MOTOROLA
Semiconductor Products Inc.

AN-823
Application Note

CBUG05 DEBUG MONITOR PROGRAM FOR MC146805E2 MICROPROCESSOR UNIT

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1. INTRODUCTION

CBUG05 is a debug monitor program written for the MC146805E2 Microprocessor Unit and contained in the MCM65516 2K × 8 CMOS ROM. CBUG05 allows for rapid development and evaluation of hardware and M6805 Family type software, using memory and register examine/change commands as well as breakpoint and single instruction trace commands. CBUG05 also includes software to set and display time, using an optional MC146818 Real-Time Clock (RTC), and routines to punch and load an optional cassette interface. Figure 1 shows a minimum system which only requires the MPU, ROM, keypad inputs and display output interfaces. Port A of the MC146805E2 MPU is required for the I/O; however, Port B and all other MC146805E2 MPU features remain available to the user. A possible expanded system is shown in Figure 2. The memory map is shown in Figure 3. Locations $1700-$173F are available to the user if the optional MC146818 RTC is not used.

FEATURES:

* MC146805E2 Eight-Bit CMOS MPU
- Expandable Multipled Address/Data Bus
- Eight-Bit I/O Port
- Eight-Bit Timer with Prescaler
- Maskable External Interrupt
- 16 Levels of Subroutine Nesting
- Minimum of 38 Bytes of Unused Internal RAM

* MCM65516 2K × 8 CMOS with CBUG05
- Memory and Register Examine/Change
- Breakpoints and Single Instruction Trace
- Branch Offset Calculation
- Set/Display Current Time (w/optional MC146818 Real-Time Clock)
- Punch/Load/Verify Cassette Tape (w/optional cassette tape interface)
- Stop Command for Low-power Software Standby
- Software Alterable Interrupt Vectors

