low to cause a RESTART 70. I was informed that additional instructions would be following shortly, but I have not received them yet so I can Make no comment on how far they go towards solving these problems.

Another valuable service of the NL is as a communications device between users, and I would like to avail myself of that service to put forth the following plea. I just found an RCA 70/752 video terminal in good working condition, and even though it is old, my Altair is just dying to talk to it. If anyone out there has any info or documentation on this terminal, I will be only too happy to reimburse for expenses you have in purchasing/ copying and mailing it to me. I would even appreciate ideas on where I might find such info.

Here's hoping we don't lose sight of the mutual benefit offered by interaction through the Micro-8 NL.

Sincerely,

Duane L. Gustavus
818 W. Hickory
Denton, Texas 76201

DON L. JACKSON (W7KGU)
P. O. Box 27514
Tempe, AZ 85282
(Telephone: 602-968-9850)

Dear Hal & John,

You wanted reader's reactions to NL volume 2 or not...I would like to see the NL continued for at least a while as long as it is still serving a purpose. I've subscribed to BYTE, but in a hobby field that is changing drastically almost daily, a NL can be the fastest way to disseminate info and rumors.

I would like to see the NL continue along its present lines of including all types of micro-processors. I have both an 8008 and a 6800 operational, and have reasonable expertese in both hardware and software.

Just a hint to pass along to anyone building a 6800 system... if you use the clock driver circuit suggested by Motorola and cannot get the MPQ-6842 quad transister package, try using 2N2222 and 2N2907 transistors. Most will work. (Received this advice straight from big-M) Quite a bit cheaper too!

Have an Intel 4004 system chips for sale if anyone interested. Only one available and very reasonalble. (4004, 4002, 4008, 4009 plus Intel manual) If interested, write for details.

Enclosed is a copy of a letter to Processor Technology, indicating my luck is not as good as other readers indicated in NL #9. Hope it was just a slip-up on their part, since we sure need reliable companies who deliver.

Sincerely,

Don

— COPY —

P. O. Box 27514
Tempe, AZ 85282
August 24, 1975

Processor Technology Co.
2465 - 4th Street
Berkeley, CA 94710

Gentlemen:

On July 22, 1975 I sent you my check #7519 in the amount of $3.00 for your software package #1. To date I have not received this software package #1, but I do have a cancelled check, indicating deposit by you to Crocker National Bank (0300 14376), and charging against my account by my bank on July 29.

As everyone else has praise for you (as indicated in the Micro-8 Users Newsletter), I give you the benefit of doubt at this time that you are not another fly-by-night outfit.

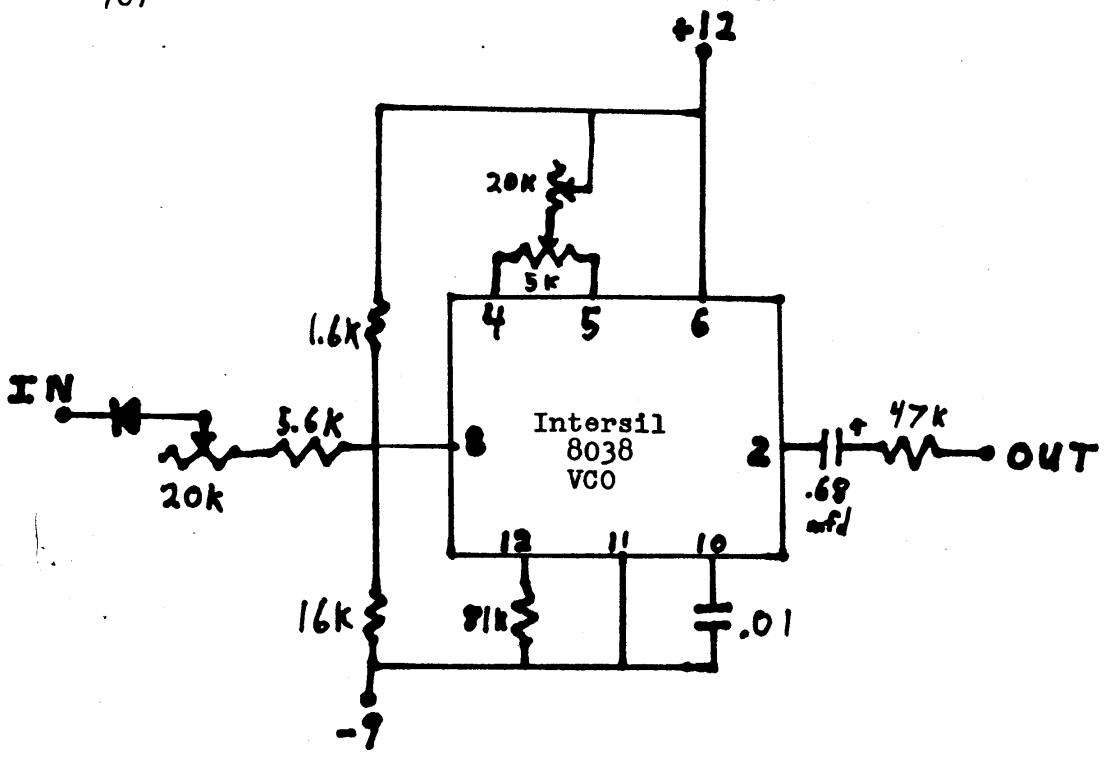
I am also extremely interested in further software, especially BASIC interpreters, and ROMs.

Won't you please check out my order, and if you haven't very recently sent me the software package, to please do so!!!

Sincerely,

Don L. Jackson

Bill Ames, 3804 Miami Road, Cincinnati, Ohio 45227 (513) 272-0884 sent us the following circuit for replacing Suding's triangle wave VCO with a sine wave. He is working on a cursor board for the TVT-II and will send details when completed, and comments that the TVT-II has a parallel load option for the cursor which should allow placing it at any position on the screen quickly and he hopes to work on this soon. He also has LIFE programmed and will send listings soon. (See Scientific American, Oct. 70)



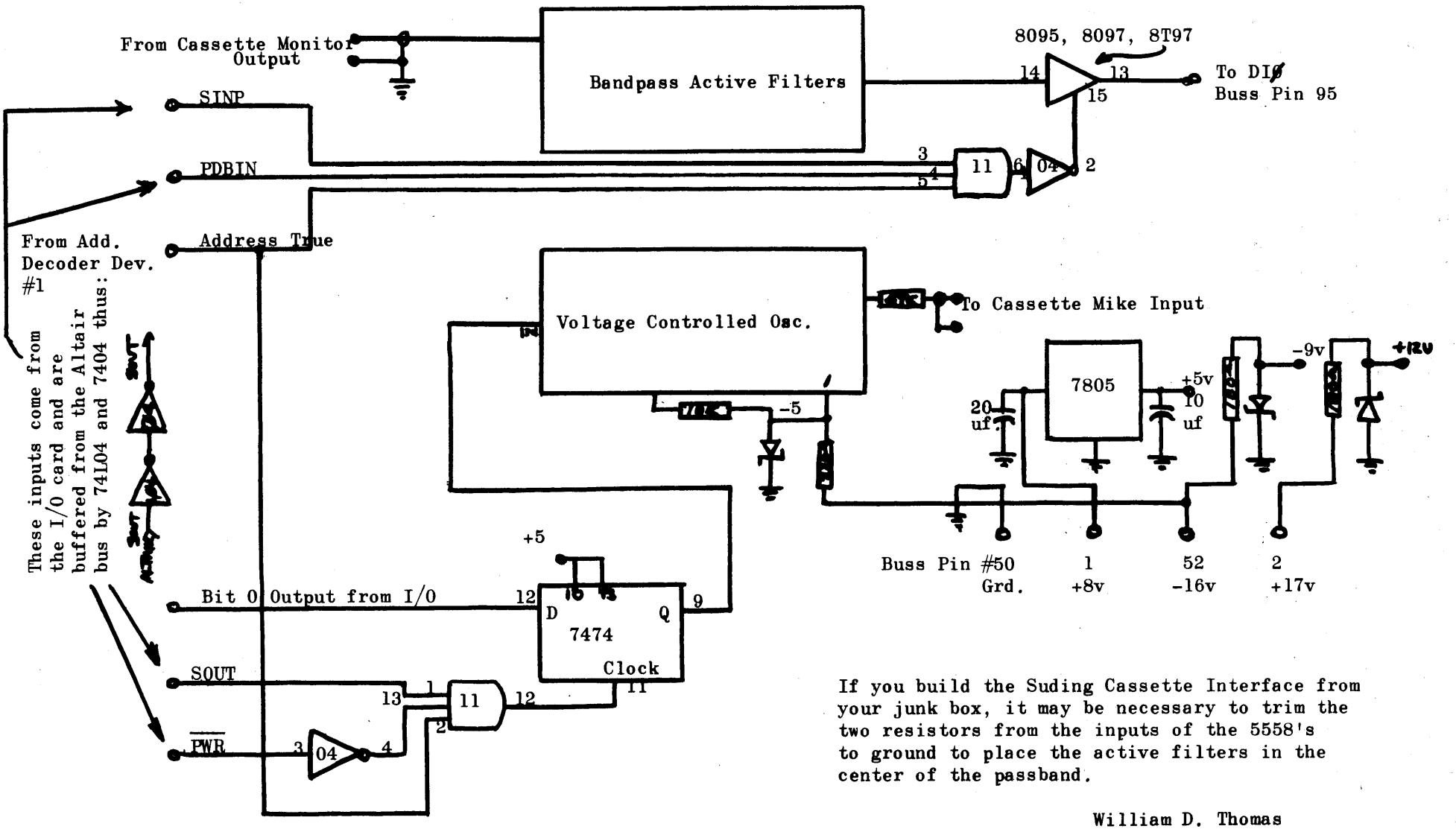
CASSETTE INTERFACE VCO, similar to DR. Suding's, except output of this circuit is a sine wave, instead of Suding's triangle wave. (See NL Vol. 1, #5, p. A-7) Tune up is same, except first adjust pot between pins 4 and 5 for best sine wave (50% duty cycle)

Larry Pleskac, 938 Paula Street, Escondido, CA 92027 writes the following: "More comments on BASIC. I have followed the same steps Terry Ritter has regarding 8008 BASIC. The NTIS report is the same report you can get from IEEE. Following my own advice in my last letter, I wrote to Processor Technology and the Digital Group regarding BASIC. Only the Digital Group replied with "Several of our people are working very hard on a BASIC for the 8008, but it will be some time before its available. The major problem is obtaining enough I/O at a reasonable cost to the hobbyist: We think we have it licked, but the devices are not yet in our hands, so there will be some significant delay." I encourage every 8008 user interested in a BASIC to write the Digital Group. We should form a committee to go after BASIC for the 8008. There must be enough talent in the group so we could start getting software routines in the newsletter. Let's all work on it. The calculator interface should be an excellent starting point. It's unfortunate that the Digital Group choose Mini Micro Mart to handle the unit. Finally, the SWTP keyboard. I haven't seen one good word printed about it. Well, here goes. First--people who buy inexpensive kits should be smart enough not to expect a Heathkit. Second--surplus is fin but what about delivery time. My keyboard is very satisfactory for the price. I use a simple delay circuit to get by the "1".

WILLIAM D. THOMAS
3112 LOIS PLACE
HIGHLAND, IN 46322
PHONE: 838-4454

ALTAIR 8800 LOGIC INTERFACE TO DR. SUDING CASSETTE

Designed to be used with W. Thomas' I/O Scheme
Controlling Software available from
THE DIGITAL GROUP



If you build the Suding Cassette Interface from your junk box, it may be necessary to trim the two resistors from the inputs of the 5558's to ground to place the active filters in the center of the passband.

William D. Thomas
Aug. 3, 1975

WILLIAM E. SEVERANCE, JR.

TELEPHONE
207 925-2271

MAIN STREET
CENTER LOVELL, MAINE 04016

August 2, 1975

Dear Hal or John,

After much procrastination and occupation with hardware, I've finally returned to my element - writing software. TEXTED, my 8008 based text editor program (with an extreme flavoring of DEC's TECO) is beginning to take shape. Presently, it is possible to type in commands, use rubouts to successively delete characters, a Control U to delete back to the beginning of the line, a double control G to delete the entire command, and an altmode to terminate the command. Flow charting has been roughed out for the various command handling routines and many general purpose subroutines have been written. I'll keep at it, but it may take a while to finish. The command decoder will be character dispatch table driven so that one may easily add commands in the future or eliminate present ones to reduce memory requirements. As to memory, I'm aiming for a 4k program segment with text buffers, etc. filling out the remainder of available memory.

In writing this program, one which I hope every 8008 owner will desire, the problem of standards rears its ugly head. The following questions arise:

1) I/O will be kept to subroutines so these may be easily changed to fit individual systems. However, certain hardware requirements are a must. Namely a hardware push down stack. I started writing TEXTED without one, then decided that for the few $$ involved, it would be a lot easier and efficient to build one. Presently, I'm using The Computer Hobbyist's design modified to my I/O structure. But, what about other users? I've purposely avoided using my nice priority interrupt system since most users won't have one.

2) Mass storage is the big problem. TEXTED commands are planned to dump selected portions of the text buffer to cassette tape, to yank in text initially from tape, etc. I'm using the Sudding Tape Interface with a UART. However, I guess I'd better write software that does its own serial-parallel conversions to be in step with others. Also, I prefer a blocked data format on tape rather than an unformatted one. What do I do to keep every one happy? And, if I had a PHi Deck, as some others may, just imagine the additional commands I'd want to implement!

3) Once TEXTED is written and debugged, what is be best way to distribute it? Although my Sudding Tape Interface works beautifully with my system, it has not been possible for me to read the tape sent out by the Digital Group, perhaps due to timing and tuning differences. Won't the same be true for others if I try to distribute tapes?

4) The DEC System 10 monitor automatically generated a carriage return-line feed sequence (two characters) at the end of each TTY line. Should I write software under this assumption or meerly end each line with a carriage return (or be general)?

5) An so on and on. I'd be interested in receiving comments on conventions for TEXTED.

In the mean time, I'm enclosing several of the general purpose subroutines I've written for TEXTED and which may be of use to the group. All of these assume that a hardware pushdown stack is available (with a PUSH being the appropriate OUT instruction and a POP being the appropriate IN instruction). They can be written, of course, without one, but much of the convenience is lost. These have been thoroughly tested and should work well, by the way.

Enough for now! I'm looking forward to the next newsletter.

Sincerely,

Bill

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;MULTIPLE PRECISION ADDITION ROUTINE - ADDS CONTENTS OF D,,E
;REGISTERS TO H,,L REGISTERS.  ENTER AT SADD FOR SINGLE PRECISION
;ADD TO H,,L.

