WISCONSIN COMPUTER SOCIETY

NEWSLETTER

Volume #2, Issue #6 June 1977 Don Stevens, Editor

MEETING NOTICE

Our meeting will be held at 1:00 p.m., June 4, 1977 at the University of Wisconsin - Parkside, Kenosha, Wisconsin (Room #125, Communications Arts Building)

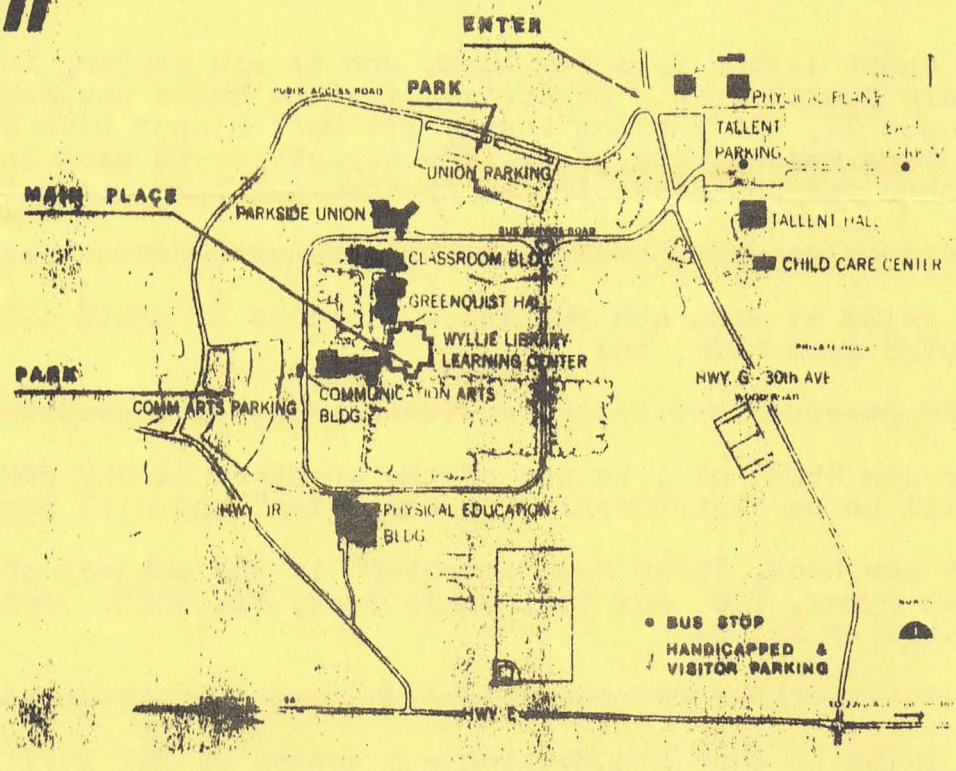
PROGRAM AGENDA

There will further discussion on the "organization of our group into a non-profit - tax deductible type organization". There will be a general discussion period in which programs for future meetings will be discussed. This meeting will be shorter than usual because we want all members to have time to attend the:

University of Wisconsin - Parkside COMPUTER FAIR which takes place from (9:00 a.m. to 5:00 p.m.) at the "MAIN PLACE".

UWP COMPUTER FAIR

University of Wisconsin-Parkside



Your Editor recently visited Heathkit in Benton Harbor, Michigan. Thru a little detective work, I was informed that Heathkit will be introducing Microcomputer Kits in August of this year. One Kit will be based on the 8080 chip and the other on the LSI-11 board.

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RCA announces the availability of their "Manual on Portable, Hand-Held, Microcomputer Data Terminal, COSMAC Microterminal CDP18S021". The 28 page MPM-212 Manual can be purchased for $2.00 from RCA Solid State Division, Box 3200, Somerville, New Jersey 08876.

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Digital Designs, Box 4241, Victoria, Texas, 77901, announces the availability of the "SCROLLER", a full function scrolling mod board for the CT-1024. Price of board and all components, etc. is $20.00

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Paratronics, Inc., announces a special 21% discount offer for the Model 100A Logic Analyzer, featured on the cover of the February 1977 issue of Popular Electronics. Regular price is $189.00 - Special group purchase price is $149.00.

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PERSONAL COMPUTING SHOW - The world's largest Holiday Inn at Chicago O'Hare International Airport is the setting for the next Personal Computing Show to be held Thursday, Friday, October 27, 28, and 29.

****

Received a short letter from Tom Luck, who is now working for General Electric, APO Seattle, WA. He advised that he has a new computer system now - Cromenco Z2, TDL monitor board, PTC Dual Floppy Disk System, PTC VDM board, Tape Reader, etc.,etc. Tom expects to be back in Wisconsin around October and would be pleased to show off his system to our group.

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ATTENDANCE PRIZE at June 4th Meeting - 4 copies of APRIL 1977 issue of COMPUTER NOTES from MITS, Inc.

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Club member Jim White will be one of the speakers at UWP COMPUTER FAIRE. His talk will be on "Introduction to Computing" and will begin at 9:30 a.m.

Jim White's new book, "Your Home Computer" is the subject of a News Release from Dymax, P.O. Box 310, Menlo Park, CA.94025. Price of Jim's book is listed at $6.00.

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ATTENDANCE PRIZE at June 4th Meeting - 4 copies of MAY 1977 issue of COMPUTER NOTES from MITS, Inc.

OCTAL - Find a "MATCH" Program

by Bob Engels & Don Stevens

```
012000/ 041 LXI   H 100000
012003/ 072 LDA     012043
012006/ 062 STA     012042
012011/ 021 LXI   D 012141
012014/ 032 LDAX  D
012015/ 117 MOV   C A
012016/ 032 LDAX  D
012017/ 276 CMP   M
012020/ 312 JZ      012044
012023/ 072 LDA     012043
012026/ 062 STA     012042
012031/ 176 MOV   A M
012032/ 271 CMP   C
012033/ 312 JZ      012011
012036/ 043 INX   H
012037/ 303 JMP     012011
012042/ 003 INX   B
012043/ 003 INX   B
012044/ 023 INX   D
012045/ 043 INX   H
012046/ 072 LDA     012042
012051/ 075 DCR   A
012052/ 062 STA     012042
```

```
012055/ 302 JNZ       012016
012060/ 345 PUSH  H
012061/ 321 POP   D
012062/ 162 MOV   M D
012063/ 315 CALL      012112
012066/ 163 MOV   M E
012067/ 315 CALL      012112
012072/ 353 XCHG
012073/ 365 PUSH  PSW
012074/ 076 MVI   A   015
012076/ 315 CALL      054000
012101/ 076 MVI   A   012
012103/ 315 CALL      054000
012106/ 361 POP   PSW
012107/ 303 JMP       012011
012112/ 176 MOV   A M
012113/ 007 RLC
012114/ 007 RLC
012115/ 346 ANI       003
012117/ 315 CALL      012134
012122/ 176 MOV   A M
012123/ 017 RRC
012124/ 017 RRC
012125/ 017 RRC
012126/ 315 CALL      012132
012131/ 176 MOV   A M
012132/ 346 ANI       007
012134/ 366 ORI       060
012136/ 303 JMP       054000
012141/ 315 CALL      050000
```

OCTAL - Find a "MATCH" Program

This program searches thru memory for all data that is a "MATCH" to data entered at beginning location 012141 thru XXXXXX depending on the number entered in location 012043. When a "MATCH" is found, it prints out the address immediately following the locations in which it has found a "MATCH" to data stored at location 012141 thru XXXXXX. This process continues thru memory. When the first address printed repeats itself, you have completed test of entire 64K of memory.

This program can be relocated any place in memory.

In the above program, CALL 054000 and JMP 054000 are the address locations on my "Data Out" routine.

Location 012000 - LXI H 100000 should be changed to beginning address of area to be searched for "MATCH" of Data.

Location 012043 - 003 INX B should be changed to agree with the number of memory locations in the "MATCH" data. Note: In this program, 003 is the number of locations occupied by the the "MATCH" data which is CALL 050000.

Location 012141 - CALL 050000 should be changed to the desired "MATCH" data.

HEX - Find a "MATCH" Program

This program searches thru memory for all data that is a "MATCH" to data entered at beginning location 0A61 thru XXXX depending on the number entered in location 0A23. When a "MATCH" is found, it prints out the address immediately following the locations in which it has found a "MATCH" to data stored at location 0A61 thru XXXX. This process continues thru memory. When the first address printed repeats itself, you have completed test of entire 64K of memory.

This program can be relocated any place in memory.

In the following program, CALL 2800 and JMP 2800 are the address locations of my "Data Out" routine.

Location 0A00 - LXI H 4000 should be changed to beginning address of area to be searched for "MATCH" of Data.

Location 0A23 - 03 INX B should be changed to agree with the number of memory locations in the "MATCH" Data. Note: In this program, 03 is the number of locations occupied by the "MATCH" data which is CALL 2800.