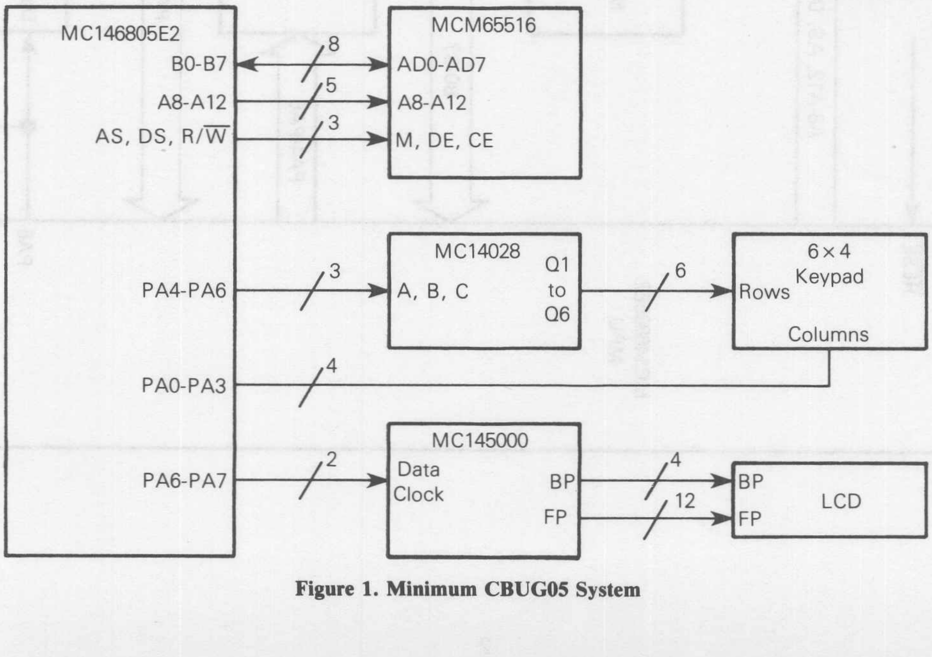


Figure 1. Minimum CBUG05 System

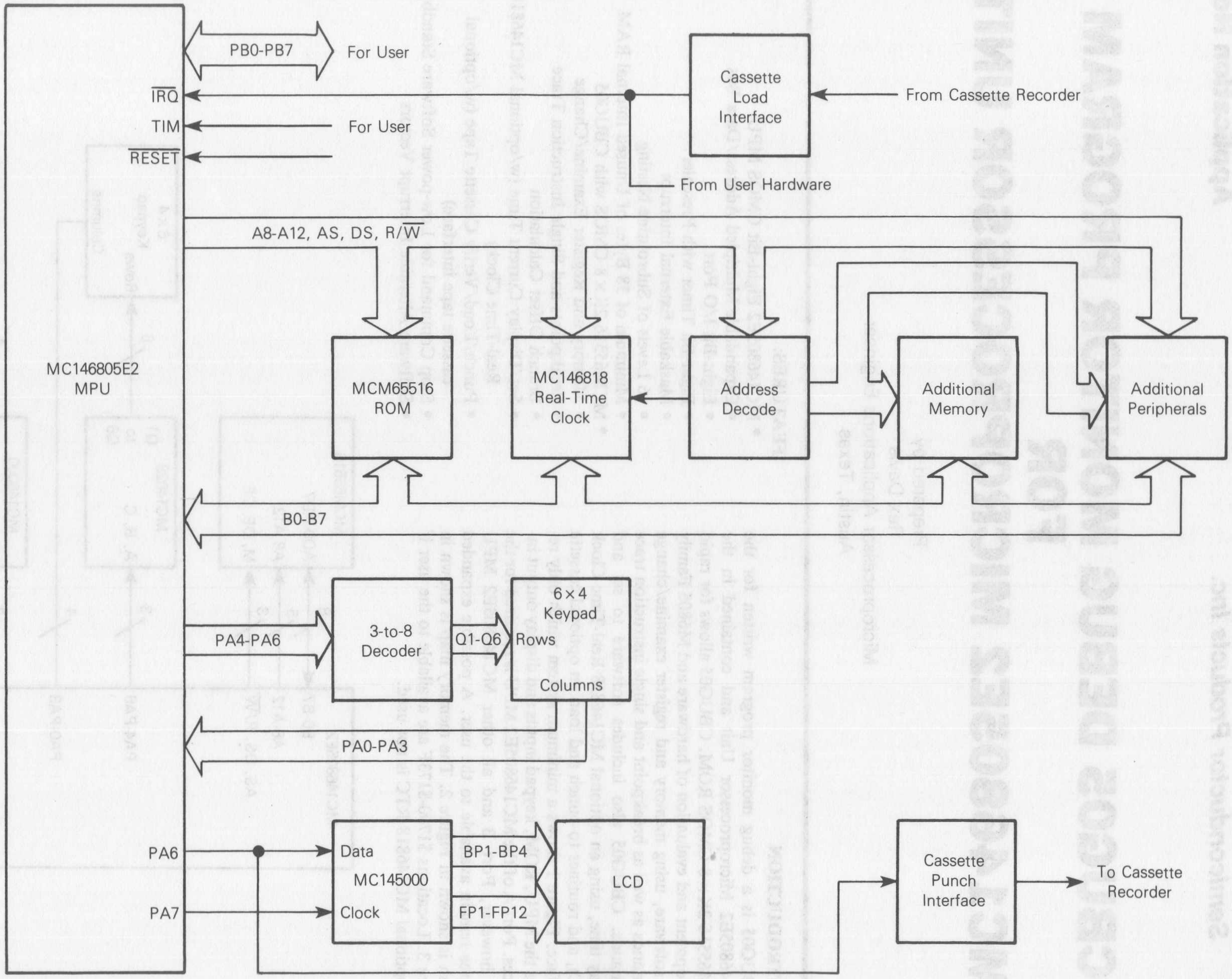


Figure 2. Expanded CBUG05 System

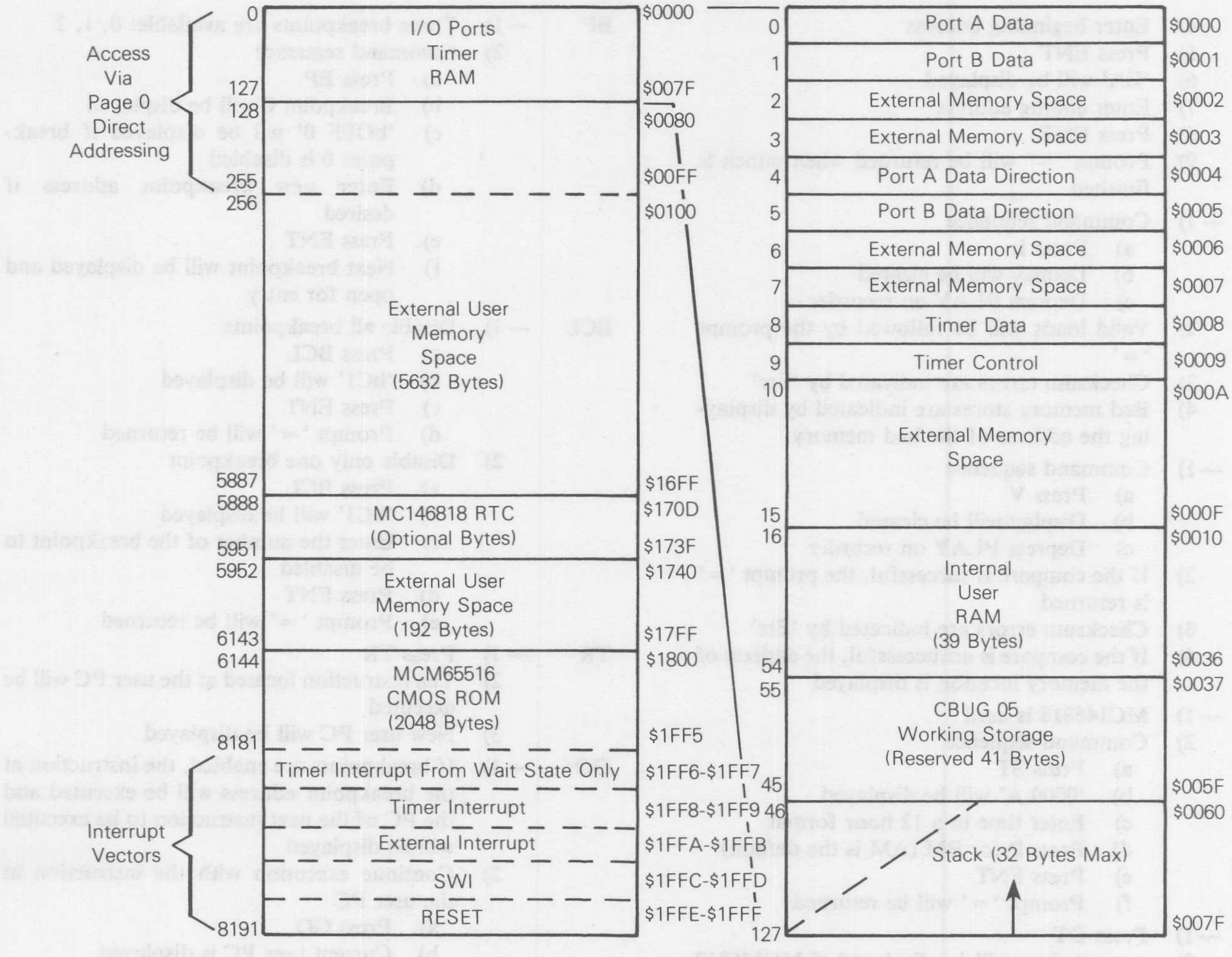


Figure 3. Address Map

2. CBUG05 COMMAND DESCRIPTION

Commands are entered in one of two ways:

(1) If the command requires no additional user input, then only the command key need be depressed; e.g., TR (CBUG05 will execute one instruction), and (2) If the command allows additional user input then the ENT key is used to enter the users input.

ESC will allow exit from all commands except STOP, V, L, & P once the ending address is entered.

1) RS — Reset MC146805E2
2) P — Punch cassette tape
3) L — Load cassette tape
4) V — Verify cassette tape against memory
5) ST — Set current time
6) DT — Display current time
7) OFF — Calculate branch offset
8) BP — Set/display breakpoints
9) BCL — Disable one or all breakpoints
10) TR — Execute one instruction
11) GO — Begin program execution
12) PC — Display user program counter
13) AR — Examine/change user accumulator
14) XR — Examine/change user index register
15) CC — Examine/change user condition code register
16) SP — Display user stack pointer
17) M — Examine/change memory contents
18) STOP — Put the system into a low power standby mode

RS — 1) Automatic on power-up
2) Press RS to:
a) Return from STOP
b) Return to monitor when program control is lost

STOP — 1) MC146805E2 oscillator is halted reducing current requirements
2) Command sequence:
a) Press STOP
b) Display will be cleared

P — 1) Place recorder into the record mode
2) Press P
3) 'bA' will be displayed

4) Enter beginning address

5) Press ENT

6) 'EA' will be displayed

7) Enter ending address

8) Press ENT