SADD:  LDI Ø            ;CLEAR D FOR SINGLE PRECISION
DADD:  PUSH             ;SAVE A ON HARDWARE STACK
       LAL              ;ADD E TO L
       ADE
       LLA
       LAH              ;ADD D TO H WITH CARRY
       ACD
       LHA
       POP              ;RESTORE A FROM HARDWARE STACK
       RET              ;AND RETURN

;MULTIPLE PRECISION SUBTRACTION ROUTINE - SUBTRACTS CONTENTS OF D,,E
;REGISTERS FROM H,,L REGISTERS.  ENTER AT SSUB FOR SINGLE PRECISION
;SUBTRACT FROM H,,L.

SSUB:  LDI Ø
DSUB:  PUSH
       LAL              ;SUBTRACT E FROM L
       SUE
       LLA
       LAH              ;SUBTRACT D FROM H WITH BORROW
       SBD
       LHA
       POP
       RET

;ROUTINE TO EXCHANGE CONTENTS OF D,,E AND H,,L REGISTER PAIRS

EXCR:  PUSH
       LAL              ;EXCHANGE L AND E
       LLE
       LEA
       LAH              ;EXCHANGE H AND D
       LHD
       LDA
       POP
       RET

;ROUTINE TO INCREMENT H,,L REGISTER PAIR

INCHL: INL
       RFZ              ;NEED TO INCREMENT H TOO?
       INH
       RET
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;ROUTINE TO DECREMENT H,,L REGISTER PAIR

DECHL: DCL
       INL
       JFZ DECHL1       ;ZERO SET IF L WAS ZERO
       DCH
DECHL1:DCL
       RET

;ROUTINE TO ROTATE CONTENTS OF D,,E REGISTER PAIR RIGHT INTO THE
;CARRY.  ENTER AT DRARCC TO INITIALLY CLEAR CARRY.

DRARCC:NDA              ;CLEAR CARRY
DRAR:  PUSH
       LAD              ;ROTATE D RIGHT INTO CARRY
       RAR
       LDA
       LAE              ;ROTATE E RIGHT INTO CARRY
       RAR
       LEA
       POP
       RET

;ROUTINE TO ROTATE CONTENTS OF D,,E REGISTER PAIR LEFT INTO THE
;CARRY.  ENTER AT DRALCC TO INITIALLY CLEAR CARRY.

DRALCC:NDA              ;CLEAR CARRY
DRAL:  PUSH
       LAE              ;ROTATE E LEFT INTO CARRY
       RAL
       LEA
       LAD              ;ROTATE D LEFT INTO CARRY
       RAL
       LDA
       POP
       RET

;ROUTINE TO COMPLEMENT (2'S) CONTENTS OF D,,E REGISTER PAIR.

DCOMP: PUSH
       XRA              ;CLEAR A
       SUE              ;SUBTRACT E FROM A=0
       LEA
       LAI Ø            ;CLEAR A (BUT DON'T DAMAGE BORROW!)
       SBD              ;SUBTRACT D FROM A=0 WITH BORROW
       LDA
       POP
       RET

;ROUTINE TO INCREMENT CONTENTS OF COUNTER IN MEMORY.  FIRST SET UP
;H,,L TO POINT TO COUNTER.  ON RETURN, C CONTAINS INCREMENTED COUNTER.

INCCNT:LCM
       INC
       LMC
       RET

;ROUTINE TO DECREMENT CONTENTS OF COUNTER IN MEMORY.  FIRST SET UP
;H,,L TO POINT TO COUNTER.  ON RETURN, C CONTAINS DECREMENTED COUNTER.

DECCNT:LCM
       DCC
       LMC
       RET
```

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;MULTIPLE PRECISION UNSIGNED MULTIPLICATION ROUTINE - MULTIPLIES
;CONTENTS OF H,,L REGISTERS BY CONTENTS OF C REGISTER.  ON RETURN,
;H,,L CONTAIN DOUBLE PRECISION PRODUCT.  ALL OTHER REGISTERS INCLUDING
;C ARE UNAFFECTED AS IS THE CARRY FLAG. FALSE ZERO FLAG IF OVERFLOW,
;ELSE TRUE.

DMUL:   PUSH            ;SAVE A
        LAB             ;SAVE B
        PUSH
        LAD             ;SAVE D
        PUSH
        LAE             ;SAVE E
        PUSH
        LBI ↑D9         ;COUNT 9 (DECIMAL) BITS
        LAI Ø           ;CLEAR A BUT WATCH CARRY
        LDH             ;TRANSFER H,,L MULTIPLICAND TO WORKING REGS
        LEL
        LHA             ;CLEAR H,,L PRODUCT REGISTERS
        LLA
DMUL1:  LAC             ;ROTATE A BIT OF MULTIPLIER INTO CARRY
        RAR
        LCA
        DCB             ;DECREMENT BIT COUNTER
        JTZ DMUL3       ;DONE?
        CTC DADD        ;IF LSB OF MULTIPLIER WAS 1, THEN H,,L=D,,E+H,,L
        JTC DMUL2       ;OVERFLOW?
        CAL DRALCC      ;SCALE MULTIPLICAND IN D,,E
        JMP DMUL1       ;AND CONTINUE
DMUL2:  LAC             ;PATCH UP C REGISTER AND CARRY IF OVERFLOW
        RAR
        LCA
        DCB
        JFZ DMUL2
        INB             ;SET ZERO FLAG FALSE TO NOTE OVERFLOW
DMUL3:  POP             ;RESTORE E
        LEA
        POP             ;RESTORE D
        LDA
        POP             ;RESTORE B
        LBA
        POP             ;RESTORE A
        RET             ;RETURN (FINALLY!!!)

;MULTIPLE PRECISION UNSIGNED INTEGER DIVISION ROUTINE - DIVIDES
;CONTENTS OF H,,L REGISTERS BY CONTENTS OF C REGISTER.  ON RETURN,
;H,,L CONTAIN DOUBLE PRECISION QUOTIENT AND E THE SINGLE PRECISION
;REMAINDER.  ALL OTHER REGISTERS INCLUDING C ARE UNAFFECTED AS IS
;THE CARRY FLAG.  DON'T TRY TO DIVIDE BY ZERO!

DDIV:   PUSH            ;SAVE A
        LAB             ;SAVE B
        PUSH
        LAD             ;SAVE D
        PUSH
        LBI ↑D17        ;COUNT 17 (DECIMAL) BITS
        LAI Ø           ;CLEAR A BUT WATCH CARRY
DDIV1:  LEA
DDIV2:  CAL EXCR        ;ROTATE DIVIDEND-QUOTIENT REGISTERS LEFT
        CAL DRAL        ;INTO THE CARRY
        CAL EXCR
        DCB             ;DECREMENT BIT COUNTER
        JTZ DDIV3       ;DONE?
        LAE             ;ROTATE WORKING DIVIDEND EXTENSION REG. LEFT
        RAL
        LEA
```

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        SUC             ;TRY TO SUBTRACT DIVISOR
        RAL             ;ROTATE CARRY INTO BIT 0
        XRI 1           ;COMPLEMENT IT
        RAR             ;AND ROTATE IT BACK INTO CARRY
        JTC DDIV1       ;SUBTRACTION OK-KEEP RESULT
        JMP DDIV2       ;SUBTRACTED TOO MUCH-DO NOT KEEP RESULT
DDIV3:  POP             ;RESTORE D
        LDA
        POP             ;RESTORE B
        LBA
        POP             ;RESTORE A
        RET             ;RETURN (SEE HOW EASY DIVISION CAN BE!)

;RADIX PRINT ROUTINES - ENTER AT OCTOUT TO PRINT CONTENTS OF H,,L
;REGISTERS AS AN OCTAL INTEGER OR AT DECOUT TO PRINT AS DECIMAL
;INTEGER (BOTH UNSIGNED).  ON RETURN REGISTERS A-E ARE UNAFFECTED,
;H,,L CONTAIN ZERO.

OCTOUT:PUSH             ;SAVE A
        LAC             ;SAVE C
        PUSH
        LCI ↑D8         ;LOAD RADIX 8 (DECIMAL)
        JMP OUT
DECOUT:PUSH             ;SAVE A
        LAC             ;SAVE C
        PUSH
        LCI ↑D10        ;LOAD RADIX 10 (DECIMAL)
OUT:    LAE             ;SAVE E
        PUSH
        LAI -1          ;MARK BASE OF STACK
        PUSH
OUT1:   CAL DDIV        ;DIVIDE SUCCESSIVELY BY RADIX
        LAE             ;PUSH REMAINDER ONTO STACK
        PUSH
        CAL TSTØ        ;ARE H,,L ZERO?
        JFZ OUT1        ;NOPE-SO CONTINUE
OUT2:   POP             ;POP A REMAINDER FROM STACK
        CPI -1          ;AT BOTTOM OF STACK?
        JTZ OUT3        ;YES-CLEAN UP AND WE'LL BE DONE
        CAL DIGOUT      ;NO-PRINT THE DIGIT (USER DEFINED ROUTINE)
        JMP OUT2        ;AND GO BACK FOR MORE
OUT3:   POP             ;RESTORE E
        LEA
        POP             ;RESTORE C
        LCA
        POP             ;RESTORE A
        RET             ;RETURN FROM THIS MADNESS

TSTØ:   XRA             ;CLEAR A
        CPH             ;H=0?
        RFZ             ;NOPE DON'T BOTHER WITH L
        CPL             ;L=0?
        RET

;ROUTINE TO CLEAR CONTENTS OF MEMORY BLOCK FROM (H,,L) UP TO BUT
;NOT INCLUDING (D,,E).  ON RETURN, H=D AND L=E.  OTHER REGISTERS
;ARE UNAFFECTED.

CLRMEM:PUSH             ;SAVE A
CLRM1:  LAH             ;TEST H-D
        CPD
        JTC CLRM2       ;TRUE CARRY IF D H
        LAL             ;TEST L-E
        CPE
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        JFC CLRM3       ;CARRY FALSE IF E L
CLRM2:  XRA             ;CLEAR A
        LMA             ;LOAD MEMORY WITH ZERO
        CAL INCHL       ;ADVANCE ADDRESS
        JMP CLRM1       ;AND DO IT AGAIN

CLRM3:  POP             ;RESTORE A
        RET             ;THAT'S ALL FOLKS

;ROUTINE TO RETRIEVE A BYTE FROM THE MEMORY LOCATION SPECIFIED BY
;THE TWO WORD (HIGH ADR 1ST-LOW ADR 2ND) POINTER CONTAINED IN
;MEMORY AND REFERENCED BY H,,L REGISTER PAIR.  ON RETURN, A CONTAINS
;THE BYTE, D,,E PAIR POINT TO THAT BYTE IN MEMORY, AND H,,L PAIR
;ARE UNAFFECTED.

LDB:    CAL PNTGET      ;FETCH POINTER TO H AND L
        LAM             ;RETRIEVE THE BYTE
        JMP PNTPT1      ;FIX UP ADDRESS REGISTERS AND RETURN

;ROUTINE TO DEPOSIT BYTE IN A INTO THE MEMORY LOCATION SPECIFIED BY
;THE TWO WORD POINTER CONTAINED IN MEMORY AND REFERENCED BY H,,L
;REGISTER PAIR.  ON RETURN, A IS UNAFFECTED, D,,E PAIR POINT TO
;THAT BYTE IN MEMORY, AND H,,L PAIR ARE UNAFFECTED.

DPB:    CAL PNTGET
        LMA             ;DEPOSIT THE BYTE
        JMP PNTPT1

;ROUTINE TO INCREMENT THE TWO WORD POINTER CONTAINED IN MEMORY AND
;REFERENCED BY H,,L REGISTER PAIR. ON RETURN, D,,E PAIR CONTAIN
;THE INCREMENTED POINTER, AND H,,L PAIR ARE UNAFFECTED.

IBP:    CAL PNTGET
        CAL INCHL       ;INCREMENT THE POINTER
        JMP PNTPT1

;ROUTINE TO FIRST INCREMENT THE TWO WORD POINTER CONTAINED IN
;MEMORY AND REFERENCED BY H,,L REGISTER PAIR THEN RETRIEVE A BYTE
;FROM THE MEMORY LOCATION SPECIFIED BY THE INCREMENTED POINTER. ON
;RETURN, A CONTAINS THE BYTE, D,,E PAIR POINT TO THAT BYTE IN MEMORY,
;AND H,,L PAIR ARE UNAFFECTED.

ILDB:   CAL PNTGET      ;FETCH POINTER TO H AND L
        CAL INCHL       ;INCREMENT THE POINTER (NOTE INCREMENTS FIRST)
        LAM             ;RETRIEVE THE BYTE
        JMP PNTPT1      ;FIX UP ADDRESS REGISTERS AND RETURN

;ROUTINE TO FIRST INCREMENT THE TWO WORD POINTER CONTAINED IN
;MEMORY AND REFERENCED BY H,,L REGISTER PAIR THEN DEPOSIT BYTE IN
;A INTO THE MEMORY LOCATION SPECIFIED BY THE INCREMENTED POINTER.
;ON RETURN, A IS UNAFFECTED, D,,E PAIR POINT TO THAT BYTE IN MEMORY,
;AND H,,L PAIR ARE UNAFFECTED.

IDPB:   CAL PNTGET
        CAL INCHL
        LMA
        JMP PNTPT1
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;ROUTINE TO FETCH THE TWO WORD POINTER REFERENCED BY H,,L REGISTER
;PAIR.  ON RETURN, H,,L CONTAIN THE POINTER AND D,,E PAIR REFERENCE
;THE LOW (2ND) WORD OF THE POINTER.

PNTGET:LDM              ;GET HIGH WORD OF POINTER
       CAL INCHL        ;GET LOW WORD OF POINTER
       LEM
       JMP EXCR         ;EXCHANGE CONTENTS OF D,,E AND H,,L REGISTER
                        ;PAIRS AND RETURN

;ROUTINE TO PLACE A TWO WORD POINTER CONTAINED IN H,,L REGISTER
;PAIR INTO THE TWO MEMORY LOCATIONS, THE SECOND OF WHICH IS
;REFERENCED BY D,,E REGISTER PAIR. ENTER AT PNTPUT IF H,,L AND
;D,,E PAIRS ARE REVERSED.  ON RETURN, D,,E PAIR CONTAINS THE POINTER
;AND H,,L PAIR REFERENCES THE FIRST WORD OF THE TWO WORD POINTER.

PNTPT1:CAL EXCR         ;EXCHANGE D,,E AND H,,L REGISTER PAIRS
PNTPUT:LME              ;STORE HIGH WORD OF POINTER
       CAL DECHL        ;STORE LOW WORD OF POINTER
       LMD
       RET

;ROUTINE TO SET SPECIFIED BITS OF A FLAG WORD IN MEMORY REFERENCED
;BY H,,L REGISTER PAIR.  ON RETURN, ZERO IS TRUE IF SPECIFIED BITS
;WERE ALREADY SET. REGISTER A CONTAINS THE NEW FLAG WORD.