Location 0A61 - CALL 2800 should be changed to the desired "MATCH" data

DEX - Find a "MATCH" Program

by Don Stevens & Bob Engels

```
0A00/ 21 LXI   H  4000
0A03/ 3A LDA      0A23
0A06/ 32 STA      0A22
0A09/ 11 LXI   D  0A61
0A0C/ 1A LDAX  D
0A0D/ 4F MOV   C A
0A0E/ 1A LDAX  D
0A0F/ BE CMP   M
0A10/ CA JZ       0A24
0A13/ 3A LDA      0A23
0A16/ 32 STA      0A22
0A19/ 7E MOV   A M
0A1A/ B9 CMP   C
0A1B/ CA JZ       0A09
0A1E/ 23 INX   H
0A1F/ C3 JMP      0A09
0A22/ 03 INX   B
0A23/ 03 INX   B
0A24/ 13 INX   D
0A25/ 23 INX   H
0A26/ 3A LDA      0A22
0A29/ 3D DCR   A
0A2A/ 32 STA      0A22
```

```
0A2D/ C2 JNZ      0A0E
0A30/ E5 PUSH  H
0A31/ D1 POP   D
0A32/ 72 MOV   M D
0A33/ CD CALL     0A4A
0A36/ 73 MOV   M E
0A37/ CD CALL     0A4A
0A3A/ EB XCHG
0A3B/ F5 PUSH  PSW
0A3C/ 3E MVI   A  0D
0A3E/ CD CALL     2C00
0A41/ 3E MVI   A  0A
0A43/ CD CALL     2C00
0A46/ F1 POP   PSW
0A47/ C3 JMP      0A09
0A4A/ 7E MOV   A M
0A4B/ 0F RRC
0A4C/ 0F RRC
0A4D/ 0F RRC
0A4E/ 0F RRC
0A4F/ CD CALL     0A53
0A52/ 7E MOV   A M
0A53/ E6 ANI      0F
0A55/ C6 ADI      30
0A57/ FE CPI      3A
0A59/ DA JC       0A5E
0A5C/ C6 ADI      07
0A5F/ C3 JMP      2C00
0A61/ CD CALL     2800
```

GOOD READING - Articles of interest

COMPUTER DESIGN - April 1977 "Microcomputer Interfacing" - What is a Logical Instruction. This article covers logical operations of the 8080

AMERICAN LABORATORY - April 1977 "Microcomputer Interfacing". This article covers interfacing computer to 10 bit DAC.

EDN - April 20, 1977 "Let assignment statements handle the soft-computation dirty work". This article covers BASIC Software programming.

ELECTRONIC DESIGN - April 12, 1977 "Taking advantage of the 8080 and 680 data manipulation capabilities". The circuits ability to handle arrays can simplify many data handling applications.

"Programming Controller for the 2708 EPROM copies data in-circuit".

EDN - April 5, 1977 "Programmable peripheral interface IC's boost your Microcomputer flexibility". This article describes the 8255 chip interface in detail.

"Talking computerese?" First learn the "ins" and "outs" of I/O. A good article on "BASIC" programming.

"BCD to Binary conversion routine". This article lists BCD to Binary conversion routine for the 6800.

ELECTRONIC DESIGN - April 26, 1977 "Exchange Data between digital systems", simultaneously with a full duplex interfacing circuit. Describes interfaco circuit for connecting data systems up to one mile away without a Modem.

EDN - May 5, 1977 "Conditional commands - the if's, and's, and but's of software". Article on BASIC Software programming - covers GOTO, FOR, NEXT, and IF statements.

"Design a low cost CRT terminal around a single chip "CPU" - article describes new chip produced by MOSTEK (MK-3870)

"The design of a home security system" lets you apply the concepts of top-down programming. The assembly code is written for a 8080 based microcomputer.

"Cut A/D conversion costs by using software and D/A converters". Memory mapped I/O helps eliminate the interface circuits normally needed.

ELECTRONIC DESIGN - May 10, 1977 "Real time systems often use interrupts to service I/O devices in order of importance, and blocks of data can be moved quickly by direct memory access

COMPUTER DESIGN - May 1977 "Microcomputer Interfacing" - The 8080 Logical Instructions.

AMERICAN LABORATORY - May 1977 "Microcomputer Interfacing - Using A/D convertors.

EDN - May 20, 1977 "Transfer Commands - a "branching bunch" of subrou... executors" - Article on BASIC programming transfer commands.

ELECTRONIC DESIGN - May 24, 1977 "Optimize transducer/computer interfaces with these six easy steps, and get the quality of data and number of useful bits needed for the computer input.

TEXT

8080 COLUMN

WELL IT SEEMS THAT NOW WITH THE BIG PUSH ON, I'VE FINALLY BROKEN DOWN AND HAVE DECIDED TO CONTRIBUTE TO OUR NEWSLETTER. THIS MONTH I WILL ATTEMPT TO SHOW SOME MEMORY TEST PROGRAMS AND PROCEDURES.

AFTER ALL, WHAT DOES EVERY MAINFRAME NEED AND USE EXTENSIVELY? MEMORY IS THE ANSWER AND WITHOUT PROPERLY FUNCTIONING MEMORY SOME VERY FUNNY (FUNNY WEIRD, NOT FUNNY HA HA) THINGS OCCUR.

ONE VERY BASIC YET SIMPLE TEST PROCEDURE IS TO WRITE ALL ZEROS IN A PREDESIGNATED BLOCK OF MEMORY, GO BACK TO THE BEGINNING AND CHECK THE VALIDITY AND PRESENCE OF CORRECT DATA. THEN DO THE SAME THING EXCEPT WRITE ALL ONES. THIS WOULD CHECK FOR BLATANT ERRORS SUCH AS BAD MEMORY CHIPS, OUTPUTS OR INPUTS OF CHIPS SHORTED (VIA SOLDER BRIDGES) OR MOST ANY OTHER OBVIOUS MISTAKES. THIS DOES NOT CHECK ADDRESS DECODING AS MENTIONED IN A PREVIOUS NEWSLETTER (VOL#2 ISSUE#2) IN WHICH AN ARTICLE BY TOM DOYLE BREIFLY OUTLINED. A RUDIMENTARY PROGRAM TO CHECK THIS IS ASSEMBLED FURTHER ON.

A MORE COMPREHENSIVE TEST PROGRAM APPEARED IN P.E. MAR '77 ISSUE WRITTEN BY THE NOW INFAMOUS HAL CHAMBERLIN (OF THE COMPUTER HOBBYIST FAME). THIS PROGRAM CHECKED GENERAL MEMORY, ADDRESS DECODE, AND PATTERN SENSITIVITY (SOMEWHAT) BY NOT WRITING ALL ONES OR ZEROS BUT USED A PSEUDO RANDOM NUMBER GENERATOR (R.N.G.) TO WRITE AND READ FROM. BY USING THE SAME PSEUDO R.N.G. SEED YOU CAN GENERATE THE SAME SERIES OF RANDOM NUMBERS. I HIGHLY RECOMMEND THIS ARTICLE TO ANYONE INTERESTED AS IT IS QUITE GOOD AND COMES WITH AN ASSEMBLED SOURCE LISTING.

FINALLY MY FAVORITE IS A MEMORY TEST WRITTEN BY JON WALDEN FOR THE PRO TECH 4K MEMORY BOARDS. THIS PROGRAM IS QUITE COMPENTENT FOR AS IN PHASE 1 IT WRITES AND CHECKS FIRST ZEROS, ONES, THEN AGAIN ZEROS WHICH CHECKS FOR OUTLANDISH AND OBVIOUS PROBLEMS. IN PHASE 2 IT PERFORMS A MORE COMPREHENSIVE TEST BY FLOATING A 1 BIT THRU A SEA OF ZEROS, THEN A ZERO BIT THRU A 4K SEA OF ONES.

THIS CHECKS ADDRESS DECODING AND SOMETHING OLD MEMORY DESIGNERS CALL "PATTERN SENSITIVITY". PATTERN SENSITIVITY IS DATA , A ONE OR A ZERO, TRANSFERRING OVER TO AN ADJACENT CELL (WITHIN THE SAME MEMORY CHIP). THIS IS PARTLY DUE TO THE ACTUAL LAYOUT OF THE IC DIE. WITH THE NEWER MEMORIES OF TODAY AND MORE EXPERIENCE UNDER THE DESIGNER'S BELTS, PATTERN SENSITIVITY IS NOT VERY COMMON. HOWEVER PHASE 2 OF THIS TEST PROGRAM DOES CHECK FOR IT.

PLEASE NOTE THAT BY NO MEANS ARE THESE PROGRAMS COMPLETE WITH DIAGNOSTICS SAYING WHAT CHIP IS BAD OR PRINTING ADDRESS, CORRECT VALUE CURRENT VALUE. ALMOST ALL OF THESE PROGRAMS WHEN RUNNING INTO AN ERROR JUMP BACK ON TO THEMSELVES IN AN INFINITE LOOP. IF SUCH FEATURES ARE DESIRED THEN YOU MUST INCORPORATE THEM INTO THE PROGRAM BY CALL'S TO YOUR DUMP ROUTINES WITHIN YOUR MONITOR OR OPERATING SYSTEM.

IF ANY OF YOU OUT THERE FEEL AMBITIOUS AND DECIDE TO DO SO WE WILL BE MORE THAN HAPPY TO PUBLISH THE PROGRAM. AND AS A CLOSING THOUGHT, IF ENOUGH INTEREST IS GENERATED, I WOULD LIKE TO WRITE A CLUB 8080 MONITOR WITH HELP FROM THE 8080 USERS. KEEP IN MIND THAT IT WON'T BE A SUPER ALS-8 BUT ENOUGH OF AN EXEC TO HANDLE MOST OF THE SIMPLE CHORES AND DRUDGERY OF MAKING A SMALL SYSTEM BEARABLE.

```
ASSMS 1000

1000                    0005 * THIS MEMORY TEST PROGRAM IS WRITTEN USING
1000                    0007 * TOM DOYLE'S OUTLINE PRESENTED IN NEWSLETTER
1000                    0010 * (VOL#2 ISSUE#2).  DON'T FORGOT LXI SP,XXXXH IF
1000                    0015 * THIS MODULE IS RUN ALONE. NOTE START ADDRESS
1000                    0020 * CAN BE ANY 4 HEX BYTE VALUE BUT STOP CAN ONLY
1000                    0025 * BE A 2 HEX BYTE PAGE ADDRESS(I.E.  01,02,03,ETC)
1000                    0030 * WRITTEN BY J.  KUCAN ON ALS-8
1000                    0035 START  EQU    0D700H  *ANY 16 BIT START VALUE
1000                    0040 STOP   EQU    0D8H    *IF TO CHECK 1K BYTES
1000 01 00 00           0045        LXI    B,0H    *C=CHECKBYTE
1003 11 00 D7           0050        LXI    D,START *D,E=CHECKBYTE LOCATION
1006 CD 36 10           0055        CALL   CLEAR
1009 21 00 D7           0060 STRT   LXI    H,START *H,L=RUNNING ADDRESS
100C 7E                 0065        MOV    A,M
100D B7                 0070        ORA    A       *TEST A AND FLAGS
100E C4 43 10           0075        CNZ    SPECL
1011 23                 0080        INX    H
1012 7C                 0085        MOV    A,H
1013 FE D8              0090        CPI    STOP
1015 C2 0C 10           0095        JNZ    STRT+3
1018 CD 36 10           0100        CALL   CLEAR
101B 13                 0105        INX    D
101C 7A                 0110        MOV    A,D
101D FE D8              0115        CPI    STOP
101F CC 27 10           0120        CZ     CHANIT
1022 79                 0125        MOV    A,C
1023 12                 0130        STAX   D
1024 C3 09 10           0135        JMP    STRT
1027 06 40              0136 CHANIT MVI    B,40H   *TELL YOU CHECKBYTE UPDATED
1029 D3 01              0137        OUT    1        *OR TO YOUR OUTPUT PORT
102B 0C                 0140        INR    C
102C 79                 0145        MOV    A,C
102D FE 00              0150        CPI    0H      *HAVE TESTED ALL CHECKBYTES?
102F CA 56 10           0155        JZ     END
1032 11 00 D7           0175        LXI    D,START
1035 C9                 0180        RET
1036 21 00 D7           0185 CLEAR  LXI    H,START
1039 AF                 0190        XRA    A       *CLEAR A
103A 77                 0195        MOV    M,A
103B 23                 0200        INX    H
103C 7C                 0205        MOV    A,H
103D FE D8              0210        CPI    STOP
103F C2 39 10           0215        JNZ    CLEAR+3
1042 C9                 0220        RET
1043 B9                 0225 SPECL  CMP    C       *IS SAME AS CHECKBYTE?
1044 C2 52 10           0230        JNZ    ERROR
1047 7D                 0235        MOV    A,L
1048 BB                 0240        CMP    E       *IS @ RIGHT LO ADDRESS?
1049 C2 52 10           0245        JNZ    ERROR
104C 7C                 0250        MOV    A,H
104D BA                 0255        CMP    D       *IS @ RIGHT HI ADDRESS?
104E C2 52 10           0260        JNZ    ERROR
1051 C9                 0265        RET
1052 06 5F              0270 ERROR  MVI    B,5FH *PRINT ERROR INDICATOR
1054 D3 01              0275        OUT    1
1056 C3 56 10           0277 END    JMP    END

CHANI   1027    CLEAR   1036    END     1056    ERROR   1052
SPECL   1043    START   D700    STOP    00D8    STRT    1009
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```
FILE

CHEKR 0200  0985
ASSMS 2:0_000 4567

2000                    0001 * THIS IS BASICLY A REWRITE OF THE PROGRAM
2000                    0002 * OFFERED IN SCCS INTERFACE (VOL 1 #2) BY JON
2000                    0003 * WALDEN TO CHECK PRO TECH 4K MEMORY BOARDS
2000                    0004         ORG    2000H
2000                    0005 ERRIR   DS     8
2008 11 00 04           0006 FST     LXI    D,0400H
200B 01 00 00           0007 NXT1B   LXI    B,START
200E 7B                 0008 NXT1A   MOV    A,E
200F 02                 0009         STAX   B
2010 60                 0010         MOV    H,B
2011 69                 0011         MOV    L,C
2012 03                 0012         INX    B
2013 BE                 0013         CMP    M
2014 CA 23 20           0014         JZ     OK1
2017 31 08 20           0015         LXI    6,FST
201A E5                 0016         PUSH   H
201B 66                 0017         MOV    H,M
201C 6F                 0018         MOV    L,A
201D E5                 0019         PUSH   H
201E E1                 0020         POP    H
201F E1                 0021         POP    H
2020 C3 20 20           0022 ER1     JMP    ER1
2023 79                 0023 OK1     MOV    A,C
2024 FE 00              0024         CPI    0
2026 C2 0E 20           0025         JNZ    NXT1A
2029 78                 0026         MOV    A,B
202A FE 10              0027         CPI    STOP
202C C2 0E 20           0028         JNZ    NXT1A
202F 7A                 0029         MOV    A,D
2030 1F                 0030         RAR
2031 DA 3B 20           0031         JC     SECND
2034 57                 0032         MOV    D,A
2035 7B                 0033         MOV    A,E
2036 2F                 0034         CMA
2037 5F                 0035         MOV    E,A
2038 C3 0B 20           0036         JMP    NXT1B
203B 3A 05 20           0037 SECND   LDA    FST-3
203E 67                 0038         MOV    H,A
203F 3A 04 20           0039         LDA    FST-4
2042 BC                 0040         CMP    H
2043 C2 C4 20           0041         JNZ    END
2046 56                 0042         MOV    D,M
2047 1E 01              0043         MVI    E,01H
2049 01 FF FF           0044 NXT2B   LXI    B,START-1
204C 03                 0045 NXT2A   INX    B
204D 7B                 0046         MOV    A,E
204E 02                 0047         STAX   B
204F 21 FF FF           0048         LXI    H,START-1
2052 23                 0049 OK2     INX    H
2053 79                 0050         MOV    A,C
2054 BD                 0051         CMP    L
2055 C2 5E 20           0052         JNZ    GO1
2058 78                 0053         MOV    A,B
2059 BC                 0054         CMP    H
205A C2 5E 20           0055         JNZ    GO1
205D 23                 0056         INX    H
205E 7D                 0057 GO1     MOV    A,L
205F FE 00              0058         CPI    0