;CALLING SEQUENCE:
;      LHI H(FLAG)       ---SET UP REFERENCE TO FLAG WORD
;      LLI L(FLAG)
;      LAI MASK          ---MASK CONTAINS 1's IN SPECIFIED BITS
;      CAL SETFLG

SETFLG:ORM              ;INCLUSIVE OR MASK AND FLAG WORD
       CPM              ;COMPARE WITH OLD FLAG WORD
       LMA              ;STORE NEW FLAG WORD
       RET

;ROUTINE TO CLEAR SPECIFIED BITS OF A FLAG WORD IN MEMORY REFERENCED
;BY H,,L REGISTER PAIR.  ON RETURN, ZERO IS TRUE IF SPECIFIED BITS
;WERE ALREADY CLEAR.  SEE SETFLG FOR SIMILAR CALLING SEQUENCE.

CLRFLG:XRI 377          ;COMPLEMENT MASK
       NDM              ;AND MASK AND FLAG WORD
       CPM              ;COMPARE WITH OLD FLAG WORD
       LMA              ;STORE NEW FLAG WORD
       RET
```

M. Douglas Callihan, Berkley St. RFD #1, Berkley, MA says that he is just about ready to buy the ALTAIR 8800 as he is particularly interested in uses of the 8080. He has a pair of Phi-decks and his ideas on utilizing them were included in one of the last newsletters. His hope is for a cassette data standard so that software can be exchanged with some degree of compatibility. He is interested in hearing from anybody in South Eastern Mass. who has a system up and running.

Mark Crook, 3 Bel Aire Road, Delmont, Pa 15626 ordered a Mark-8 because it has the bugs worked out and a lot of software is available. He intends to use the Suding modifications. Mark's reason for building a computer include curiosity, and applications such as automating his checkbook and income tax, and a little mutual fund analysis. He would like to teach the beast to inventory groceries and print out a shopping list with the theory that if he can save his wife some time, she'll be more enthusiastic. He thinks that a lot of work should be in this direction.

Michael Christoffer, 4139 12th NE #400, Seattle, WA 98105 says that he received a letter from Bob Albrecht at PCC and only two people has shown any interest in the "build your own BASIC" article (volume 3, #4, PCC Newspaper). The project has apparently been dropped due to lack of interest. This lack of interest should not be tolerated. The ability to develop a high level language with less than 4k of memory is a necessity for the unsupported avocational microcomputer builders if their wives and children are expected to become users. It is understandable that many are having hardware and peripheral problems at the present time. However, high level language development for limited memory systems must be the next order of business. Everyone interested in this near dead project should forward a letter indicating so to PCC. This is of importance to the future of 8008 users!!!!!

REVIEW . . .

THE SCIENTIFIC CALCULATOR INTERFACE

by "Tex" Ritter

Imagine! It finally arrived! The Mini Micro Mart scientific calculator interface kit. Never mind that the thing costs $69.95. Never mind that it took five weeks to fill the order. Bet you can hardly wait 'till I open 'er up . . . Well, SURPRISE, because it's a replay of the Mark-8 boards.

Details? Sure -- just like the Mark-8, the calculator interface board is double-sided, but not plated-through. And just like the Mark-8, IC connections are sometimes made from the top, sometimes from the bottom of the board. This means that any plastic-cased socket you use must be raised above the board to allow soldering to both top-side and bottom-side connections. Further, the IC pads were cleverly laid out with small runs between each pad, so plain Molex pins can't be used either.

Yes, some IC devices really do go bad during operation. And if the IC's are not in sockets, the system can't be checked by substitution. Now, to avoid destroying the board, you chop all the leads off of the IC body, so they can be removed from the board one-by-one; now the IC can't be checked.

This problem was one of the main difficulties in working on the Mark-8, and should have been left behind by now. Since Space Circuits seems to make a profit on similar-sized plated-through boards @ $13 (plus postage and handling) it's a shame this wasn't. I finally soldered in Molex pins (with nests) and duplicated all top-of-the-board connections on the bottom with individual wires -- what a hassle.

The Mini Micro Mart literature indicates that the $69.95 price should include software. Twelve weeks after this order, I have yet to receive this software. Perhaps more amusing is the letter received with the kit. Among other things, they found that under-rated components might have been substituted for two of the resistors (sure enough, they were!), and the lucky kit owner is simply supposed to request replacements. In this way, the cost of checking the individual kits was placed on the consumer.

The kit included no instructions, but only a component layout, which was probably sufficient. One 2k resistor was missing, but I had a replacement. Unfortunately, the board was cut inaccurately, so that it may be improperly inserted into an edge-connector such that adjacent pins are shorted.

I have yet to run the thing -- it may even work.

TEX'S TOPICS

by Terry F. Ritter
2524B Glen Springs Way
Austin, TX 78741

8008 BASIC -- Well, almost . . .

With assistance from Edward Byrne (Naperville, Illinois) we seem to have cracked "The Case of the Two BASICs." It seems that the National Technical Information Service (NTIS, U.S. Dept. of Commerce, 5285 Port Royal Rd., Springfield, VA 22151) document PB-235 874 "A Basic Language Interpreter for the Intel 8008 Microprocessor," by Weaver, Tindell, and Danielson @ $3.75 is exactly the IEEE report R75-20 @ $5.20. Neither, of course, include any listings, and so make rather dull reading by themselves, but are great guides to the actual system.

This system was apparently developed on an IBM 360 (using an 8008 simulator program) as part of a seminar course on minicomputers, and has probably not been implemented on an actual 8008. In particular, the (copyrighted) Datapoint 2200 Floating Point Package and transcendentals were used, but not listed (this package may require a hardware stack for PUSH/POP instructions as in the Datapoint). Alternately, the Scientific Calculator interface might be used if the floating-point format internal to the BASIC is modified. As written, the system uses 16k of memory -- it's my feeling that the system is just not very efficient, but Ed points out that it may be possible to partition the program into overlays that could be brought in from tape as needed.

I have about 72 pages of (assembler) source code, and 40 pages of simulation tests (with one error). I don't think many of you will want to play with this thing, but it is now availiable, and a suitable distribution mode can be worked out. In particular, you might send a BIG, heavy-duty self-addressed envelope, about a dollar in stamps (I'll go so far as to put on what it needs), a twenty-dollar check for guarantee of safe return, and you get to keep the package for a week. If you return it, you get your check back. If not, of course, I'll get very angry. Alternately, Hal may want to supervise distribution.

Speaking of Tape . . .

There has certainly been a lot of bruhaha (try THAT quickly three times) in the last six months or so about tape storage of data. First came the FSK systems, of which the 375 baud Suding system is now dominant (The Digital Group's software strategies serve to enforce this standard). The Computer Hobbyiest has a fairly nice pulse system that is much less-dependent upon tape speed-accuracy, but is still limited to about 500 baud, max. But there has been very little notice of the Don Tarbell system, which stores bi-phase data at 1.5k baud. (I got his info package for $2.50 12/15/74: Don Tarbell, 144 Miraleste Dr., Apt. 106, Miraleste, CA 90732).

The slower storage systems rely on software for parallel to serial to parallel conversions, but if the 8008 is not fast enough for the Tarbell system, hardware may be necessary. On the other hand, the 8080 is probably fast enough to simplify the interface, and faster tape systems are coming . . .

Put ROM In High-Memory!

When I first developed my ROM Mini-Executive, I decided to place it just above my 1k memory, i.e., starting at 04 000. Now that I've decided to add more memory, the obvious question is "Where do I put it?" If the new memory is placed after the ROM segment, RAM will be broken into two seperate blocks, which is very undesirable (especially when loading programs from tape). In any other case, the ROM must be re-addressed and re-programmed. Since most software-on-tape is designed to load into low memory (using the RESTART locations), this area should be RAM. Save yourself my problem -- put your ROM's and library routines in high memory. Now RAM can be contiguously enlarged until it encroaches on the ROM library.

The Modular Computer

The computer hobby is going to be around awhile, and lots of experimenters and small companies are going to be improving and expanding small systems. Consequently, a manufacturer could gain a good reputation in this hobby, and a whole industry, by introducing a complete modular system of PC boards and support designs for the small-computer user. The Modular Computer is something like this:

The Modular Computer should be composed of circuit boards in a solid, easily-expandable card-cage. Each card should be sold drilled and plated-thru, availiable populated or bare, and include a card-puller lever for easy extraction. Each card in the modular computer should contain one complete logical system, and should not need signals from other cards (other than the CPU) in order to operate. The backplane should be fully parallel, so that each card slot could accomodate any card (this would facilitate board-testing via a cable-extended socket).

Connections to external devices (data I/O, interrupts, etc.), could be made on the boards proper via DIP plugs; the wires could then be brought out the front of the card cage between the cards. In this way it should be possible to place eight input or output ports on one card, maximizing the use of board real-estate, while eliminating backplane pin-limitations.

I/O and memory boards should be designed with DIP-switch selectable addressing on each card; this would facilitate installation and substitution (in case of trouble). Every attempt should be made to make ROM essentially interchangable with RAM to facilitate the development of programs in RAM, and their transfer to EROM for use.

Each peripheral device on a card would be designed to function wholly on that card; any needed input or output ports would be included (with selection circuitry) on that board.

A front panel is generally used to gain control of the CPU for system hardware tests. A full-scale unit could be implemented, extended by cable, and simply plugged into the bus like any other card; alternately a mini unit could be designed on one card-edge alone. The system must allow the bus to be extended three feet or so (via line-drivers, buffers, or equipment as necessary) to allow table-top troubleshooting of any card (including the CPU). The basic system should allow the use of any known 8-bit chip by simply plugging in a different CPU board.

Brion Johnson, 1423 Alta Vista Road, Santa Barbara. CA 93103

Using a 555 as a touch switch.

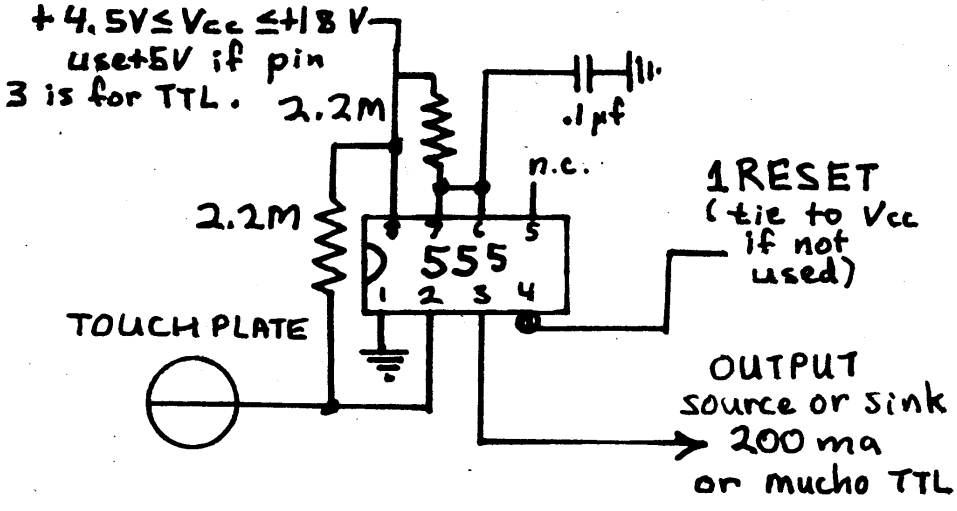
Using the hookup shown below, the handy 555 timer/oscillator becomes a touch switch, with input from a human on one side, and output compatible with TTL on the other. The 555 is used in its monostable mode with the timeout being about a second, depending of course on the tolerance of R2 and C1. When a human finger touches the touch plate, the trigger pin of the 555 (pin 2) picks up the induced 60HZ field from the building's AC line wiring. Although the current of this AC is very low, it is sufficient to trigger the high impedance input of the 555. The monostable delay of 1 second is sufficient to debounce the input and presents a beautiful fast-risetime pulse at pin 3 which is capable of sinking or sourcing 200 milliamps and is TTL compatible. To make a momentary action switch use pin 3 directly. To make an alternate action (touch on, touch off) switch, run pin 3 to the clock input of a j-k flipflop which has both J and K inputs high, and the flipflop will toggle everytime the touch plate is touched.

In addition, if the touch plate is touched and held, the 555 will oscillate at a frequency near its timeout rate. This is useful for such operations as examining memory, etc. Note that the circuit in this mode is not completely reliable, Ocassionally double or trible pulses may get thru as the 555 is not guaranteed for a 100% duty cycle.

Layout is not too critical, although the RC circuit is a little sensitive to noise. Make the touch plate leads as short as possible. A piece of aluminum screen makes a beautiful touch plate.

I have used this circuit for all of the front panel controls for MINAC II (see newsletter #7) and am quite pleased with the speed and smoothness of operation.

(I have seen and used this setup and it is great. You'll just have to breadboard the circuit. You'll think of a million uses for it once you see it work. Hal)



A. J. Keck, 250 Carriage Road, Winnipeg, Manitoba, Canada R2Y 0M2 888-8409 has an ALTAIR 8800.

C. A. Southard, WAØIOT, 2519 Meadowbrook Drive SE, Cedar Rapids, Iowa 52403 has a 4K SCELBI system running now.

James H. Edwards, 6631 Wakefield Drive, Apt. 209, Alexandria, VA 22307 built the ALTAIR kit but dosen't have it debugged as yet. He plans to use it with a TVT-1 and a surplus keyboard with potential future projects including games and music synthesis. He wants to get the BASIC but just can't see paying the MITS prices for memory and I/O just to get the software they offer. Any other suggestions?

Joel Granick, 922 Eden Avenue, Highland Park, NJ 08904 has purchased an ALTAIR 8800 but is disturbed by the outragious price of MITS peripherals. His immediate needs are to obtain more memory, construct an I/O device (probably a TV terminal), and obtain a software system. He wants to know if anyone is in the process of putting software for 8080 systems on mask programmed ROM's?

Alan Smith, RR #1, DeGraff, MN 56233 purchased the Scelbi-8H unpopulated PC boards and obtained parts and assembled it. He designed and built an octal keyboard and a TVT and is now in the process of debugging a Modem using wire wrap. He says the Texas Instrument Microprocessor TV series was a good introduction to microprocessors but the $25 book is not worth that much now.

P. Reece, PO Box 939, Waterdown, Ontario, Canada LOR 2Ho is interested in PDP-8 cross assemblers and simulators for 8008's. They have 15 PDP-8's (s, I, & E), a CDC-6400, an HP-3000, & three HP-2100's where he works. The DEC machines are used exclusively for real time work in physiology and psychology. He is currently building an 8008 machine in an attempt to prove to the people he works with that computing power in real time can be augmented greatly with intelligent half-way processors which are inexpensive, albeit slow.

James I. Garrett, Jr., 9523 LBJ Freeway, Apt. 204, Dallas, TX 75231 is interested in the ALTAIR 8800 and attended the MITS demonstration. This is his report: "The only thing that impressed me was the CPU. They <u>did not</u> have the disk, high speed printer, etc. up. However I do like it designwise. I'm a scientific programmer in geophysical research (high level languages only). The ALTAIR BASIC is SUPER!! I learned BASIC 4 years ago so I sat down at their terminal and whipped out a plotting routine and factorial program in about 10 minutes." He says that he would like to apply a microcomputer to a solar heated and cooled house along with a timesharing system for accounting, games, etc. He has some experience in electronics but is mostly interested in software. James is a physics major from Georgia State University in Atlanta and has access to a WATS line after 7 PM so can communicate with others rather inexpensively.

Chase Bockman, 4805 NE 52, Portland, Oregon 97218 is researching the concept of digitally controlling a sound reinforcement system thru the use of surplus 8008 microprocessors and associated chips. The system should be capable of transmitting 16 channels of multiplexed information from a remote analog to digital converter with memory to a microphone mixing console with voltage controlled gain blocks. His profession is sound reinforcement and he only has a limited knowledge of digital processes and applications. Chase would be gratefull for any assistance participants might offer in the form of practical circuit applications using surplus components.

THE "SPHERE SYSTEM PHILOSOPHY"

SPHERE Corp., 96 E. 500 So., Bountiful, Utah 84010

The SPHERE 1 computer system was designed to provide an uncompromising computer system at minimal cost.

The keyword to our design is the word "SYSTEM". Every phase of the design has been influenced by the "SYSTEM" philosophy. To justify the system title, a "COMPUTER" must perform an application acceptably. Recently the cost of peripherals and software have substantially exceeded the cost of the computer, but without them, a computer can not perform much of anything acceptably.

With the onset of the micro-processor, real design innovations have been possible, but without the system philosophy, a micro-processor can only reduce the processor cost. Peripherals, memory, and software continue to be expensive.

The SPHERE 1 computer is uniquely cost effective because it utilizes real design innovations to reduce the amount of circuitry required throughout the system. The SPHERE add-on memory board will support 4, 8, 12, or 16K of dynamic random access memory (instead of four 4K memory boards and a mother board). Our power supply has been placed in a separate chassis to eliminate a common source of heat. This allows the system to run cooler and eliminates the need for an expensive fan. The system uses a standard TV for a 512 character display. The use of the TV and other common components has reduced the cost and allowed more machine versatility. Further cost reductions have been achieved by replacing the front console (lights and switches) with the TV terminal and a program in Read Only Memory (ROM) that performs the same function, only better. The CPU card is packaged to provide all of the basic funtions required by a useful system, thereby eliminating unnecessary extra PC BOARDS.

In order to insure a full offering of high quality peripherals from the onset, we have selected manufacturers who already have peripherals which interface to our product. This philosophy has allowed us, in the case of our disk, to select already running software (namely a disk operating system) which we may offer to our users immediately. Other peripherals that are available with our system include a low cost line printer and a paper tape reader/perforator. These devices are interfaced to the system via a single interface module which also serves as a programmable digital Input/Output port. The SPHERE system also supports its own set of terminals, the lowest cost terminals available today.

The Program Development System (PDS) includes an EDITOR, and MINI ASSEMBLER, and a debugging package. It also includes CRT display and audio cassette software drivers, plus a cassette loader and dumper. Although most computer processing occurs at the character (8 BIT) level, it is sometimes desireable to use 16 bit arithmetic so we have provided an extended 16 bit instruction set in the PDS system. This package rounds out the "SYSTEM" concept for our smallest systems.

There are proponents of various computer languages everywhere. Each language is suited more or less to a specific group of applications. Although the advent of the micro-processor really dictates some new philosophies in computing language, the BASIC language seems to come closest to this philosophy. Because of its widespread use we have selected it to be our first computer language.

The FLOPPY DISK OPERATING SYSTEM (FDOS) is supplied on all systems purchased with a disk unit. FDOS is an extended PROGRAM DEVELOPMENT SYSTEM. It provides for named files, an extended editor, a full assembler, and debugging system. This system includes a comprehensive 300 page programming manual.

The software supplied to make the Sphere System a useful "SYSTEM" is attractive; however, the real contribution that SPHERE offers is one of commitment. The SPHERE "SYSTEM" concept demonstrates only the surface of the real technological advances that are possible when true design innovation is combined with foresight and state-of-the-art technology. The SPHERE "SYSTEM" concept is the commitment. Watch and see.

THE ONE CARD COMPUTER

The logical approach to the solution of any problem is to determine the minimum requirement for a satisfactory result. In the case of a small computer, an absolute minimum would include a reasonable amount of memory, a capable CPU, Input/Output capability, a real-time clock, read only memory program which if used in conjunction with a terminal can replace the computer's switch panel and display lights, and finally it ought to have a convenient Bus structure to easily attach other modules.

The SPHERE ONE CARD COMPUTER includes all of the above features plus a few that also deserve attention. Below each of the principal features are listed:

1) The CPU — The MOTOROLA 6800 microprocessor is the most advanced microprocessor available today. It reduces the necessity for support components and includes features not found on computers of many times the size. The IBM 370 for example will not store all of its registers automatically upon receipt of an interrupt as the 6800 will. The 6800 system resembles the architecture of the Digital PDP-11 in many ways. These include instructions that "PUSH" data onto a STACK temporarily and when temporary storage is no longer required the data may be "POPed" off of the stack. The 6800 doesn't have as many registers as the 8080; however the 6800 has several addressing modes which in most cases completely outweigh its lack of registers. These modes are particularly advantageous when tables are processed. However, when three or four counters are being incremented or decremented the 8080 is faster, but in either case the 6800 is easier to program.

2) Memory — This system uses the 2107A type 4K by 1 dynamic random access memory. This memory was used because it is the least expensive memory available and would lower the cost of the system. All refresh circuitry for the system is included on the CPU board.

3) I/O — If this board is used in a stand alone situation a CPU must communicate to the outside world. Therefore, the system is supplied with 16 programable I/O lines as an option. Four additional lines which may be used as programed interrupts are also supplied on the board.

4) Real-time clock — A stand alone process control system and many other systems require the capability of monitoring the progress of an activity. The SPHERE system has a real-time clock which will interrupt the system at a set interval. This interval is a function of the refresh clock which is set at 1 ms. The interrupt may occur at 1x, 2x, 4x, 8x, or 16x the refresh rate. The interval may also be set externally. The rate is determined by a wire strap.

5) EPROM — The Erasable Programmable Read Only Memory used by the system is the 1702 A. Programers for this EPROM are commonly available so that users may find programing the system for a stand alone application a reasonable task. When delivered with a SPHERE system the EPROM contains a Program Development System (PDS) which is described under "SOFTWARE".

6) BUS structure — The BUS is driven by tri-state TTL buffers which are capable of driving 35 standard TTL devices. The BUS is connected to this board via three 14 pin dual-in-line connectors which will transmit and receive information over 3 14 conductor flat ribbon cables. Eight data, 16 address, BUS and control lines are transmitted bidirectionally to and from the CPU, memory, and perephials. I/O devices, buffer, and status registers are addressed as memory locations at the top (HIGH ORDER LOCATIONS) of memory in much the same as the digital PDP-11. This means that about 35,000 devices could be attached to the system (theoretically). It also means that any machine instruction may operate on device buffer and status registers as they would to memory.

This limits the maximum memory on SPHERE systems to 56K instead of the theoretical 64K because the high order 8K is reserved for device status and buffer registers.

7) Power-on reset — When power is applied to this board, circuitry forces a reset to the processor until the system power has had time to stabilize. The system will immediately thereafter jump to a specific location in the read only memory (EPROM) to begin meaningful processing.

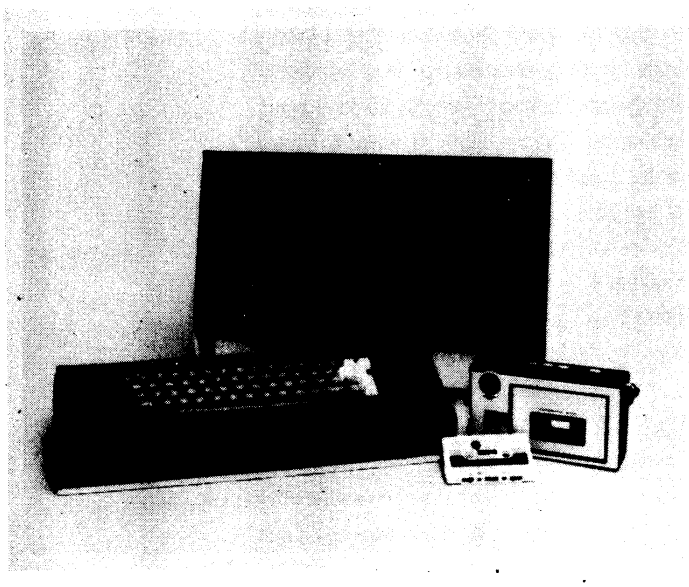
Program Development System

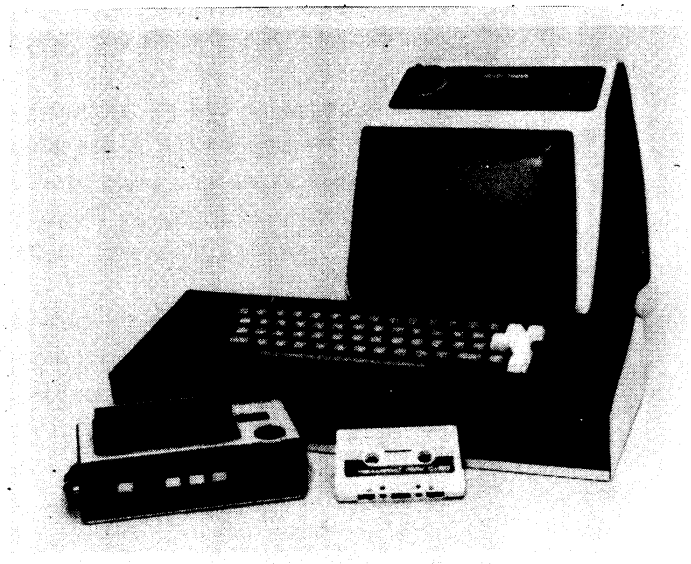
PDS represents a unique approach to the software of a low cost computer system. By the addition of software routines located in a 1K PROM even the smallest system is capable of doing useful work as well as performing all of the functions of a switch panel and display lights. The software, consisting of a debugger, assembler, editor, 16 bit arithmetic, and ASCII conversion routines, allows for development of user software in much the same way as large disk based systems.

The SPHERE Debugging Aid (SDA) is designed to aid in program development, as well as replace the usual switch panel and display lights function. It allows the user to easily view and alter the contents of memory or CPU registers from the keyboard-CRT display.

The Mini-Assembler allows the user the ability to input source assembly language programs and output unrelocatable binary object code. It can handle up to 62 symbolic addresses, different operand sizes and octal, decimal and hexadecimal operands. The operation codes are entered in hexadecimal (i.e. ADDA immediate is "8B").

Included is an expanded instruction set (EIS) for working with 16 bit operands in any one of several pseudo 16 bit registers or from memory or immediate operands. The EIS contains instructions to subtract, add, multiply, divide, move, compare and shift 16 bit operators as well as instructions to perform BINARY-ASCII conversion. It also includes instructions to perform I-O from the CRT-keyboard or the audio cassette or modem. The input-from-keyboard instruction includes a built in CRT based editor allowing scrolling and text insertion and deletion based on a cursor, allowing easy text manipulation.





SPHERE SYSTEMS

SYS1/KIT HOBBIEST ($650)

This computer system is capable of satisfying the needs of the user who wishes to program, develop, and debug programs for light process control, experimenting, and some educational purposes. As with all SPHERE "SYSTEMS", the computer was designed to perform a useful function. It was not intended to be a useless computer with a lot of money spent on front console.

All SPHERE systems are shipped with software and a commitment that software developed in the future by SPHERE or one of its users will be available at minimal cost. The PDS SYSTEM is included in the read only memory of this system. It and other software which is available is described under the heading "SOFTWARE".