2061 C2 6A 20           0059         JNZ    GO2
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```
2064 7C                 0060          MOV     A,H
2065 FE 10              0061          CPI     STOP
2067 CA 7D 20           0062          JZ      BIT
206A 7A                 0063 GO2      MOV     A,D
206B BE                 0064          CMP     M
206C CA 52 20           0065          JZ      OK2
206F 31 08 20           0066          LXI     6,FST
2072 D5                 0067          PUSH    D
2073 C5                 0068          PUSH    B
2074 E5                 0069          PUSH    H
2075 66                 0070          MOV     H,M
2076 6A                 0071          MOV     L,D
2077 E5                 0072          PUSH    H
2078 E1                 0073          POP     H
2079 E1                 0074          POP     H
207A C2 7A 20           0075 ER2      JMP     ER2
207D 3A 01 20           0076 BIT      LDA     FST-7
2080 67                 0077          MOV     H,A
2081 3A 00 20           0078          LDA     FST-8
2084 BC                 0079          CMP     H
2085 C2 C4 20           0080          JNZ     END
2088 7A                 0081          MOV     A,D
2089 02                 0082          STAX    B
208A 79                 0083          MOV     A,C
208B FE FF              0084          CPI     0FFH
208D C2 4C 20           0085          JNZ     NXT2A
2090 78                 0086          MOV     A,B
2091 FE 0F              0087          CPI     STOP-1
2093 C2 4C 20           0088          JNZ     NXT2A
2096 AF                 0089          XRA     A
2097 BA                 0090          CMP     D
2098 7B                 0091          MOV     A,E
2099 C2 BF 20           0092          JNZ     LST
209C FE 80              0093          CPI     80H
209E CA A6 20           0094          JZ      NEW
20A1 07                 0095 ROT      RLC
20A2 5F                 0096          MOV     E,A
20A3 C3 49 20           0097          JMP     NXT2B
20A6 16 FF              0098 NEW      MVI     D,0FFH
20A8 1E FE              0099          MVI     E,0FEH
20AA 01 00 00           0100          LXI     B,START
20AD 7A                 0101 STORE    MOV     A,D
20AE 02                 0102          STAX    B
20AF 03                 0103          INX     B
20B0 79                 0104          MOV     A,C
20B1 FE 00              0105          CPI     0
20B3 C2 AD 20           0106          JNZ     STORE
20B6 78                 0107          MOV     A,B
20B7 FE 10              0108          CPI     STOP
20B9 C2 AD 20           0109          JNZ     STORE
20BC C3 49 20           0110          JMP     NXT2B
20BF FE 07              0111 LST      CPI     07H
20C1 C2 A1 20           0112          JNZ     ROT
20C4 C3 C4 20           0113 END      JMP     END
20C7                    0114 STOP     EQU     10H
20C7                    0115 START    EQU     00H

BIT      207D    END      20C4    ER1      2020    ER2      207A
ERRIR    2000    FST      2008    GO1      205E    GO2      206A
LST      20BF    NEW      20A6    NXT1A    200E    NXT1B    200B
NXT2A    204C    NXT2B    2049    OK1      2023    OK2      2052
ROT      20A1    SECND    203B    START    0000    STOP     0010
STORE    20AD
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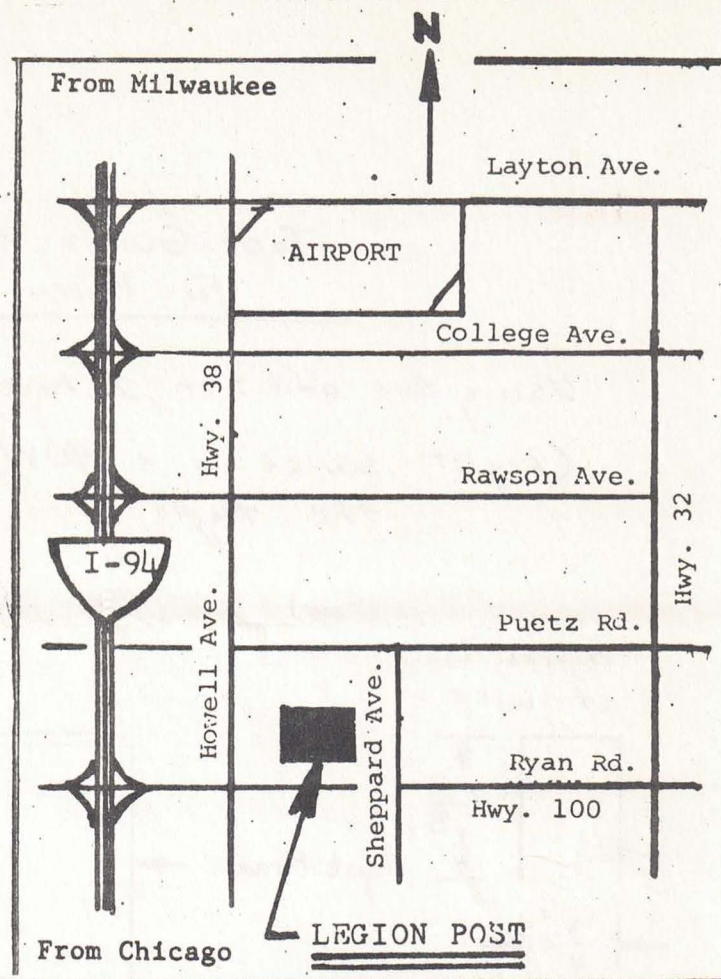
The South Milwaukee Amateur Radio Club will be the Host to "SWAPFEST 77" on Saturday, July 9, beginning at 7:00 a.m., at the American Legion Post 434, in Oak Creek, Wisconsin

food ! prizes ! happy hour !

ELECTRONIC FLEA MARKET

buy sell swap



Report on the Raeco Paper Tape Reader

The Raeco paper tape reader must truly be one of the better buys in personal computing. After using mine for more than a month now, I would definitely recommend it to everyone, since it has performed flawlessly for my needs. The only difficulty with the unit is easily corrected for about 10 cents worth of material and 5 minutes of labor. (See "Tape Guide Hold Down Improvement For Raeco Paper Tape Reader" in this issue)

Several hints to help others achive the excellent (none yet) read error performance I have experienced are:

1. When adjusting the light source (height and position), set up the computer to display the input port at which the tape data is available. (the center hole status LED on the tape reader can be operating perfectly while one or two of the data bits may have marginal or too much light). Use the same tape you plan to read to set the light and verify that the processor will get the right data, hole for hole.

2. Look out for older grey fan-fold tapes, especially if they are faded, as you may get read errors at the folds. (Too much light can leak through the faded folds).

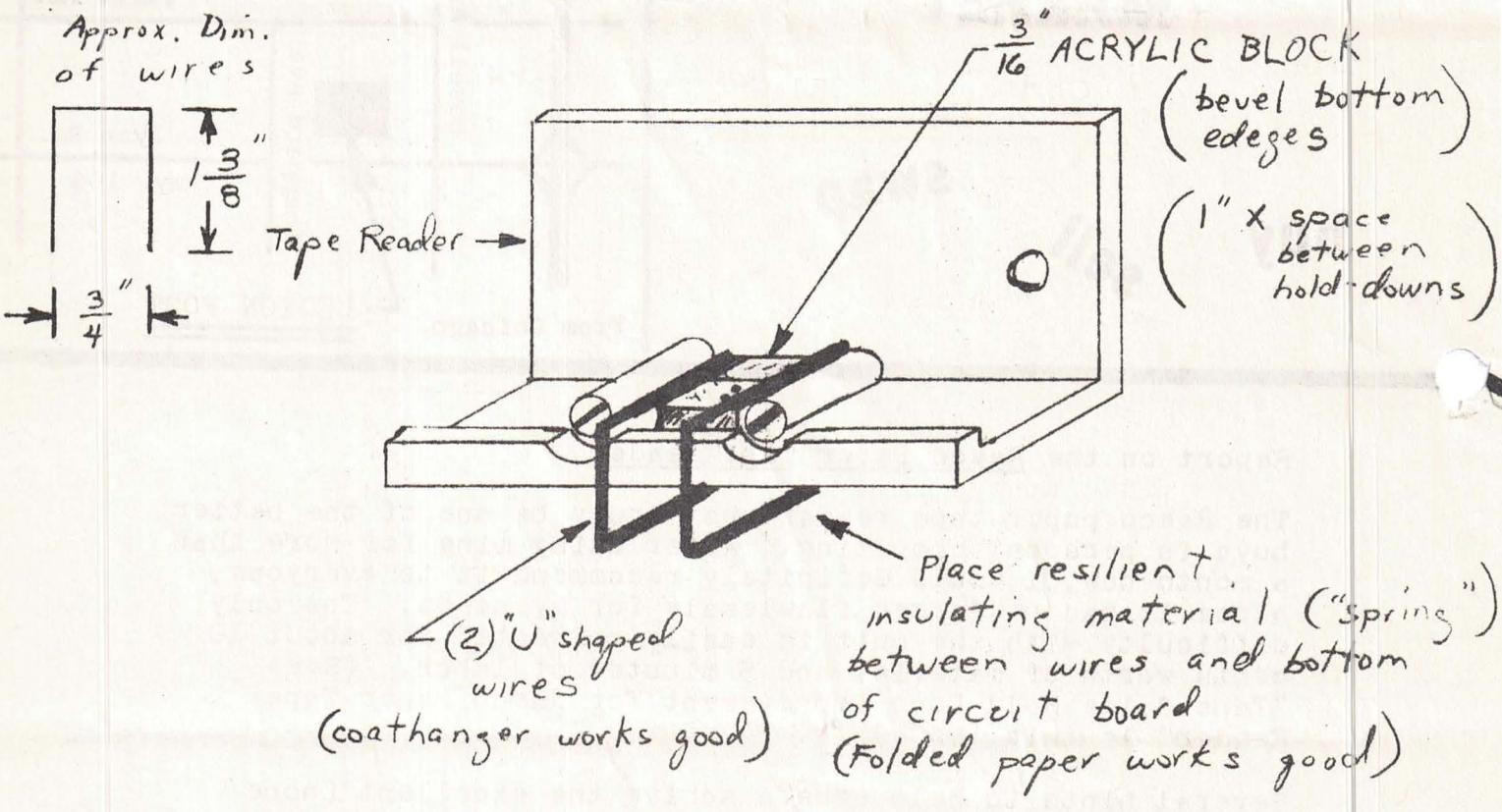
3. Keep tapes clean (use a box to catch the tape-not a dirty floor).

Dave Saar

5-6-77 A. Saal

Tape Guide Hold Down Improvement For Raeco Paper Tape Reader

Using this addition, I have not had a single read error. (Light source is a 40W incandesant lamp about 8-10" above the tape)



There should be just enough material between the wires and the PC board to give a light drag to the tape as it is pulled through.

Note: Use masking tape to hold the wires to the "spring" in the correct position. Wires should be seated in the gap between the acrylic block and the hold down rods.

Intel Format Checksum Paper Tape Loader with Verity

(A revised and appended version of Processor Technology's "5K BASIC Intel Format Paper Tape Loader")

Dave Saar
5-6-77

(Assembled for Processor Technology 5K BASIC)

BEGIN	XRA A	COMPUTE ZERO	18 00	AF
	MOV B,A	INITILIZE CHECHSUM REGISTER	01	47
	LXI SP	SET STACK POINTER TO (TOP OF MEMORY +1)	02	31 00 2
	CALL READ		05	CD 08 18
READ	CALL TTYIN	GET AN ASCII CHAR FROM TAPE	08	CD 59 18
	CPI ":"	IS IT A RECORD MARK?	0B	FE 3A
	JNZ READ	IF NOT A RECORD MARK, LOOP TILL IS	0D	C2 08 1
	CALL CHAR	GET RECORD LENGTH	10	CD 3E 18
	MOV D,A	LOAD RECORD LENGTH COUNTER	13	57
	RZ	IF RECORD LENGTH ZERO-DONE JUST PUT TAPE ON SCREEN NOW	14	C8
	ADD B	FOR THE CHECKSUM	15	80
	MOV B,A	SAVE THE ADD IN CHECKSUM REGISTER	16	47
	CALL CHAR	GET HIGH BYTE OF LOAD ADDR.	17	CD 3E 18
	MOV H,A	PUT IN LOAD ADDR. POINTER	1A	67
	ADD B	FOR THE CHECKSUM	1B	80
	MOV B,A	SAVE IN CHECKSUM REGISTER	1C	47
	CALL CHAR	GET LOAD ADDR LOW BYTE	1D	CD 3E 18
	MOV L,A	PUT IN ADDR. POINTER	20	6F
	ADD B	FOR THE CHECKSUM	21	80
	MOV B,A	SAVE CHECKSUM	22	47
	CALL CHAR	WASTE THE RECORD TYPE	23	CD 3E 1
LOOP	CALL CHAR	GET THE FIRST TWO ASCII AND CONVERT TO A BYTE	26	CD 3E 1
	MOV M,A	PUT BYTE IN MEM AT H-L	29	77
	INX H	NEXT ADDR TO LOAD	2A	23
	ADD B	FOR CHECKSUM	2B	80
	MOV B,A	SAVE CHECKSUM	2C	47
	DCR D	DECREASE RECORD LENGTH COUNTER	2D	15