Expandability has been considered from the onset. Some of these considerations include additional memory to 64K, inter-computer communications, a full line of peripherals, home and industry utility, and lowering cost while increasing performance in the future. Below are listed the modules contained in the system:

1) CPU1 — This module contains all of the features listed under "THE ONE CARD COMPUTER".

2) KBD1 — This module includes a standard typewriter style alph-numeric keyboard layout with an adding machine style numeric keypad located to the right. Above the numeric keypad is a star shaped cursor control keypad which includes HOME and ERASE functions. The keyboard module also includes 2-key rollover (single key read until released, regardless of other keys pressed), complete interface from keyboard to CPU bus with additional interfacing to the bus for 10 general purpose digital I/O lines which may be used at the user's discretion. This module includes an attractive keyboard chassis. This chassis houses the keyboard and all of the modules in this system plus 3 slots for future expansion. A maxium of seven additional KBD1 modules may be added later.

3) CRT1 — This module contains the necessary electronics to display 512 characters on a television or video monitor. The 64 character ASC11 character set is displayed in a matrix of 32 characters by 16 lines. Each character is displayed in a matrix of dots, 5 dots wide and 7 dots high. To display a character a computer program simply moves the desired character into a memory position which is also the display refresh buffer. The refresh buffer is located in the high-order 8K of memory. It consists of 512 bytes of static RAM that is organized to be accessed by the CPU and CRT simultaneously without degrading the access time to either CPU or CRT (dual port memory). Output from this module to the video monitor appears as a composite video signal or separate horizontal, vertical, and video signals. Etches for RF modulator (adjustable from channels 1-3) have been left on the PC board, and schematics have been provided; however, components have not been supplied because this type of circuit requires FCC testing and approval. Instructions for TV modification are included with purchase.

4) PWR1 The power supply has been designed expressly for the SPHERE 1 system. It produces 5 volts at 5 amps, 12 volts at 3 amps, -5 volts at 400mA, and -12 volts at 400mA. Ratings may be improved with the addition of capacitors. The circuits are highly under rated which should allow the system to run cooler. The power supply includes zener over voltage and reverse voltage protection. All supplies are current-limited, however over current-protection for the 5 volt supply may allow a power transistor ($1.50) to burn out. The 12 volt supply also allows this to happen. This occurs because of a cost trade-off ($40.00 to protect $3.00 in transistors) vs performance (will probably never occur). The power supply is contained in a separate chassis which includes a 3 prong wall plug, power cord, cable to the rest of system, and a fuse to protect the system.

5) BCB1 Each of the system modules is connected via a system bus. The bus consists of 3 flat ribbon cables containing 14 conductors each. Every other conductor is grounded to eliminate cross talk (electrical noise). Each cable is connected to each board via a 14 pin dual-in-line (DIP) connector. Each board has 3 standard 14 pin IC sockets where each of the three bus cables attach.

6) PCB1 Power is bussed to each of the boards of the system via a separate 14 conductor ribbon cable. This cable is attached to each board via a 14 pin dual-in-line connector.

7) OPR1 The operator/reference manual set is designed to introduce the SPHERE 1 system to the new computer user. It describes in detail how each instruction works. It also describes in detail, interrupts, stack operations, Input/Output, peripheral device characteristics, memory organization, projected device reserved locations and limited characteristics, and execution timing. Programming examples are included to illustrate various hardware features and a section is included to introduce programming concepts to the first time computer user. Appendices are included to aid program development. Although this manual set is comprehensive, some users may require further information so references are amply provided. The manual set is loose bound to receive updates and includes sections where SWAP newsletters, kit assembly instructions, manuals, and maintenance manuals may be kept. Kit assembly instruction manuals are a part of the package; however, each module in kit form contains an associated kit assembly manual which may be kept in this binder. SPHERE has introduced its user group to promote interchange of ideas, useful circuits, comments, gripes, software (from games to statistical packages), announcements (i.e. user has 10 Amp 5 volt power supply for $15.00 type!). The SWAP newsletter will not be governed by the marketing arm of the company. Hopefully the users will completely govern this group in the future. SWAP membership is included with any "SYSTEM" purchase or with the purchase of the OPR1 manual set. Future membership fees will be determined by users.

SYS2/KIT INTELLIGENT ($750)

This system was specifically designed to solve the needs of two different users.

1) The user who wishes to communicate to other devices over serial lines such as a telephone.
2) The user who wishes to utilize this device as a stand alone computer, and use the communications facility to save and restore programs and data using a standard audio cassette.

The communications facility is implemented as a single module (PC board) which contains a standard asyncronous communications interface and a modem. Serial communications to other devices such as a teletype or other computer may take place without the use of a modem; therefore, the modem portion of the board is listed as a separate module (CAS1).

This system includes all of the features found in SYS1/KIT plus the following:

1) COM1 This module contains the ability to accept data in 8 bit parallel format from the CPU and transmit it serially with 1 or 2 start bits and a stop bit. Seven or eight data bits may be transmitted with optional even or odd parity. At the same time data in similar format may be received serially. The data will be checked for proper parity (if desired) and false start bits will be rejected. Communications may occur at several standard rates. These rates are strap-selectable with each board pre-strapped at 300 bits per second. Although other rates are available on this module, the standard rates are 110, 150, 300, 600, 1200, 2400, 4800, and 9600 Baud. Baudot Code teletypes can be supported with minor modification if 20% speed degredation is acceptable. X-on and X-off functions are provided by an on board relay. No cables are supplied.

2) CAS1 This module contains a complete ORIGINATE/ANSWER modem. The device has additionally been adapted to operate with an audio cassette. The modem will operate at a maximum speed of 600 Baud. It has been designed with particular emphisis on acousticly coupled lines rather than Direct Access Arrangements (DAA's). The SH, RING, +V DH, DA, DR, and $\overline{\text{GND}}$ signals are provided for the CBT type of DAA however. A speaker and a microphone are all that are required to complete the acoustic coupler. Provisions for use of this module with an audio cassette are redily available. The cassette's AUX or MIC jack may be used as computer output, and the AUX SPKR jack may be used as computer input. No cableing is provided with this unit.

John Bottoms, Box 158CTS, 1000 W. 42 St., Indpls, IN 46208 says he has just finished the first batch of TVT-II boards that he is selling for $18. They are on FR-4 (fire resistant G-10 1/16" one ounce board). The etch is done by the subtractive process using FECL. They are not plated thru or plated because 1) plating is expensive and difficult and 2) plating traps chemicals below the copper that are corrosive and can eventually shorten the life of the board. He is just getting started in business and decided to do the TVT-II boards first. One of his main concerns is to try to keep prices for amateurs as low as possible. He is willing to etch MOD-8 circuit boards if we supply him with the drawings. He had planned to work on the Mark-8 mods which would revise the clock, I/O, and memory. The CPU and one K of memory would be on one board and the remaining memory would be on an additional board. It would have no front panel. He would be glad to produce TVT-1 boards if there would be sufficient demand. John has been in digital work for 11 years and just finished his degree in computer systems engineering at Purdue. He is still working on the TVT-II memory and cursor boards and he will soon provide prices and availability dates.

August 15, 1975

John Ford
5561 Esplanada
Santa Maria, Calif.,
93454

Mr. Hal Singer
Micro-8 Newsletter

Dear Hal,

Some of your subscribers are still trying to decide if the water is too deep or the current too strong to wade in. The amount of money a newcomer might anticipate having to spend is a highly variable consideration. The following list may help define some of the costs:

1. MIKE203 Assembled computer	$325.00
2. Power Supply (Surplus)	25.00
3. CRT Interface (Suding type)	125.00
4. Cassette Interface (Suding type)	25.00
5. Keyboard-ASCII (Surplus)	30.00
6. 1K RAM	100.00
7. Misc IC's and tools.	75.00
	$705.00

The price list I've given above should be analyzed carefully. If the Hobbyist has a greater degree of hardware expertise than the author of this letter, he may purchase un-assembled kits and save $100. My 8008 system was purchased from Martin Research -- there are several other 8008 (8080, etc.) systems which may be more or less expensive. I consider the list above to be a minimal requirements list for the following reasons:

Starting with item 2 on the above list.

2. The Martin Research MIKE203 does not provide a power supply at the base price.
3. This is probably the cheapest method of obtaining reliable and flexible output from your computer...unless you can limp along with an octal or binary display.
4. It is essential to have some means of permanently storing programs. If a program is over 50 instructions in length, it becomes drudgery to re-enter the program each time the computer is turned on.
5. Most of us will require the greater flexibility of character input provided by an ASCII Keyboard.
6. In my opinion, if you are not planning to set up some fairly elaborate programs, you really shouldn't be looking at a computer. 1-4K of memory would be minimal storage for good programming potential.
7. Unless you are buying a "complete" system, you will probably find that you will need to buy some additional interfacing IC's and tools.

I think it should be mentioned that the current trend of pricing may will bring the overall costs much lower ($100 -- $200) within two years. Also, the proliferation of microprocessors may well make the current herd obsolete in short order. My expenses would have been much higher if I had not been able to draw on the hardware experience of Hal Singer and Dave Duskin.

A final note: $700 is a lot of bread, and it means that the 8008 will have to be more than a toy. It has already been an education.

John Ford

FMC Corporation

Crane & Excavator Division
1201 Sixth Street Southwest
Cedar Rapids Iowa 52406
(319) 398 3200 Cable LinkSpeedr

July 11, 1975

Micro-8 User Group Newsletter
Cabrillo Computer Center
4350 Constellation Road
Lampoc, California 93436

Dear Hal Singer:

As a recent subscriber, let me say that I appreciate your newsletter; I had previously gotten it through a friend here at our company. I also subscribe to The Computer Hobbyist, The Scelbi Digest, ECS (no Byte, with our old Ham "friend" Wayne Green), and The Digital Group. I have ordered equipment from Scelbi (8-H, audio tape, TTY interface); SWT (TVT-1, TVT-2, digital VOM-counter, keyboard); and Suding TVT (not arrived yet). I have full manuals from Scelbi, M6800, and RGS (Uhg), and Nat Wadsworth's excellent (including its errors) programming manual.

Somehow, I get the impression that Scelbi is not given the attention in your publication which is due them. Example: several class their audio interface as expensive and complicated, but like all the stuff I have received from them, it is complete (chassis, parts, and good documentation). The boards in the 8-H and interfaces are first-class PTDS (plotted through double sided), complete instructions, and large, easy-to-use schematics. Additionally, all deliveries have been prompt and reliable -- perhaps a rarity in today's small computer game.

The 3K Scelbi I have going may not be the nicest-looking machine, but it is easy to build and understand. Nat Wadsworth supplies very good documentation for those of us starting, and will answer questions in writing or over the phone (no, he doesn't even require a SASE). Case in point: I was having bit memory failures with my garden variety 1101's, and Nat suggested the test sequence and recommendations over the phone. Case in point: I ordered a PROM from him at a stated price, but when billed it was at a new lower rate -- he could have easily charged me the price at order time. Dealing with Scelbi has been a rewarding and business-like procedure, something those of us in a business appreciate. I hope your readers who are concerned about the shoddy suppliers, incomplete documentation, etc., give Scelbi serious consideration! Except for the excellent data from Suding, I feel that with the Scelbi record, and information, I wouldn't need the rest of all the micro machine data at all! I do follow with interest, however, the exploding developments taking place in this field.