	[illegible] LOAD	IF RECORD LENGTH COUNTER	2E	C2 26

	IN 01	RESET UART DAV FLAG	18 97	DB 01
	JMP BEGIN	START OVER	99	C3 00 1
	NOTE:	To use the Verify		
		mode made the		
		following changes at		
		1829, 182A, and 182B		
	JMP VRFY	substitutes verify for load	1829	C3 81 1

PAPER TAPE LOADER FOR PROCESSOR TECH 5K BASIC

This program is a revised and appended version of the paper tape loader program included wirh Processor Technologys 5K BASIC. It takes advantage of the checksum that is on the tape, and allows verifying memory against the tape (a very good memory test also). To use, I/O port addresses and mask words should be changed to match your system in the subroutines TTYIN, OFF,RDERR, and VFERR. This program assumes 8K of memory, CRT terminal (1200 baud or faster is desirable) with status on port 0 and data on port 1, and a paper tape reader with data on port 2 and status on port 3.

The tape data is written to the screen as it is recieved from the reader. If the filling of the screen stops, an error has occured and the processor is waiting in loop for the tape to back up and the character "Escape" to be entered at the keyboard. Before continuing to re-read or skip the record in which the error occured, check the load address on the screen, since, if the read error occured there, it may have bombed an eariler part of the program being loaded.

To use the verify mode, change the program as shown on page 4 and start the processor at addr. 1800. If the processor hangs up in an error loop in the verify mode, first try hitting any key other than "Escape". If this clears the loader (watch the front panel lights), there was a verify error (memory dosent match the tape)(have your spare memory chips handy). If only "Escape" clears the loader, there was a checksum error in reading the tape.

UNIVERSAL CODE CHART FOR DATA COMMUNICATIONS

	8-BIT ASCII		7-BIT ASCII		EVEN PARITY ASCII		ODD PARITY ASCII		EBCDIC		6-BIT TRANSCODE		6-BIT TYPESETTER		EBCD		SELECTRIC		FIELD DATA		BAUDOT	
	BINARY	HEX	BINARY	HEX	BINARY	HEX	BINARY	HEX	BINARY	HEX	BINARY	HEX	BINARY	HEX	BINARY C 12 4 8 A 8	HEX	BINARY C 12 4 8 A 8	HEX	BINARY	HEX	BINARY	HEX
A	11 000 001	C1	1 000 001	41	01 000 001	41	11 000 001	C1	11 000 001	C1	000 001	01	000 011	03	0 100 011	23	1 111 001	79	000 110	06	–	00 011
B	11 000 010	C2	1 000 010	42	01 000 010	42	11 000 010	C2	11 000 010	C2	000 010	02	011 001	19	0 100 011	13	1 110 110	76	000 111	07	?	11 001
C	11 000 011	C3	1 000 011	43	01 000 011	C3	11 000 011	C3	11 000 011	C3	000 011	03	001 110	0E	1 100 011	73	1 111 010	7A	001 000	08	:	01 110
D	11 000 100	C4	1 000 100	44	01 000 100	44	11 000 100	C4	11 000 100	C4	000 100	04	001 001	09	0 100 011	98	0 101 010	2A	001 001	09	$	01 001
E	11 000 101	C5	1 000 101	45	01 000 101	C5	11 000 101	C5	11 000 101	C5	000 101	05	000 001	01	1 101 011	58	1 001 010	4A	001 010	0A	3	00 001
F	11 000 110	C6	1 000 110	46	01 000 110	C6	11 000 110	C6	11 000 110	C6	000 110	06	001 101	0D	1 011 011	53	1 110 011	73	001 011	0B	!	01 101
G	11 000 111	C7	1 000 111	47	01 000 111	47	11 000 111	C7	11 000 111	C7	000 111	07	011 010	1A	0 111 011	38	0 100 011	23	001 100	0C	8	11 010
H	11 001 000	C8	1 001 000	48	01 001 000	48	11 001 000	C8	11 001 000	C8	000 000	08	010 100	14	0 000 111	67	0 100 110	26	001 101	0D	=	10 100
I	11 001 001	C9	1 001 001	49	01 001 001	C9	11 001 001	C9	11 001 001	C9	001 001	09	000 110	06	1 100 111	67	0 011 001	19	001 110	0E	8	00 110
J	11 001 010	CA	1 001 010	4A	01 001 010	CA	11 001 010	CA	11 010 001	D1	010 001	11	001 011	0B	1 100 001	61	1 000 011	43	001 111	0F	'	01 011
K	11 001 011	CB	1 001 011	4B	01 001 011	4B	11 001 011	CB	11 010 010	D2	010 010	12	001 111	0F	1 010 001	51	0 011 010	1A	010 000	10	(	01 111
L	11 001 100	CC	1 001 100	4C	01 001 100	CC	11 001 100	4C	11 010 011	D3	010 011	13	010 010	12	0 110 001	31	1 000 110	46	010 001	11	)	10 010
M	11 001 101	CD	1 001 101	4D	01 001 101	4D	11 001 101	CD	11 010 100	D4	010 100	14	011 100	1C	1 001 001	49	1 100 001	61	010 010	12	-	11 100
N	11 001 110	CE	1 001 110	4E	01 001 110	4E	11 001 110	CE	11 010 101	D5	010 101	15	001 100	0C	0 101 001	25	1 010 010	52	010 011	13	N	01 100
O	11 001 111	CF	1 001 111	4F	01 001 111	CF	11 001 111	4F	11 010 110	D6	010 110	16	011 000	18	0 011 001	19	1 000 101	45	010 100	14	9	11 000
P	11 010 000	D0	1 010 000	50	01 010 000	50	11 010 000	D0	11 010 111	D7	010 111	17	010 110	16	1 111 001	79	0 001 011	08	010 101	15	0	10 110
Q	11 010 001	D1	1 010 001	51	01 010 001	D1	11 010 001	51	11 011 000	D8	011 000	18	010 111	17	0 000 101	45	1 011 011	58	010 110	16	1	10 111
R	11 010 010	D2	1 010 010	52	01 010 010	D2	11 010 010	52	11 011 001	D9	011 001	19	001 010	0A	0 100 101	25	0 101 001	29	010 111	17	4	01 010
S	11 010 011	D3	1 010 011	53	01 010 011	53	11 010 011	D3	11 100 010	E2	100 010	22	000 101	05	1 010 010	52	0 100 101	25	011 000	18	Bell	00 101
T	11 010 100	D4	1 010 100	54	01 010 100	D4	11 010 100	54	11 100 011	E3	100 011	23	010 000	10	0 110 010	32	0 000 010	02	011 001	19	5	10 000
U	11 010 101	D5	1 010 101	55	01 010 101	55	11 010 101	D5	11 100 100	E4	100 100	24	000 111	07	0 110 010	4A	0 110 010	32	011 010	1A	7	00 111
V	11 010 110	D6	1 010 110	56	01 010 110	56	11 010 110	D6	11 100 101	E5	100 101	25	011 110	1E	0 101 010	2A	0 110 001	31	011 011	1B	;	11 110
W	11 010 111	D7	1 010 111	57	01 010 111	D7	11 010 111	57	11 100 110	E6	100 110	26	010 011	13	0 011 010	1A	1 110 101	75	011 100	1C	2	10 011
X	11 011 000	D8	1 011 000	58	01 011 000	D8	11 011 000	58	11 100 111	E7	100 111	27	011 101	1D	1 111 010	7A	1 100 010	62	011 101	1D	/	11 101
Y	11 011 001	D9	1 011 001	59	01 011 001	59	11 011 001	D9	11 101 000	E8	101 000	28	010 101	15	0 100 110	46	1 100 111	67	011 110	1E	6	10 101
Z	11 011 010	DA	1 011 010	5A	01 011 010	5A	11 011 010	DA	11 101 001	E9	101 001	29	010 001	11	0 100 110	26	1 010 100	54	011 111	1F	"	10 001
a	11 100 001	E1	1 100 001	61	01 100 001	E1	01 100 001	61	10 000 001	81												
b	11 100 010	E2	1 100 010	62	01 100 010	E2	01 100 010	62	10 000 010	82												
c	11 100 011	E3	1 100 011	63	01 100 011	63	01 100 011	E3	10 000 011	83	(NO LOWER CASE)											
d	11 100 100	E4	1 100 100	64	01 100 100	E4	01 100 100	64	10 000 100	84												
e	11 100 101	E5	1 100 101	65	01 100 101	65	11 100 101	E5	10 000 101	85												
f	11 100 110	E6	1 100 110	66	01 100 110	66	11 100 110	E6	10 000 110	86												
g	11 100 111	E7	1 100 111	67	01 100 111	E7	01 100 111	67	10 000 111	87												
h	11 101 000	E8	1 101 000	68	01 101 000	E8	01 101 000	68	10 001 000	88												
i	11 101 001	E9	1 101 001	69	01 101 001	69	11 101 001	E9	10 001 001	89												
j	11 101 010	EA	1 101 010	6A	01 101 010	6A	11 101 010	EA	10 010 001	91												
k	11 101 011	EB	1 101 011	6B	01 101 011	6B	01 101 011	EB	10 010 010	92												