I want to order a Suding calculator kit, but what is the status now on the MiniMicroMart situation for these units?

Sincerely,

C. Southard

C. Southard WAØIOT
2519 Meadowbrook Drive SE
Cedar Rapids, Iowa 52403

WILLIAM H. FREEMAN
REGISTERED PROFESSIONAL ENGINEER
816 MEADOWLARK LANE
GLENVIEW, ILLINOIS 60025
(312) 724-5547

July 15, 1975

Dear Hal:

Attached to this letter is a contribution to your NL concerning cassette transports. The company with which I am associated manufactures language laboratories, stenographic dictation practice systems and other listening systems. As we have a reasonably good knowledge of tape transports, because we use them in our systems, my comments are biased to the side of reliability but I hope they are objective. We sell our equipment to schools, so ruggedness and reliability are at the top of the list of requirements. After seeing a Phi-Deck, to put it bluntly, I wouldn't have one.

Incidentally, just today, Scott Goff, the manager of the Mincom Division of 3M was in to see me. I asked him about the availability of the 9577 deck (see my comments) to individuals. His reply was that anyone who wants one can buy one. This deck is normally sold to OEMs so I asked specifically about this point.

Another subject - I need help. After taking the course at Northwestern on microprocessors, which was sponsored by the Computer Section of the IEEE, I have been frustrated by one thing - programming. Maybe you can point me in the right direction, suggest books, magazine articles, etc., which will get me moving. Twenty years ago I had a short course (10 hours) on FORTRAN, ran 3 problems and never had occassion to use it again. I probably could read up on FORTAN and program in that, but the instruction sets of the microprocessors don't make any sense to me.

About two months ago I went to hear a talk by Capt. Grace Hopper. The talk was sponsored by the Computer department of Northwestern. Mrs. Hopper, if you don't know her, has been in computer programming since year one and has probably forgotten more about programming than any 10 programmers put together. She has a tremendous sense of humor and tells her stories dead pan but with a twinkle in her eye. (She got a standing ovation at the end of her talk.) But what I am leading up to is her comments about octal.

She said when octal first was proposed she thought it looked good and so she learned it. Then at the end of the month her check book didn't balance. So she took it to her brother (a banker) for him to look over. He takes a look and says, "You have subtracted in octal!" Mrs. Hopper said it took 3 months for her to get her check book straightened out! Her conclusion was not to use octal as one cannot program or use octal during the day and then come back to a decimal world and keep things straight.

My own reaction, from the sidelines as it were, is that a home or hobby computer should be able to be communicated with in a high level language, say BASIC, to give reasonable performance. Stone age chiselling in of 1's and 0's (Dr. Lennon's phrase) is just too time consuming. I know the hobbyist has lots of time but one does want to see some results now and then.

I do enjoy the NL in spite of my programming ignorance. I have no home computer, largely because I can't decide yet which way to jump, and partly because of lack of time (the daytime business runs into the nighttime!).

Cordially,

Bill Freeman

William H. Freeman

Comments on Cassette Transports:

Letters previously printed in the NL have proposed the use of a Phi-Deck cassette transport in connection with a cassette interface for recording data. While this cassette transport has some nice features, your writer feels he should point out some obvious disadvantages and suggest a better alternate.

The Phi-Deck has 4 d-c motors; one for the capstan drive, one each for fast-forward and rewind and the fourth motor to engage and disengage the heads thru a geneva movement. The heads are mounted on the cross piece of an inverted-U which pivots on the open end. Use of the d-c motors provides a very nice control of all the motions required in any tape transport using transistors to directly energize the motors - no relays. Logic is very easy to implement. In the sample shown to this writer over a year ago, the transport went thru its several paces with considerable agility. One can make the deck do almost anything imaginable.

Now, the disadvantages as seen by your writer. The d-c motors will have a limited life because the brushes will wear out. When this happens the motor will have to be replaced because the brushes are not accessible. An a-c motor is needed if one wants reliability and long life. The mechanical construction is flimsy. Most of the mechanism is mounted on a single flat sheet of .047" (18 ga.) steel with legs bent down in front and rear - no side fold for stiffening. Your writer has also heard that the head alignment is not always maintained by the inverted-U mechanism.

There are very few cassette transports on the American market but paying $100 for the Phi-Deck is getting ripped off. Many of you are aware of the ruggedness of Wollensak transports so why not get a solenoid controlled Wollensak. The Mincom Division of the 3M Co. has a small Wollensak transport, Model 9577, which only costs $79.75 for one. This cassette transport has a large a-c motor, a large fly-wheel, is solenoid operated (24 vdc) and has an optical end-of-tape sensing. The size of this unit is 5 5/8 x 6 3/4 x 4 25/32 deep.

For those who want the absolute best with money no object, then try the Model A9 transport made by AMILON. They have made digital transports and this audio one is derived from that. The one performance feature which impressed this writer was the <.1% wow and flutter! The price for one is about $165. It has all kinds of super specs which need not be enumerated here. It is about the same size as the Wollensak.

So there you have it. A much better alternative than the Phi-Deck with less cost and much better reliability and performance. Your writer is in a company which uses cassette transports and is not connected with any of the companies mentioned.

John J. Krohmer, 5723 N. 14th Place, Phoenix, AZ 85014 (The Heart Of Cowboy Country) called all the owners of ALTAIRS on the list that MITS supplied him and they promptly appointed him corresponding secretary which is ridiculous he says because he dosen't even have a typewriter. Several of the guys have a variety of mini's and micro's and would be interested in contacting others with similar machines. (John has an M6800 system.) They will be submitting articles, programs, etc. to the newsletter soon.

Micro-8 User Group Newsletter
Cabrillo Computer Center
4350 Constellation Road
Lompoc, CA 93436

July 11, 1975

Gentlemen,

First let me say that I think that your newsletter is a godsend to the computer hobbyist. When I received the packet of prior issues, I devoured them with the enthusiasm I normally devote only to the latest "couldn't-put-it-down" novel.

I have been in programming and computer work for over 10 years, mostly on large commercial systems (IBM 360/370, Burroughs, NCR) and some minicomputers. I have worked with several programming languages and operating systems, and have a sizable library of info on these topics and several others relating to various aspects of data processing. I would be happy to provide bibliographic information to any member (text or manual recommendations, etc.). This is both from positive and negative viewpoints -- I can recommend "winners" in the book field and point out losers (many of which I have unfortunately acquired). Programming is both a vocation and avocation to me, so I am really looking forward to using my "micro" system for "pure" programming language research, plus practical applications and "fun" things such as games and demonstration programs.

I had never had much interest in kit-building and practical electronics in general until a friend showed me the Dec. 74 Popular Electronics article, which really amazed me, since I had no idea that the smaller end of the computer scale had progressed so far so fast. After considerable attempts at investigating this new phenomenon, I learned of Bob Cook, and he put me on to the Digital Group and your publication. I ordered an Altair 8800 from Mits with the minimum 256 bytes of memory largely as a result of the spirited discussion from your pages, because before that I had been about to hand Mits most of my life savings for additional features that I then saw were available from other sources at much lower rates, and for the most part, better specifications.

For the past 2 weeks, I have been soldering my fingers together (and occasionally some components) and despite my lack of knowledge of electronics and its attendant jargon, I managed to get it all together. I was generally impressed with the completeness, clarity and quality of the Mits kit, even though I had to purchase several additional items. It does not yet operate correctly, so I can't consider it to be complete, but I have hopes that it won't be too difficult to iron out the remaining bugs. Using the display panel for input and readout, it will "deposit" and "examine" correctly, but placing it in "run" mode produces some very spooky results -- it appears to operate on some program known only to it, not the one that I stored.

I am now actively trying to evaluate the various I/O methods and techniques available, and hope to eventually come up with a system which includes 1 or 2 casettes, a super-simple (and cheap) paper tape reader, plus an I/O typewriter or teleprinter, and a keyboard-CRT combination a la the various TVT systems.

In this last regard, I am especially indebted to your publication, as I was just about to order several things from the MiniMicroMart, before reading the many adverse comments about their delivery problems and refund policies. Many of the things that they advertise (and their ad copy) are well-nigh irresistible, since they seem to have just exactly what is needed. I suppose this is just another instance of things being too good to be true. In any case, I can't believe that someone with as much evident expertise and who had taken as much time and energy to produce their bulletins would be placed in such a box for long, so I hope they get straightened out soon.

With regard to other sources, I think the Digital Group in Denver is splendid, and I have ordered their casette interface and basic software package for the 8080. My only quibble is that I seem to have been waiting a long time for their latest flyer and/or newsletter. Perhaps the whole group went on vacation.

I still haven't heard from the Computer Hobbyist in North Carolina. I'll check my next bank statement to see if they cashed my check. Ditto the People's Computer Company.

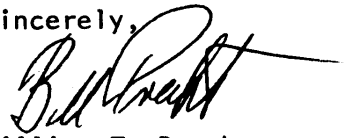
I sent for the literature package from Sphere, which uses the Motorola 6800 CPU, and they seem very ambitious but much over their head with regard to what they can deliver and support. At least they realize the tenuous situation they are in with regard to the mail-fraud laws -- every page of their specifications is stamped "Preliminary - price and specifications are subject to change without notice."

I've talked with several micro users in the Chicago area, and would like to get the "Chicago group" re-organized or re-invigorated. I think this will be a very big area for micros.

If any of your readers can specify an I/O port for an Altair, and/or a "second-source" for their (Mits') I/O boards and interfaces, I would certainly appreciate hearing from them, either directly or through the newsletter. Ditto the memory and expansion boards.

To conclude this rambling dissertation, just let me say that this is certainly the most exciting field that I have been associated with in some time, and thanks again for your publication.

Sincerely,



William T. Precht
1102 S. Edson
Lombard, IL 60148

Carl T. Helmers, Jr., M. P. Publishing Co., Box 378, Belmont, MA 02178 says that his supply of the original ECS series has been exhausted to date and he only has back issues from January onward. He is negotiating with a publisher to have the series turned into a paperback of 200 to 300 pages and is looking for people interested in contributing to such a book. These plans may have changed somewhat since he is now editor of BYTE magazine. ECS magazine subscribers have been serviced on a two for one basis to BYTE for the remainder of their present ECS subscription. The oscilloscope graphics PC board for the unit described in the last issue of ECS is available for $25 from Carl at the above address and is described by Mr. Loomis of Loomis labs as the prettiest PC board layout he has ever seen.

Christian S. Bauer, PHD, PE, Assistant Professor Of Engineering, Florida Technological University, Box 25000, Orlando, FL 32816 says that FTU is rapidly becoming a hotbed of microcomputer activity and computer hobbyists in the Central Florida area are encouraged to contact him (office phone (305) 275-2615, home phone (305) 678-2413) to discuss matters of common interest. They have projects underway involving INTEL 4040's, 8080's (wired on a general purpose interface board for use with the NOVA minicomputer), 3000 series chips, a Motorola 6800 system, and last but not least, a Mark-8 8008 system with 2K of 1101A memory as well as two TVT's.

PRACTICE LIMITED TO ORTHODONTICS

NEAL SHEFFIELD, JR., D.D.S. W4zpz
2601 OAKCREST AVENUE - SUITE E
GREENSBORO, NORTH CAROLINA 27408

TELEPHONE (919) 288-5401

August 18, 1975