l	11 101 100	EC	1 101 100	6C	01 101 100	6C	11 101 100	EC	10 010 011	93												
m	11 101 101	ED	1 101 101	6D	01 101 101	ED	01 101 101	6D	10 010 100	94												
n	11 101 110	EE	1 101 110	6E	01 101 110	EE	01 101 110	6E	10 010 101	95												
o	11 101 111	EF	1 101 111	6F	01 101 111	6F	11 101 111	EF	10 010 110	96												
p	11 110 000	F0	1 110 000	70	01 110 000	F0	01 110 000	70	10 010 111	97												
q	11 110 001	F1	1 110 001	71	01 110 001	71	11 110 001	F1	10 011 000	98												
r	11 110 010	F2	1 110 010	72	01 110 010	F2	11 110 010	F2	10 011 001	99												
s	11 110 011	F3	1 110 011	73	01 110 011	F3	11 110 011	73	10 100 010	A2												
t	11 110 100	F4	1 110 100	74	01 110 100	74	11 110 100	F4	10 100 011	A3												
u	11 110 101	F5	1 110 101	75	01 110 101	F5	01 110 101	75	10 100 100	A4												
v	11 110 110	F6	1 110 110	76	01 110 110	F6	01 110 110	76	10 100 101	A5												
w	11 110 111	F7	1 110 111	77	01 110 111	77	11 110 111	F7	10 100 110	A6												
x	11 111 000	F8	1 111 000	78	01 111 000	78	11 111 000	F8	10 100 111	A7												
y	11 111 001	F9	1 111 001	79	01 111 001	F9	11 111 001	79	10 101 000	A8												
z	11 111 010	FA	1 111 010	7A	01 111 010	FA	01 111 010	7A	10 101 001	A9												
0	10 110 000	B0	0 110 000	30	00 110 000	30	10 110 000	B0	11 110 000	F0	0 110 000	30	0 111 110 U	36	0 01 010 100 L	54	0 01 100 100 L	64	0 110 000	30	0 10 110 F	16
1	10 110 001	B1	0 110 001	31	00 110 001	B1	10 110 001	31	11 110 001	F1	1 110 001	31	1 111 101 U	3D	1 00 100 000 L	20	1 00 100 000 L	20	1 110 001	31	1 10 111 F	17
2	10 110 010	B2	0 110 010	32	00 110 010	B2	10 110 010	B2	11 110 010	F2	2 110 010	32	2 110 011 U	33	2 00 010 000 L	10	2 00 010 000 L	10	2 110 010	32	2 10 011 F	13
3	10 110 011	B3	0 110 011	33	00 110 011	33	10 110 011	B3	11 110 011	F3	3 110 011	33	3 100 001 U	21	3 00 110 000 L	30	3 01 110 000 L	70	3 110 011	33	3 00 001 F	01
4	10 110 100	B4	0 110 100	34	00 110 100	B4	10 110 100	B4	11 110 100	F4	4 110 100	34	4 101 010 U	2A	4 00 001 000 L	08	4 00 000 100 L	04	4 110 100	34	4 01 010 F	0A
5	10 110 101	B5	0 110 101	35	00 110 101	35	10 110 101	B5	11 110 101	F5	5 110 101	35	5 110 000 U	30	5 01 101 000 L	68	5 00 001 000 L	08	5 110 101	35	5 10 000 F	10
6	10 110 110	B6	0 110 110	36	00 110 110	36	10 110 110	B6	11 110 110	F6	6 110 110	36	6 110 101 U	35	6 01 011 000 L	58	6 01 011 000 L	58	6 110 110	36	6 10 101 F	15
7	10 110 111	B7	0 110 111	37	00 110 111	B7	10 110 111	B7	11 110 111	F7	7 110 111	37	7 100 111 U	27	7 00 111 000 L	38	7 01 101 000 L	68	7 110 111	37	7 00 111 F	07
8	10 111 000	B8	0 111 000	38	00 111 000	B8	10 111 000	B8	11 111 000	F8	8 111 000	38	8 100 110 U	26	8 00 000 100 L	04	8 00 111 000 L	38	8 111 000	38	8 11 010 F	1A
9	10 111 001	B9	0 111 001	39	00 111 001	B9	10 111 001	B9	11 111 001	F9	9 111 001	39	9 111 000 U	38	9 01 100 100 L	64	9 00 110 100 L	34	9 111 001	39	9 11 000 F	18
SP	10 100 000	A0	0 100 000	20	SP 10 100 000	A0	SP 00 100 000	20	SP 01 000 000	40	SP 011 010	1A	SP 000 100 S/U	04	SP 01 000 000 –	40	SP 01 000 000 –	40	SP 000 101	05	SP 00 100 –	04
!	10 100 001	A1	0 100 001	21	! 00 100 001	21	! 10 100 001	A1	! 01 011 010	5A			! 100 011 S	23	! 01 110 101 U	75	! 00 000 001 L	01	! 101 101	2D	! 01 101 F	0D
"	10 100 010	A2	0 100 010	22	" 00 100 010	22	" 10 100 010	A2	" 01 111 111	7F					" 00 110 100 U	34	" 01 001 001 U	49			" 10 001 F	11
#	10 100 011	A3	0 100 011	23	# 00 100 011	A3	# 00 100 011	23	# 01 111 011	7B	# 111 011	3B			= 00 110 100 L	34	# 01 110 000 U	70	= 100 110	26	# 10 100 F	14
$	10 100 100	A4	0 100 100	24	$ 00 100 100	24	$ 10 100 100	A4	$ 01 011 011	5B	$ 011 011	1B	$ 100 011 U	23	$ 01 110 101 L	75	$ 00 000 100 U	04	$ 100 111	27	$ 01 001 F	09
%	10 100 101	A5	0 100 101	25	% 00 100 101	A5	% 10 100 101	A5	% 01 101 100	6C	% 101 100	2C			% 01 101 000 U	68	% 00 001 000 U	08	% 101 010	2A		
&	10 100 110	A6	0 100 110	26	& 00 100 110	26	& 10 100 110	A6	& 01 010 000	50	& 010 000	10	& 111 000 S	38	& 01 000 011 L	43	& 01 101 000 U	68	& 000 001	01		
'	10 100 111	A7	0 100 111	27	' 00 100 111	27	' 10 100 111	A7	' 01 111 101	7D					' 01 011 000 U	58	' 01 001 001 L	49	' 111 010	3A	' 01 011 F	0B
(	10 101 000	A8	0 101 000	28	(00 101 000	28	(10 101 000	A8	(01 001 101	4D			(110 001 S	31	(01 100 100 U	64	(00 110 100 U	34	(101 001	29	(01 111 F	0F
)	10 101 001	A9	0 101 001	29	) 00 101 001	A9	) 10 101 001	A9	) 00 101 001	29	) 01 011 101	5D	) 110 001 U	31	) 00 100 100 U	64	) 01 100 100 U	64	) 100 000	20	) 10 010 F	12
*	10 101 010	AA	0 101 010	2A	* 00 101 010	2A	* 10 101 010	AA	* 00 101 010	2A	* 01 011 100	5C	* 011 100	1C	* 00 000 100 U	04	* 00 111 000 U	38	* 101 000	28		
+	10 101 011	AB	0 101 011	2B	+ 00 101 011	2B	+ 10 101 011	AB	+ 01 001 110	4E					+ 01 000 011 U	43	+ 00 010 011 U	13	+ 100 010	22		
,	10 101 100	AC	0 101 100	2C	, 00 101 100	2C	, 10 101 100	AC	, 01 101 011	6B	, 101 011	2B			, 01 110 110 L	76	, 00 111 011 *	3B	, 101 110	2E	, 01 100 F	0C
-	10 101 101	AD	0 101 101	2D	- 00 101 101	2D	- 10 101 101	AD	- 01 100 000	60	- 100 000	20	101 001 U	29	- 00 000 001 *	01	- 00 110 111 L	37	- 100 001	21	- 00 011 F	03
.	10 101 110	AE	0 101 110	2E	. 00 101 110	2E	. 10 101 110	AE	. 01 001 011	4B	. 001 011	0B	111 100 S/U	3C	. 00 110 111 L	37	. 01 010 001 *	51	. 111 101	3D	11 100 F	1C
/	10 101 111	AF	0 101 111	2F	/ 10 101 111	AF	/ 00 101 111	2F	/ 01 100 001	61	/ 100 001	21			/ 01 100 010 L	62	/ 00 000 111 L	07	/ 111 100	3C	/ 11 101 F	1D

CAPS = "SHIFT"
LC = "UNSHIFT"
UNSHIFT 011 111 1F
SHIFT 011 011 1B

CAPS = "UC"
LC = "LC"
LC 00 011 111 1F
UC 00 011 100 1C

CAPS = "UC"
LC = "LC"
LC 00 011 111 1F
UC 00 011 100 1C

(NO LOWER CASE)

(NO LOWER CASE)
"LETTERS" 11 111 1F
"FIGURES" 11 011 1B

UPPER CASE (U)
LOWER CASE (L)
EITHER (*)

UPPER CASE (U)
LOWER CASE (L)
EITHER (*)

COURTESY OF

ATLANTIC RESEARCH CORPORATION

5390 CHEROKEE AVENUE · ALEXANDRIA, VIRGINIA 22314

703-354-3400

MANUFACTURERS OF INTERSHAKE and DATA TEK 9600

UNIVERSAL CODE CHART FOR DATA COMMUNICATIONS

8-BIT ASCII			7-BIT ASCII			EVEN PARITY ASCII			ODD PARITY ASCII			EBCDIC			6-BIT TRANSCODE			6-BIT TYPESETTER			EBCD				SELECTRIC				FIELD DATA		BAUDOT	
	BINARY	HEX		BINARY	HEX		BINARY	HEX		BINARY	HEX		BINARY	HEX		BINARY	HEX		BINARY	HEX		C	1	2	4	8	A	B	HEX		BINARY	HEX	BINARY	HEX
:	10 111 010	BA	:	0 111 010	3A	:	00 111 010	3A	:	10 111 010	BA	:	01 111 010	7A	:			:	111 010	S	3A	:	00	001	000		U	08	:	01 101 011	L	6B	:	111 011	3B	:	11 110	F	1E
<	10 111 100	BC	<	0 111 100	3C	<	00 111 100	3C	<	10 111 100	BC	<	01 001 100	4C	<	001 100	0C					<	00	010	000		U	10				<	100 011	23					
=	10 111 101	BD	=	0 111 101	3D	=	10 111 101	BD	=	00 111 101	3D	=	01 111 110	7E								=	00	100	000		U	20	=	00 010 011	L	13	=	100 100	24					