Neal says he is glad to talk to any fellow hobbyist at (919) 275-7720. His MOD-8 is nearing completion. He is waiting for the "modified" modified 8316 board which should be in by the end of September (1975?) he hopes. He is using the 8316 monitor and 4K of 2102 memory and 5K or more of core, a tape deck, and the IBM Selectric I/O printer #735.

Dear Hal:

Since several IBM Selectric I/O Keyboard Printers have become available to the group, I thought they might be interested in the following:

The IBM Selectric I/O is made by their Office Products Division (OPD) for some IBM Data Systems and also for OEM use. There are a number of minor variations and optional features for each of two basic models.

The CORRESPONDENCE Model uses the same basic typing element and character arrangement as the ordinary office Selectric Typewriter. A 7 level code (Selectric correspondence bail code) is input to the machine selector magnets for character print or machine function. This same 7 level code is ouput from the machine from the keyboard transmitting contacts. code in = code out

The BCD Model uses a different arrangement of characters on the typing element and therefore an entirely different "Selectric" code is used. The OEM BCD machine will probably have a #908 typing element, ten pitch and will print upper case characters only in the lower case or unshifted mode. The upper case mode prints mostly solid blocks. The matching key tops are standard gray only.

The IBM system oriented BCD models may have keytops marked for both upper and lower case characters as well as special symbols to match the particular system. System oriented BCD elements like the #963 are available and can also be used in the OEM BCD machine if you don't mind replacing some key tops or remarking for a few different special character positions.

On the BCD machine, the keyboard transmitting contacts output a BCD code which is different from the input bail code. code in $\neq$ code out

Note: code conversion can be handled easily by a ROM, but be careful of "code converter" chips because of these differences. Better check the truth table before ordering.

Any of these machines may have 48 or 24v DC coils and may be wired common positive or common negative. Coils have voltage spike protecting diodes.

IBM people have been very helpful in locating the documents that are needed to interface these machines. It took a lot of digging, but here they are: see attached

Everything you want to know about the IBM Selectric I/O Printer-
and where to find it.

SOURCE/PART NUMBER	TITLE/DESCRIPTION	PRICE
OPD/241-5737-0	"Selectric" I/O Typewriter Service Manual Description, operation and adjustment of 74X, 73X, and 775. Includes wiring diagram, input, out codes, type head arrangement, contact and magnet timing charts. Also suggested external connections for ready/busy output mode. 311 pages-2 color, probably a thousand or more illustrations --highly recommended--	$3.90
OPD/241-5687	Type Catalog Typebars, elements, keybuttons and keyboard layouts. 58 pages	
DP/S124-0054-9	IBM Selectric-Universal I/O Keyboard Printer Parts Catalog Lists all replaceable parts including type heads (elements) and key buttons-covers machine types 740, ARS1415, ARS1014, 1620, 870, 1977, SABRE, STRETCH, 735/765, 735/870, 735/767, 2152. 150 pages necessary for above machines	$2.60
DP/S123-1008-7	Selectric Printer for Communication Terminals-Parts Catalog Similar to above, but for 835-2740, 935-2741,2970, 1980-9, 1980-12, 1518. necessary for above machines 130 pages	4.00
DP/S225-6595-2	Selectric I/O Keyboard Printer Basic theory of operation-most if not all is covered in first listing above. Not as complete or specific as above. 83 pages	2.92
DP/S225-1726-7	IBM Field Engineering Maintenance Manual-Selectric I/O Keyboard Printers Maintenance and adjustments, lubrication points and sub assembly removal. Good illustrations with line drawings and large halftone photographs. about 250 pages	4.45

Order through the appropriate division. DP=Data Process
OPD=Office Products Division Cost listed only where known.
There may be a charge for most others also. Inquire when ordering.
Allow 2 or 3 weeks for delivery.

From IBM /Parts Dept. No. 1159077	A-MP connecter 50 contact female-this mates with the 50 pin male connecter found in most machines. Kit of Parts (consult parts catalog for other connecter configurations) Note: Socket and contacts also available from Burndy Distributors @ about $30.00. For prototype or temporary connections use MOLEX .062 female connectors-about $4.00/c and insulate with plastic sleeving	20.00

**** **** **** **** **** **** ****

Zero force 24 pin sockets (for the MOD-8 PROM Programmer) are manufactured by Textool and are available through their area representatives advises Mr. White of Textool Customer Service Department. Call 214-259-2676 for address of representative nearest you or order from Techrep, P. O. Box 508, Indian Rock Beach, Fla. 33535. Mention Part#224-331M 24 Pin Zero force socket and enclose $7.45.

Mike Baran says his work will soon involve the Intel MCS80 micrcomputer. He writes, "My interest in microcomputers is both professional and personal. Until our machine arrives, a co-worker (Len Oleniczak) & I have been toying with an Intel 4004. We are writing an assembler and a simulator for the Intel 4004/4040 which will use (almost) ANSI FORTRAN and run on a CDC 6000 series computer. We should be well into the debugging stage by the time you receive this letter. Our next project will be to write an assembler and simulator for the Intel 8080 to run on the same machine. We are writing rather than buying for several reasons: a) cost of buying is too high and no funds are available. b) good experience to be gained thru the project c) we can include custom features where desired.

Neil A. Benson. 10040 Nicollet, Bloomington, MN 55420 has the following to say about his plans to do image processing: "I am not doing it so I don't want to go into too much detail now but the basic process is used by Stebber in QST for April, May, & June of this year. He converts Slow Scan TV (128 lines/frame, 4 lines/sec) to normal TV frame rate. In the process he averages the signal to produce 256 lines/frame and to generate another level of grey. He uses a 7483 adder and 7485 magnitude comparator. My ideas are similar but I would apply the process to weather pictures from the satellites (also see back issues of QST). By the way, Robert A. Heinlein (not Hemlein) is one of the better authors of science fiction -- 20 & 30 years ago he wrote stories which are now happening regarding computers. "The Moon Is A Harsh Mistress" is based around a computer. In "Time Enough For Love" it is difficult to seperate the computers from the people! (Don't read this TOME without first reading "Future History" as they go together. So Much for the literature class."

32200 Arlington
Birmingham, Michigan 48009

Gentlemen,

I read about your group in the Computer Bits column of the June issue of Popular Electronics and am interested in participating in a user group of mini/microcomputer hobbyists. I have just completed the construction of a basic Altair 8800 and am in the process of checking it out. I would also like copies of your past newsletters and am enclosing a stamped self-addressed envelop as requested. Thank you very much.

The construction of the 8800 was very straight foreward with a couple of exceptions and took me about thirty hours. The chassis does not fit into the cabinet with the screws furnished to mount the control panel circuit board to the subpanel and the front panel swithes should be installed with only the nuts (as shown) not with washers. I am in the process of checking out the programming instructions and have found what are apparently two errors. The PUSH instruction (page 50) states that the status bit register is the first byte pushed into memory. It is the second as the accumulator is the first. Also the CPI instruction is shown as 00 111 100 on page 70 when it should be 11 111 110 as is correctly shown on page 90.

The quality of the parts appears to be quite good. I was missing two resistors and had one defective RL-21 LED which were replaced by MITS. Communications with MITS have been reasonable but slow.

I am looking forward to hearing from you.

Sincerely,

Don H. Morrison

Don H. Morrison

S. Trim
2991 E. 43rd. Ave.
Vancouver 16, B.C.
Canada

Dear Sir:

I am presently a subscriber to your newsletter although (due to a distinct lack of money) I have no immediate plans to construct a computer. At the monent I am using a Hewlett-packard 2000F which is owned by the Vancouver City College. This is a time sharing system free to all comers, however it is completly lacking in graphics capability. This is very frustrating since my primary intrest at present is spacewar and similar interactive graphics. I am intrested in corresponding with anyone else who is intrested in this field.

If convenient I would like whatever information is available on the graphics terminal refered to in your newsletter (by James Hogenson published by MP Publishing Co.) although this information will be of little use until such time as I build a computer.

One more thing, has anybody compiled the facts on all the various computer systems (Mark-8, Altair 8800, Mike-2, Mod-8, Shelby-8H, PDP-4, etc.) if not i would suggest that this is an area worth some attention such a list comparing cost, construction difficulity parts availability, machine capability, etc would be very useful to people like me who know little about computers.

On MITS it would appear that they want to become the I.B.M. of the mini-computer market. They have adopted some of the same techniques, their apparent strategy being to encourage the use of the Altair 8800 to the point where it becomes the standard home computer under these conditions the majority of software development takes place for the Altair so that a person entering the field has the choice of going it alone or buying an Altair at an attractive price. the profits will be made by makingit difficult (by witholding bussing information) to use any but MITS peripetuals (same strategy as IBM) it is then possible to place high prices on this equipment knowing that the Altair oner can either buy from them or build their own which most people will be unable to do.

Sincerly Yours

Sidney Trim

Ernst Schubert, POB 851, Los Alamitos, CA 90720 (213) 421-0124 and (714) 826-5033 says that considering all the wasted experimentation and experiences with the various suppliers of dubious reputation, he is inclined to order an ALTAIR with 12K of memory and extended BASIC. He will start with a dual disk system (CALCOMP floppy) and will replace his teletype with a DEC-writer as soon as possible. The machine will be used for a prototype for a school system for administrative tasks and business applications. He will concentrate on software and would like to help as a clearing house for software distribution if there is a need without duplicating the activity of the ALTAIR user group.

S. Lieberman, 1489 Durango Avenue, Los Angeles, CA 90035 says he received Dave Chapman's redrawing of the Precision Systems Power Supply and wants to pass on his appreciation for outstanding work. (By the way, Dave has been receiving a lot of requests for the drawings. Apparently, the newsletter article mentioning it was confusing. He redrew them and they can be obtained from the Cabrillo Computer Center. For you guys that don't know what we're talking about, The Precision Systems Power Supply was a surplus unit that was mentioned in the original Mark-8 article. They have long since been sold out and the schematics are only of interest to those that did get one. It is possible that two different models were sent out and that the available schematic only covers one of them.

Rick Brennan, 601 South Knight, Park Ridge, IL 60068 sent the following design allowing I/O on an 8080 system, particularly the ALTAIR. He has constructed both, using one Vector Plugboard and wire wrap wire for land to land connections. He warns that lots of .1 mfd line capacitors should be put in even tho they aren't shown on the diagram. He promises to send in info on his 2102 memory board as soon as he gets time.

Notes on I/O intefaces:

Since the 8121's are TRI-STATE devices, I used them along with a memory board, that is I shared the 8095 bus drivers between my memory board and the input multiplexers. This is possible because both the multiplexers and the memory chips are TRI-STATE. That is why the AND gate is there-to combine the signals of all devices sharing the 8095's. If this is not required, then the AND gate is not needed and the output of the 7430 should be used to enable the bus drivers. However, if more input ports are desired, as would be expected, the additional 8121 multiplexers can be added along with the AND gate.

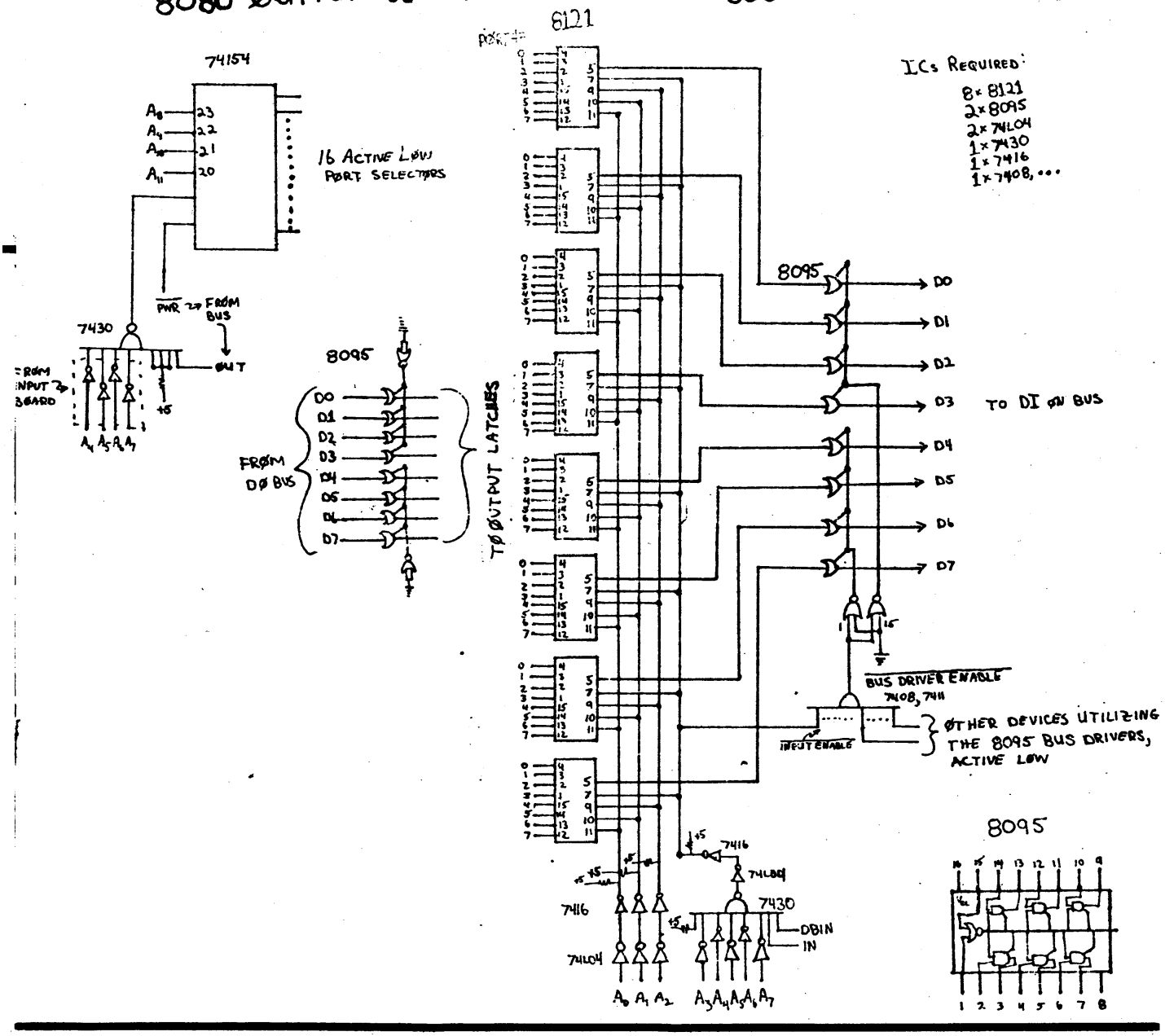
To expand the number of input ports two paths may be taken depending on how many more ports are desired. If another set of 8 is wanted, it may be cheaper to go with the 7430-74104's, depending on current prices or what is on hand. If more than 16 ports are desired it may be possible to go with larger multiplexers (if they exist-I don't know off hand) or instead of using a 7430 to decode the "high order" input address a decoder such as the one used in the output selector can beused. A 3 to 8 would give 64 ports, given enough multiplexers.

To set up ports 10 and beyond, it is necessary to determine where you want the ports to start. That is, what are the high order digits in the port address going to be? In my design, the high order address is 00. If you want the next set to follow right after, you will pick 01 as the next high order address. To make ports coincide with their chosen addresses, you must invert all bits that are going to be zero before going into the 7430. All the ones can go directly into the 7430. For example, since all the high order bits are zero in my design, they are all inverted. If you would like to add ports 10 thru 17, all bits except bit 3 should be inverted.

Remember to watch the fan-out of the 7416 buffers, they should be able to drive about 3 sets of multiplexers with no trouble.

The output port selector is capable of selecting up to 16 sets of latches to hold the data which is on the output bus. The selector can drive edge triggered latches directly, but for level clocked devices an inverter must be placed on the selector's output since it is an active low output which would cause the latches to follow the data bus whenever the latches are not selected. The nice thing about edge triggered latches is that they include nice things like preset and clear which ALTAIR owners can tie to the front panel CLR switch.

As with the input section, the output port selector may be expanded either using 7430 decoding or a decoder.



Richard J. Lerseth, 8245 Mediterranean Way, Sacramento, CA 95826 is a civil engineer heavily involved in water quality data acquistion systems under control of microprocessors which are in the planning stages at the present time. He has much experience in FORTRAN programming but the microprocessor game is new to him, both hardware and software. He has ordered a MIKE-2 system kit. He is getting into the hobby game because after 10 years of successfully programming the CDC 3300, the state is kicking him up into the supervisory staff and he wants to stay in the game. Here is some more info on his plotting package briefly mentioned in NL#8. The "3D Plot Package" is in ANSI FORTRAN is offered at duplication cost only to hobbyists. The only requirement is that it never be sold commercially for more than paper cost. (it was a personal effort "as a hobby"). A copyright has been applied for to guarantee this. It was originally written for a drum plotter but can be used with little modification on a graphic scope like Hal Chamberlin's (The Computer Hobbyist). Write Richard if you are interested.

Don Tarbell supplied us with the following list of Neat Places in L. A. for finding computer related surplus components. Compiled May 25, 1975

Earl's Supply Co. OS 9-1439
14814 Hawthorne Blvd.
Lawndale, CA 90260
Pwr. Supplies, Papter Tape Readers, Card Readers

C A Electronic Enterprises 834-5868
2529 E. Carson Street
Carson, CA
Integrated Circuits

Aber Electronics
1204 W. Washington Blvd.
Los Angeles, CA
Pwr. Supplies, Fans, IC's

Apex
San Fernando Road, Lankershim Blvd.
Large Place, all kinds of stuff

Lee Lab Supply 823-9120
13714 S. Normandie
Gardena, CA
Test Equipment

C H Sales 796-2628
2176 E. Colorado
Pasadena, CA
Tape Drives, Core, PS's, Disk Drives

Stern Enterprises 764-7070
13115 Saticoy Street
North Hollywood, CA
TTY's, Storage Tubes, Oscilloscopes
Military Surplus

NET Electronics
8218 Firestone Blvd.
South Gate, CA
Optical Page Readers, Calc. Printers
Calc. Keyboards

J J Glass Electronics
1624 Main St.
Los Angeles, CA
TTY Equip., Test Equip., Cable

Bernies Surplus 882-9414
20746 Plummer
Chatsworth, CA
Modems, IC's, Cable, PS's, Tape Drives, Card Readers, Core & IC Memory, CRT Displys, Keyboards, and loads of other junk

LMN Electronics (213) 967-4611
1042 E. Garvey Avenue
West Covina, CA 91790
IC's, LED's, Test Equipment

Hiway Co.
1147 Venice Blvd.
Los Angeles, CA
Military Surplus, Transformers

Hubbard Electronics
10861 Burbank Blvd.
(East Of Vineland)
Burbank, CA
Delay Line Memories, Card Frames, Power Supplies

I.C. Electronic Supply 892-1191
16723 Roscoe Blvd. (across from Van Nuys airport)
Van Nuys, CA
IC's, PS's, Keyboards, small parts

Sachs Co. 731-5536
3524 W. Pico
Los Angeles, CA
Military Surplus, Test Equip., Tape Drives

Vern's Surplus Electronics 864-4846
12161 E. Front
Norwalk, CA
Cable, Military Surplus

An Com Electronics Surplus 769-5518
5667 Lankershim Blvd.
North Hollywood, CA
TTY's

Electronic Surplus
10426 Burbank Blvd.
Burbank, CA
Test Equipment, Racks. Pwr. Supplies

Terminal Systems. Inc. 769-6772
11300 Hartland
North Hollywood, CA (not open on weekends)
Late Model TTY Equip.

R L Electronics 398-5377
12474 Washington Blvd.
Los Angeles, CA 90066
PC boards, Connectors, IC's

C H Surplus, 10725 E. Rush, El Monte, California.
Very large area outside warehouses. Nothing marked with price, must ask. Lots of computer equipment goes thru here but you have to catch it before it gets dismantled for the place in Colorado.

LOS ANGELES SURPLUS STORES BY WB6QDS 5/73

A-OK Electronics (235-4119)
3801 S. Broadway
L. A., CA (Downtown
8:30-5 M-F)

Aber Electronics (747-6311)
1204 W. Washington Blvd.
L. A. (Downtown 10-6 M-Sat.)

Acme Electronics (764-9000)
11523 Sherman Way (Mon to 8
No. Hollywood 8:30-5:30 T-S)

Airbourne Sales (870-4687)
8501 Steller Dr. (8:30-5 Mon-F
Culver City 8:30-12 Sat)
Exc. Catalog

All Electronics (380-8000)
905 S. Vermont (Downtown
L. A. 9-5 M-F)

An-Com Electronics (769-5518)
5600 Lankershim Blvd.
N. Hollywood (10-6 M-S)

Apex Electronics (875-5377)
8909 San Fernando Rd.
Sun Valley (9-5 M-S)

Art's Surplus (873-2626)
6212 Sepulveda Blvd.
Van Nuys (9-5 M-S)

C&H Sales (796-2628)
2176 E. Colorado Blvd.
Pasadena (9-6 M-F;9-5 S)

J. J. Candee (764-7070)
13115 Saticoy
N. Hollywood (9-5F;9-4S)

Electronic & Ind. Surplus Co.
5272 Valley
L.A. (Downtown) (8:30-5M-F)

J. J. Glass Elect. (749-1179)
1624 S. Main St. (9:30-5 M-Th
L. A. (Downtown) 9:30-2 S)

Gulf Enterprises (877-6003)
10426 Burbank Blvd.
N. Hollywood (9-9M-F; 9-5 S)

Hiway Co. (382-8383)
1147 Venice Blvd.
L.A. (Downtown) (9-5 M-S)

Hubbard Elect. (769-1137)
10861 Burbank Blvd
N. Hollywood (8-5:30 M-S)

Int'l TV (DU8-0621)
2772 W. Olympic Blvd (8:30-9 M)
L.A. (Downtown (8:30-5:30 T-S)

Also
Int'l TV (776-8830)
5144 W. Imperial Highwav
El Segundo (9-6:30;F to 9)

K&M Electronics (734-0363)
1308 Logan
Costa Mesa

Mann Communications (889-6666)
28710 Canwood Rd.
Agoura

Harry Metz Elect. (734-0363)
1161 S. Vermont
L. A. (Downtown) (9-4M-F)

Jim Mills (805-646-6387)
162 S. La Luna
Ojai (hrs. by app't)

R&L Electronics (398-5377)
12474 Washington Blvd.
L. A. (near Culver City)
(8:30-4:30M-F; 9:30-4:30S)

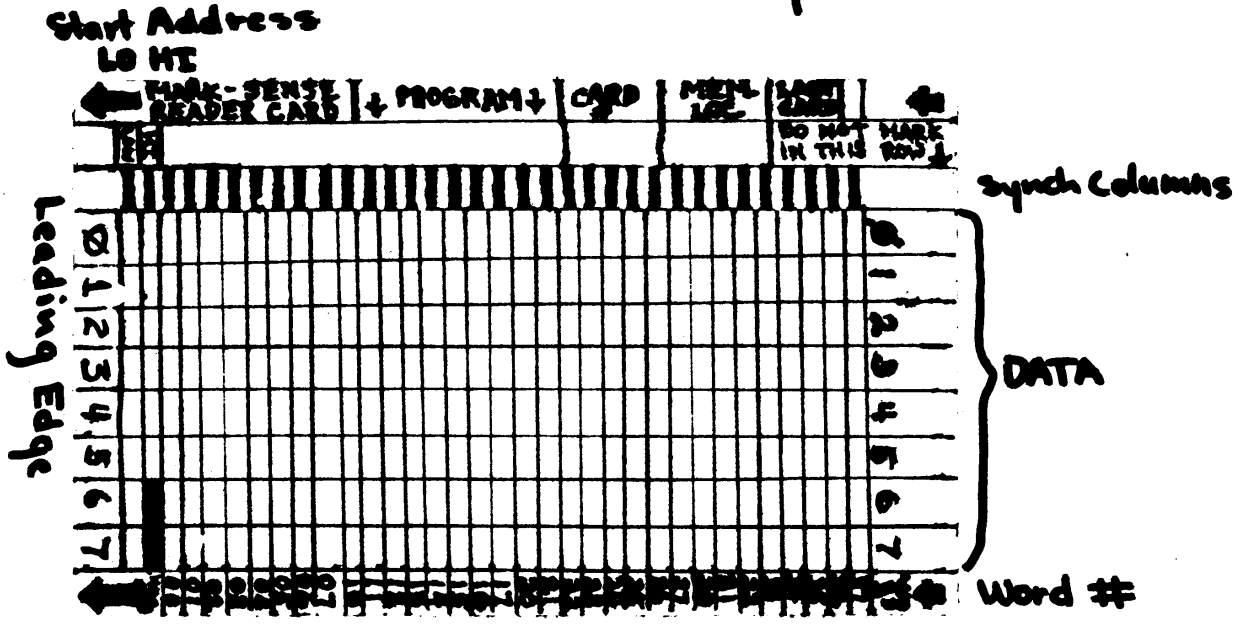
S&S Electronics (828-0242)
3311 Pico Blvd.
Santa Monica (9-4 T-S)

The Stockpile (714-537-4352)
Garden Grove (9-5 T-S)

Vern's (864-4846)
12161 E. Front St.
Norwalk (9-4:30 M-S)

Paul N. Even, 4637 Rosehill St., Philadelphia, PA 19120 (215) 457-1822 has the following comments regarding the standardization proposal (NL #6) "I believe the input and output ports should be reserved for high-speed devices such as discs, additional RAM's, tape drives, etc. Everything else can be placed on a data bus, and with 256 ports on a bus, there shouldn't be any problems about what goes where. I am using I/O ports 07 for data, and output port 10 for bus address. It might also be helpful to have a second data bus for I/O flags and other equipment. This bus can use the same address output, but only ½ of another input port in order to reserve space for the high speed devices. Why waste a whole input port for 1 or 2 flags? Steve Wash's output display circuit (Vol 1, #4, Fig. 9) is something so useful in debugging equipment that it should be a must for everyone. However, it is very easy to monitor INPUT signals by feeding in the $\overline{IN}$ signal. Add a couple more gates and a decoder, and you can monitor any I/O signal on any data bus. Another useful addition would be a second interrupt input port switched on when the front panel switches are disabled, with deposit and memory address load lines brought out. This would enable you to input programs by a keyboard, cassette, or a free-running PTR without first loading an input subroutine. The Microswitch #53RW4-1 alphanumeric keyboard sold by Bill Godbout for $19.95 is nice, but was designed for a card punch. The output can be made ASCII with a lot of diodes and some extra gates. It should be easier to use by those who have worked with card punches before. The X-Y recorder would be a real pain to build and probably inaccurate. Better to buy one surplus (like I did) for $100. Regarding the drop thru card reader, don't assign me this project because I'll probably never get around to building one, but here are some extensive suggestions: 1) To identify a mark on the card as data, you need a synchronization column. When the reader senses this mark, it latches and sends the data. For best results, have the sync lines 1/2 the width of the data boxes and centered. 2) I also propose an extra column for additional info, such as a bit to tell the computer which is the last card. Other bits may be useful for control purposes such as redefining memory locations. 3) Due to the fact that the cards are a very time-consuming thing to prepare, they must be standarized and printed in quantities for the entire user group. Also, we should be able to print specialty cards for games or surveys, with questions printed in place of some of the data blocks. 4) The most convenient size for data blocks is 1/8" by 1/4". On the rough sample below, this allows for 32 8-bit words on a 3 x 5 card. Longer cards could be used, but they may be too big for games or surveys. 5) The entire card should be printed in a light LED color Red. 6) Red LED's should be used to illuminate the Data columns so the data box lines will not give false readings. 7) A green LED is used to illuminate the sync column, so the red synch track will absorb the green light, thereby appearing black. 8) the sensors can be either phototransistors or photdiodes, but they must be closely coupled to the card surface. Fiber optics would be a big help. The IC tester should belong under software, not construction. All you need in most cases is a socket and power for the chip. Other logic families may need only simple interfacing. The only construction is for timers, schmitt triggers, op amps, and other linear functions, and its probably better to build seperate testers for these. HELP!! a) Does anyone know how to program a MM5220 ROM? b) Could someone prepare a table which lists the complete ASCII, BAUDOT, PUNCH CARD, and Morse Codes all at once? It would be a great help in making code conversion programs, and building peripherals. I just can't find all this information anywhere. That's it for now. Next time I'll send a bunch of schematics of my setup."

Paul Even's Mark Sense Sample Card



Dear Hal: July 8, 1975

Please send me a copy of the documentation on the MIL Cassette Interface which you mentioned in NL #5. I need only the data and software listings for the cassette unit since I have the other software listings in the Monitor-8 ROM. I have included the 20¢ SASE. Do you have any information on the MIL PROM programmer? If so, I would appreciate receiving it.

I now have everything to begin to put the MIL MOD-8 together. I got the boards, etc. from Maury Goldberg. The P.C. boards are really super. It's going to be orders of magnitude easier to build than the Mark 8, thanks to the plated thru holes.

What is the story on the Monitor 8-ROM? I ordered one from Maury in February; then I gave up hope when I heard that MIL had "crashed." However, two weeks ago I got an unmarked chip from him labeled Monitor 8-ROM. Has he got a new source for them, or am I one of the lucky ones to get one of the last few chips?

I hope to get my system up by Xmas. It will have 4K to 8K bytes of 2102 RAM, 2 K bytes 1702 PROM, the Monitor 8 ROM, PROM programmer, and a ASR 38 TTY. I haven't decided which cassette interface to use: the MIL version, Dr. Suding's, TCH's or whether to interface my H.P. digital cassette unit to the system.

I will probably build a front panel for the MIL Mod 8 (probably similar to Dr. Suding's design) since I have had some bad experiences trying to troubleshoot and debug programs on OEM-type systems which have only TTY access. (e.g. Q: What do you do when the Monitor Executive won't load? A: Punt and call the factory rep., who brings down a front panel to debug with at many $/hr!)

Best wishes,

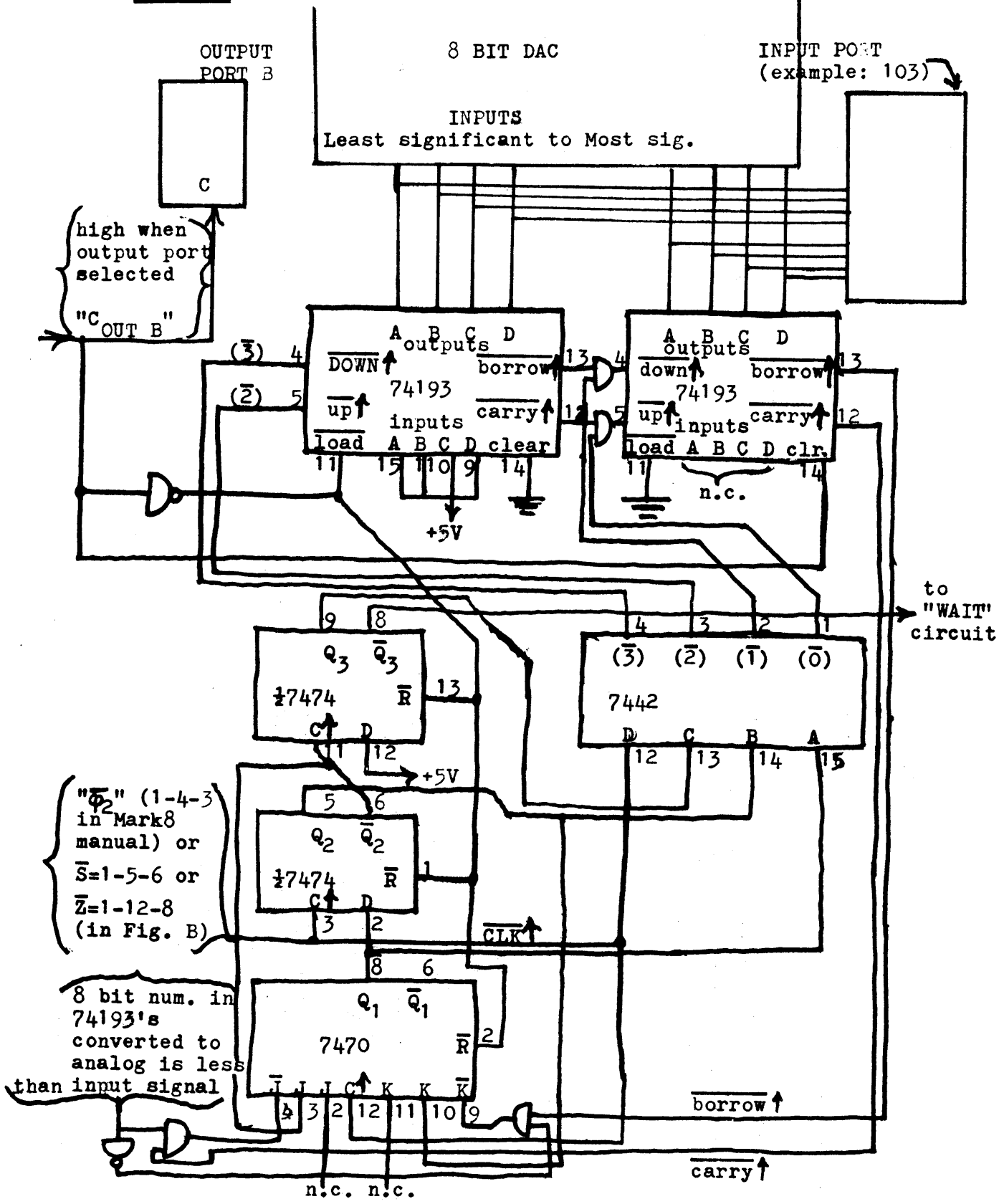
Gary

PURDUE UNIVERSITY
DEPARTMENT OF CHEMISTRY
CHEMISTRY BUILDING
WEST LAFAYETTE, INDIANA 47907

Gary W. Kramer
Research Assistant

Thomas R. Amoth, 228 Fox Rd., Media, Pa. 19063, ph:(215)566-1068, rev.7/9/75

Fig. A A to D CONVERTER



Thomas R. Amoth, 228 Fox Rd., Media, Pa. 19063, ph:(215)566-1068, rev.7/9/75

Fig. B How to Change the CPU BOARD to Allow an External device Make the Mark8 Wait

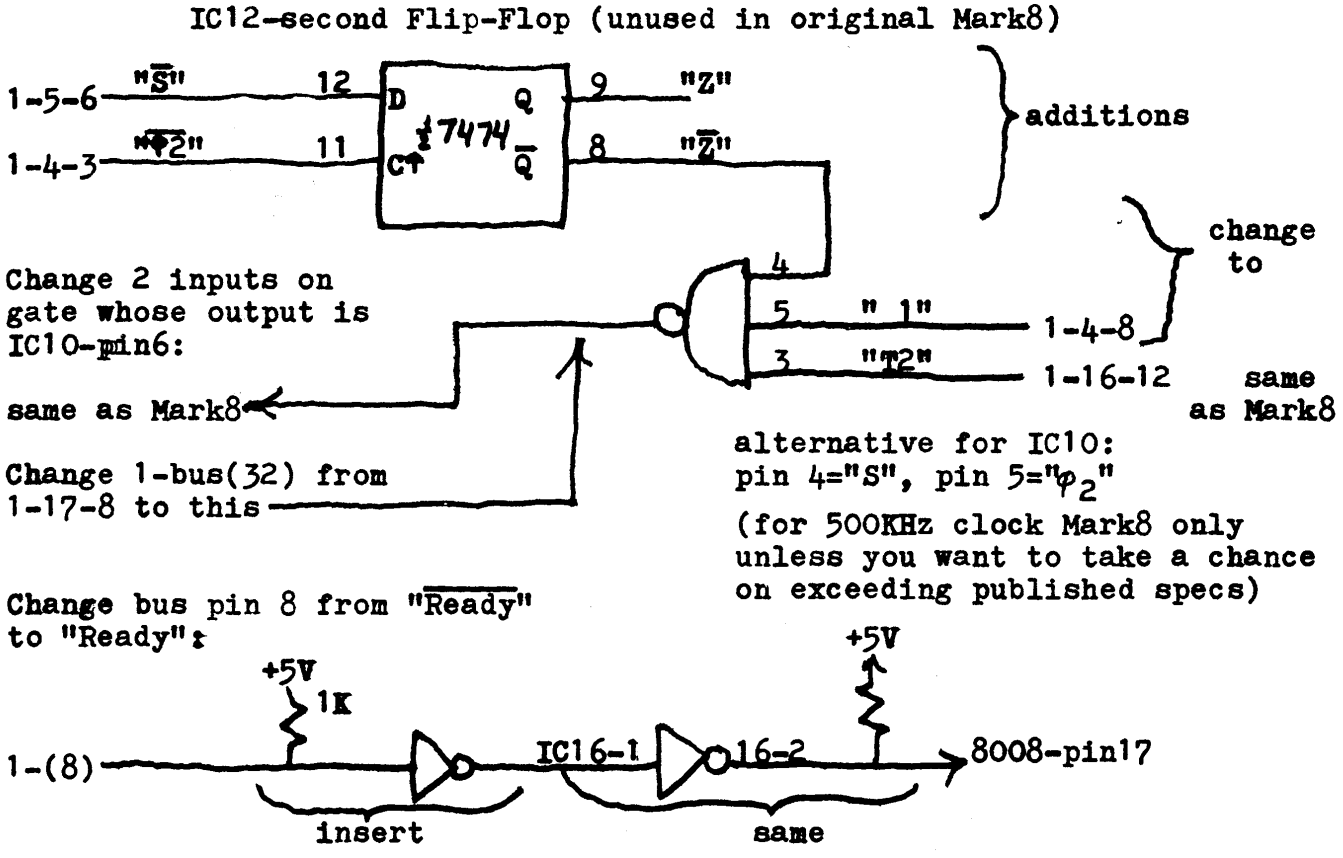
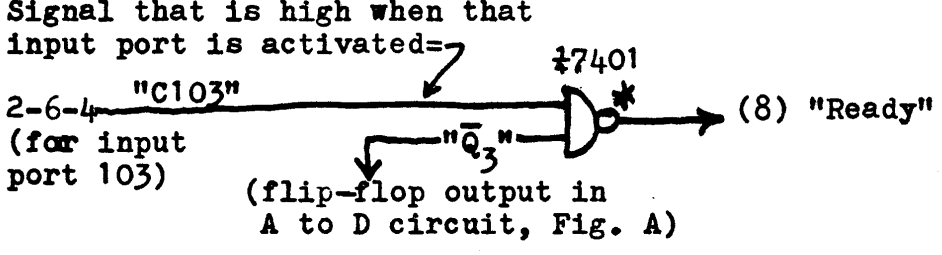
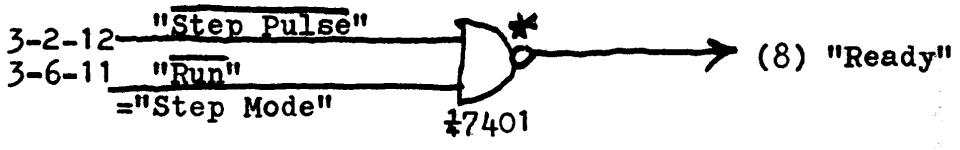


Fig. C "WAIT CIRCUIT" : Injects a "Wait" signal when octal 103 is executed and the A to D converter circuit is not finished.

Multiplexer Board:



Address Board (#3) modification:



Note: with this open-collector "Ready" bus, any number of I/O ports can be made to cause the Mark8 to wait until they are ready for data to be transmitted. This will greatly simplify the programming when doing I/O to one device at a time. Even I/O to many devices simultaneously can be simplified by setting up one input port to input up to 8 "device ready to transmit data byte" signals, and using a loop that uses JTZ instruction to terminate looping when a "1" bit from one of the devices occurrs.

Also note that some sort of circuit at least similar to this must be used in order to allow memories with access times greater than 1.5us to be used with the Mark8.

Thomas R. Amoth, 228 Fox Rd., Media, Pa., 19063, ph:(215)566-1068, rev.7/9/75

Fig. D FLOW CHART for Flip-flop States (of this A to D Converter)