>	10 111 110	BE	>	0 111 110	3E	>	10 111 110	BE	>	00 111 110	3E	>	01 101 110	6E								>	00	111	000		U	38				>	100 101	25					
?	10 111 111	BF	?	0 111 111	3F	?	00 111 111	3F	?	10 111 111	BF	?	01 101 111	6F				?	110 110	S	36	?	01	100	010		U	62	?	00 000 111	U	07	?	101 100	2C	?	11 001	F	19
@	11 000 000	C0	@	1 000 000	40	@	11 000 000	C0	@	01 000 000	40	@	01 111 100	7C	@	111 100	3C	@	101 001	S	29	@	00	000	010		L	02	@	00 010 000	U	10	@	101 111	2F					
[	11 011 011	DB	[	1 011 011	5B	[	11 011 011	DB	[	01 011 011	5B																		[	00 100 000	U	20	[	000 011	03					
\	11 011 100	DC	\	1 011 100	5C	\	01 011 100	5C	\	11 011 100	DC	\	11 100 000	E0																									
]	11 011 101	DD	]	1 011 101	5D	]	11 011 101	DD	]	01 011 101	5D																		]	00 100 000	L	20	]	000 100	04					
^	11 011 110	DE	^	1 011 110	5E	^	11 011 110	DE	^	01 011 110	5E																		^	000 010	02									
–	11 011 111	DF	–	1 011 111	5F	–	01 011 111	5F	–	11 011 111	DF	–	01 101 101	6D															–	00 110 111	U	37								
`			`	1 100 000	60	`	01 100 000	60	`	11 100 000	E0	`	01 111 001	79																									
{	11 111 011	FB	{	1 111 011	7B	{	01 111 011	7B	{	11 111 011	FB	{	11 000 000	C0																									
:	11 111 100	FC	:	1 111 100	7C	:	11 111 100	FC	:	01 111 100	7C	:	01 101 010	6A																									
}	11 111 101	FD	}	1 111 101	7D	}	01 111 101	7D	}	11 111 101	FD	}	11 010 000	D0																									
~	11 111 110	FE	~	1 111 110	7E	~	01 111 101	7E	~	11 111 110	FE	~	10 100 001	A1																									
												¢	01 001 010	4A				¢	00 000 010	U	02	¢	01	011	000		U	58										
												¬	01 011 111	5F								¬	00	110	111		U	37										
												|	01 001 111	4F				↓	101 000	S/U	28	|	01	1	0	110		U	76										
																														00	100	000	U	20						
																														00	000	001	U	01						
																		UNSHIFT	011 111		1F	UC	00	011	100		1C		UC	00	011	100	1C				FIGS	11 011	1B
																		SHIFT	011 011		1B	LC	00	011	111		1F		LC	00	011	111	1F				LTRS	11 111	1F
ACK	10 000 110	86	ACK	0 000 110	06	ACK	00 000 110	06	ACK	10 000 110	86	ACK	00 101 110	2E																									
BEL	10 000 111	87	BEL	0 000 111	07	BEL	10 000 111	87	BEL	00 000 111	07	BEL	00 101 111	2F	BEL	001 101	0D	BEL	101 011		2B																	
BS	10 001 000	88	BS	0 001 000	08	BS	10 001 000	88	BS	00 001 000	08	BS	00 010 110	16								BS	01	011	101			5D	BS	01 011 101		5D							
												BYP	00 100 100	24								BYP	00	001	110			0E	BY	00 001 110		0E							
CAN	10 011 000	98	CAN	0 011 000	18	CAN	00 011 000	18	CAN	10 011 000	98	CAN	00 011 000	18																									
												CC	00 011 010	1A																									
CR	10 001 101	8D	CR	0 001 101	0D	CR	00 001 101	8D	CR	00 001 101	0D	CR	00 001 101	0D				RET	001 000		08													CR	111 111	3F	CR	01 000	08
DC1	10 010 001	91	DC1	0 010 001	11	DC1	00 010 001	11	DC1	10 001 001	91	DC1	00 010 001	11																									
DC2	10 010 010	92	DC2	0 010 010	12	DC2	00 010 010	12	DC2	10 001 010	92	DC2	00 010 010	12																									
DC3	10 010 011	93	DC3	0 010 011	13	DC3	10 010 011	93	DC3	00 010 011	13	DC3	00 010 011	13																									
DC4	10 010 100	94	DC4	0 010 100	14	DC4	00 010 100	14	DC4	10 010 100	94	DC4	00 011 100	3C																									
DEL	11 111 111	FF	DEL	1 111 111	7F	DEL	11 111 111	FF	DEL	01 111 111	7F	DEL	00 000 111	07	DEL	111 111	3F		RUBOUT 111 111		3F	DEL	01	111	111			7F	DEL	01 111 111		7F							
DLE	10 010 000	90	DLE	0 010 000	10	DLE	10 010 000	90	DLE	00 010 000	10	DLE	00 010 000	10	DLE	011 111	1F																					
												DS	00 100 000	20					ELEVATE	000 010	02																	
EM	10 011 001	99	EM	0 011 001	19	EM	10 011 001	99	EM	00 011 001	19	EM	00 011 001	19	EM	111 110	3E		THIN SP	100 000	20																	
ENQ	10 000 101	85	ENQ	0 000 101	05	ENQ	00 000 101	05	ENQ	10 000 101	85	ENQ	00 101 101	2D	ENQ	101 101	2D		ADD TH SP	100 100	24																	
												EOB	00 100 110	26					EM SP	100 101	25	EOB	01	011	110			5E	EOB	01 011 110		5E							
EOT	10 000 100	84	EOT	0 000 100	04	EOT	10 000 100	84	EOT	00 000 100	04	EOT	00 110 111	37	EOT	011 110	1E		EN SP	101 110	2E	EOT	01	111	100			7C	EOT	01 111 100		7C							
ESC	10 011 011	9B	ESC	0 011 011	1B	ESC	00 011 011	1B	ESC	10 011 011	9B	ESC	00 100 111	27	ESC	101 010	2A		OR	101 111	2F																	
ETB	10 010 111	97	ETB	0 010 111	17	ETB	00 010 111	17	ETB	10 010 111	97	ETB	00 100 110	26	ETB	001 111	0F		V RULE	110 010	32																	
ETX	10 000 011	83	ETX	0 000 011	03	ETX	00 000 011	03	ETX	10 000 011	83	ETX	00 000 011	03	ETX	101 110	2E		EM LEAD	110 100	34																	
																			EN LEAD	110 111	37																	
FF	10 001 100	8C	FF	0 001 100	0C	FF	00 001 100	0C	FF	10 001 100	8C	FF	00 001 100	0C																							FF	111 110	3E			
FS	10 011 100	9C	FS	0 011 100	1C	FS	10 011 100	9C	FS	00 011 100	1C	FS	00 100 010	22					U RAIL	111 001	39																	
																			L RAIL	111 011	3B																	
GS	10 011 101	9D	GS	0 011 101	1D	GS	00 011 101	1D	GS	10 011 101	9D								Q CENT	111 110	3E																	
HT	10 001 001	89	HT	0 001 001	09	HT	00 001 001	09	HT	10 001 001	89	HT	00 000 101	05	HT	101 111	2F					HT	00	101	111			2F	HT	00 101 111		2F							
												IFS	00 011 100	1C																									
												IGS	00 011 101	1D																									
												IL	00 010 111	17								IL	00	111	101			3D	IL	00 111 101		3D							
												IRS	00 011 110	1E																									
												IUS	00 011 111	1F																									
												LC	00 000 110	06								LC	00	011	111			1F	LC	00 011 111		1F							
LF	10 001 010	8A	LF	0 001 010	0A	LF	00 001 010	0A	LF	10 001 010	8A	LF	00 100 101	25								LF	01	101	110			6E	LF	01 101 110		6E						LF	00 010	02
NAK	10 010 101	95	NAK	0 010 101	15	NAK	00 010 101	95	NAK	00 010 101	15	NAK	00 111 101	3D	NAK	111 101	3D																					
												NL	00 010 101	15								NL	01	101	101			6D	NL	01 101 101		6D							
NUL	10 000 000	80	NUL	0 000 000	00	NUL	00 000 000	00	NUL	10 000 000	80	NUL	00 000 000	00																							PER	111 101	3D			
												PF	00 000 100	04				PF	100 010		22	PF	01	001	111			4F	PF	01 001 111		4F							
												PN	00 110 100	34								PN	01	001	100			4C	PN	01 001 100		4C							
												PRE	00 100 111	27								PRE	00	111	110			3E	PRE	00 111 110		3E							
												RES	00 010 100	14								RES	00	001	101			0D	RES	00 001 101		0D							
												RLF	00 001 001	09																									
RS	10 011 110	9E	RS	0 011 110	1E	RS	00 011 110	1E	RS	10 011 110	9E	RS	00 110 101	35								RS	00	101	100			2C	RS	00 101 100		2C							
SI	10 001 111	8F	SI	0 001 111	0F	SI	00 001 111	0F	SI	10 001 111	8F	SI	00 001 111	0F																									
												SM	00 101 010	2A																									
												SMM	00 001 010	0A																									
SO	10 001 110	8E	SO	0 001 110	0E	SO	10 001 110	8E	SO	00 001 110	0E	SO	00 001 110	0E																									
SOH	10 000 001	81	SOH	0 000 001	01	SOH	10 000 001	81	SOH	00 000 001	01	SOH	00 000 001	01	SOH	000 000	00																					
												SOS	00 100 001	21																									
STX	10 000 010	82	STX	0 000 010	02	STX	10 000 010	82	STX	00 000 010	02	STX	00 000 010	02	STX	001 010	0A																					
SUB	10 011 010	9A	SUB	0 011 010	1A	SUB	10 011 010	9A	SUB	00 011 010	1A	SUB	00 111 111	3F	SUB	001 110	0E																					
SYN	10 010 110	96	SYN	0 010 110	16	SYN	10 010 110	96	SYN	00 010 110	16	SYN	00 110 010	32	SYN	111 010	3A																					
												UC	00 110 110	36								UC	00	011	100			1C	UC	00 011 100		1C							
US	10 011 111	9F	US	0 011 111	1F	US	10 011 111	9F	US	00 111 111	1F				UB	011 101	1D																					
VT	10 001 011	8B	VT	0 001 011	0B	VT	10 001 011	8B	VT	00 001 011	0B	VT	00 001 011	0B																									

UPPER CASE (U)
LOWER CASE (L)
EITHER (*)

UC 00 011 100 1C
LC 00 011 111 1F

TP 104-8-75

HEX TO CHARACTER CODE FOR DATA COMMUNICATIONS

EBCDIC		EVEN PARITY ASCII	ODD PARITY ASCII	7-BIT ASCII		EBCD		SELECTRIC	
						UC	LC	UC	LC
00	NUL	NUL		00	NUL				
01	SOH		SOH	01	SOH			O	!
02	STX		STX	02	STX	¢	@	T	t
03	ETX	ETX		03	ETX				
04	PF		EOT	04	EOT	•	8	$	4
05	HT	ENQ		05	ENQ				
06	LC	ACK		06	ACK				
07	DEL		BEL	07	BEL	H	h	?	1
08			BS	08	BS	:	4	%	5
09	RLF	HT		09	HT				
0A	SMM	LF		0A	LF				
0B	VT		VT	0B	VT	D	d	P	p
0C	FF	FF		0C	FF				
0D	CR		CR	0D	CR	RES		RES	
0E	SO		SO	0E	SO	BYP		BY	
0F	SI	SI		0F	SI				
10	DLE		DLE	10	DLE	<	2	@	2
11	DC1	DC1		11	DC1				
12	DC2	DC2		12	DC2				
13	DC3		DC3	13	DC3	B	b	+	=
14	RES	DC4		14	DC4				
15	NL		NAK	15	NAK				
16	BS		SYN	16	SYN				
17	IL	ETB		17	ETB				
18	CAN	CAN		18	CAN				
19	EM		EM	19	EM	O	o	I	i
1A	CC		SUB	1A	SUB	W	w	K	k
1B		ESC		1B	ESC				
1C	IFS		FS	1C	FS	UPPER CASE		UPPER CASE	
1D	IGS	GS		1D	GS				
1E	IRS	RS		1E	RS				
1F	IUS		US	1F	US	LOWER CASE		LOWER CASE	
20	DS		SP	20	SP	=	1	[±]	1
21	SOS	!		21	!				
22	FS	"		22	"				
23			#	23	#	A	a	G	g
24	BYP	$		24	$				
25	LF		%	25	%	R	r	S	s
26	EOB/ETB		&	26	&	Z	z	H	h
27	ESC/PRE	'		27	'				
28		(		28	(				
29			)	29	)	N	n	R	r
2A	SM		*	2A	*	V	v	D	d
2B		+		2B	+				
2C		,		2C	,	RS		RS	
2D	ENQ	–		2D	–				
2E	ACK	.		2E	.				
2F	BEL		/	2F	/	HT		HT	
30		0		30	0	;	3		
31			1	31	1	L	l	V	v
32	SYN		2	32	2	T	t	U	u
33		3		33	3				
34	PN		4	34	4	"	#	(	9
35	RS	5		35	5				
36	UC	6		36	6				
37	EOT		7	37	7	¬		–	-
38			8	38	8	>	7	*	8
39		9		39	9				
3A		:		3A	:				
3B			;	3B	;	G	g	`	`
3C	DC4	<		3C	<				
3D	NAK		=	3D	=	IL		IL	
3E			>	3E	>	PRE		PRE	
3F	SUB	?		3F	?				

EBCDIC		EVEN PARITY ASCII	ODD PARITY ASCII	7-BIT ASCII		EBCD		SELECTRIC	
						UC	LC	UC	LC
40	SP			40	@	SP		SP	
41		A		41	A				
42		B		42	B				
43			C	43	C	+	&	J	j
44		D		44	D				
45			E	45	E	Q	q	O	o
46			F	46	F	Y	y	L	l
47		G		47	G				
48		H		48	H				
49			I	49	I	M	m	"	'
4A	¢		J	4A	J			E	e
4B	•	K		4B	K	U	u		
4C	<		L	4C	L	PN		PN	
4D	(	M		4D	M				
4E	+	N		4E	N				
4F			O	4F	O	PF		PF	
50	&	P		50	P				
51			Q	51	Q	K	k	•	•
52			R	52	R	S	s	N	n
53		S		53	S				
54			T	54	T	)	0	Z	z
55		U		55	U				
56		V		56	V				
57			W	57	W				
58			X	58	X		6	¢	6
59		Y		59	Y				
5A	!	Z		5A	Z				
5B	$		[	5B	[	F	f	Q	q
5C	•	\	\	5C	\				
5D	)		]	5D	]	BS		BS	
5E	;		^	5E	^	EOB		EOB	
5F	¬	–		5F	–				
60	-	\		60	`				
61	/		a	61	a	J	j	M	m
62			b	62	b	?	/	X	x
63		c		63	c				
64			d	64	d	(	9	)	0
65		e		65	e				
66		f		66	f				
67			g	67	g	I	i	Y	y
68			h	68	h	%	5	&	7
69		i		69	i				
6A	¦	j		6A	j				
6B	.		k	6B	k	E	e	:	;
6C	%	I		6C	l				
6D	–		m	6D	m	NL		NL	
6E	>		n	6E	n	LF		LF	
6F	?	o		6F	o				
70			p	70	p			#	3
71		q		71	q				
72		r		72	r				
73			s	73	s	C	c	F	f
74		t		74	t				
75			u	75	u	!	$	W	w
76			v	76	v	'	.	B	b
77		w		77	w				
78		x		78	x				
79	\		y	79	y	P	p	A	a
7A	:		z	7A	z	X	x	C	c
7B	#	{		7B	{				
7C	@	¦		7C	¦	EOT		EOT	
7D	'	}		7D	}				
7E	=	~		7E	~				
7F	"		DEL	7F	DEL	DEL		DEL	

COURTESY OF

ATLANTIC RESEARCH CORPORATION

5390 CHEROKEE AVENUE · ALEXANDRIA, VIRGINIA · 22314

703-354-3400

MANUFACTURERS OF INTERSHAKE and DATA TEK 9600

EBCDIC	EVEN PARITY ASCII	ODD PARITY ASCII	8 BIT ASCII	EBCDIC	EVEN PARITY ASCII	ODD PARITY ASCII	8 BIT ASCII		FIELD DATA	6-BIT TYPESETTER SHIFT	6-BIT TYPESETTER UNSHIFT	6-BIT TRANSCODE	BAUDOT LTRS	BAUDOT FIGS
80		NUL	NUL	C0 {	@		@		00			SOH		
81 a	SOH		SOH	C1 A		A	A		01 &	E	e	A	E	3
82 b	STX		STX	C2 B		B	B		02 ^	ELEVATE		B	LF	
83 c		ETX	ETX	C3 C	C		C		03 [	A	a	C	A	
84 d	EOT		EOT	C4 D		D	D		04]	SPACE		D	SP	
85 e		ENQ	ENQ	C5 E	E		E		05 SP	S	s	E	S	BEL
86 f		ACK	ACK	C6 F	F		F		06 A	I	i	F	I	8
87 g	BEL		BEL	C7 G		G	G		07 B	U	u	G	U	7
88 h	BS		BS	C8 H		H	H		08 C	RETURN		H	CR	
89 i		HT	HT	C9 I	I		I		09 D	D	d	I	D	$
8A		LF	LF	CA	J		J		0A E	R	r	STX	R	4
8B	VT		VT	CB		K	K		0B F	J	j	.	J	'
8C		FF	FF	CC	L		L		0C G	N	n	<	N	,
8D	CR		CR	CD		M	M		0D H	F	f	BELL	F	!
8E	SO		SO	CE		N	N		0E I	C	c	SUB	C	:
8F		SI	SI	CF	O		O		0F J	K	k	ETB	K	(
90	DLE		DLE	D0 }		P	P		10 K	T	t	&	T	5
91 j		DC1	DC1	D1 J	Q		Q		11 L	Z	z	J	Z	"
92 k		DC2	DC2	D2 K	R		R		12 M	L	l	K	L	)
93 l	DC3		DC3	D3 L		S	S		13 N	W	w	L	W	2
94 m		DC4	DC4	D4 M	T		T		14 O	H	h	M	H	#
95 n	NAK		NAK	D5 N		U	U		15 P	Y	y	N	Y	6
96 o	SYN		SYN	D6 O		V	V		16 Q	P	p	O	P	0
97 p		ETB	ETB	D7 P	W		W		17 R	Q	q	P	Q	1
98 q		CAN	CAN	D8 Q	X		X		18 S	O	o	Q	O	9
99 r	EM		EM	D9 R		Y	Y		19 T	B	b	R	B	?
9A	SUB		SUB	DA		Z	Z		1A U	G	g	SPACE	G	8
9B		ESC	ESC	DB	|		|		1B V	SHIFT		$	FIGS	
9C	FS		FS	DC		\	\		1C W	M	m	*	M	.
9D		GS	GS	DD	]		]		1D X	X	x	US	X	/
9E		RS	RS	DE	^		^		1E Y	V	v	EOT	V	;
9F	US		US	DF					1F Z	UNSHIFT		DLE	LTRS	
A0	SP		SP	E0 \		`			20)	THIN SPACE		–		
A1		!	!	E1	a		a		21 –		3	/		
A2 s		"	"	E2 S	b		b		22 +	PF		S		
A3 t	#		#	E3 T		c	c		23 \	!	$	T		
A4 u		$	$	E4 U	d		d		24 =	ADD THIN SPACE		U		
A5 v	%		%	E5 V		e	e		25 >	EM SPACE		V		
A6 w	&		&	E6 W		f	f		26 #		8	W		
A7 x		'	'	E7 X	g		g		27 $		7	X		
A8 y		(	(	E8 Y	h		h		28 *	∨	∨	Y		
A9 z	)		)	E9 Z		i	i		29 (	@	–	Z		
AA	*		*	EA		j	j		2A %		4	ESC		
AB		+	+	EB	k		k		2B :	BELL		.		
AC		,	,	EC		l	l		2C ?			%		
AD		–	–	ED	m		m		2D !			ENQ		
AE		.	.	EE	n		n		2E .	EN SPACE		ETX		
AF	/		/	EF		o	o		2F @	QR		HT		
B0		0	0	F0 0	p		p		30 0		5	0		
B1	1		1	F1 1		q	q		31 1	(	)	1		
B2	2		2	F2 2	r		r		32 2	V RULE		2		
B3		3	3	F3 3	s		s		33 3		2	3		
B4	4		4	F4 4		t	t		34 4	EM LEADER		4		
B5		5	5	F5 5	u		u		35 5		6	5		
B6		6	6	F6 6	v		v		36 6	?	0	6		
B7	7		7	F7 7		w	w		37 7	EN LEADER		7		
B8	8		8	F8 8		x	x		38 8	&	9	8		
B9		9	9	F9 9	y		y		39 9	UPPER RAIL		9		
BA		:	:	FA	z		z		3A '	:	;	SYN		
BB	;		;	FB		{	{		3B ;	LOWER RAIL		#		
BC		<	<	FC	|		|		3C /			@		
BD	–		=	FD		}	}		3D .		1	NAK		
BE		>	>	FE			~		3E FF	QUAD CENTER		EM		
BF		?	?	FF	DEL		DEL		3F CR	RUBOUT		DEL		

TP-107-7-75