9) Prompt '=' will be returned when punch is finished

L — 1) Command sequence

a) Press L

b) Display will be cleared

c) Depress PLAY on recorder

2) Valid loads will be followed by the prompt '='

3) Checksum errors are indicated by 'Err'

4) Bad memory stores are indicated by displaying the address of the bad memory.

V — 1) Command sequence

a) Press V

b) Display will be cleared

c) Depress PLAY on recorder

2) If the compare is successful, the prompt '=' is returned

3) Checksum errors are indicated by 'Err'

4) If the compare is unsuccessful, the address of the memory location is displayed

ST — 1) MC146818 is used

2) Command sequence

a) Press ST

b) '0000 A' will be displayed

c) Enter time in a 12 hour format

d) Press P for PM (AM is the default)

e) Press ENT

f) Prompt '=' will be returned

DT — 1) Press DT

2) current time will be displayed if MC146818 has been initialized

OFF — 1) Beginning and ending addresses point to the instruction opcode addresses

2) The opcode for the branch instruction must exist at the beginning address so the monitor can determine whether to do a bit branch or a conditional branch

3) Command sequence

a) Press OFF

b) 'bA' will be displayed

c) Enter beginning address

d) Press ENT

e) 'EA' will be displayed

f) Enter ending address

g) Press ENT

4) If valid:

a) 'USE xx' will be displayed.

b) xx will be loaded into beginning address + 2 for bit branches and address + 1 for conditional branches.

5) If not valid:

a) Offset calculation result is displayed in 2's complement and 'Or' (out of range) is displayed

b) No change is made to instruction at the beginning address.

BP — 1) Three breakpoints are available: 0, 1, 2

2) Command sequence

a) Press BP

b) Breakpoint 0 will be displayed

c) 'bOFF 0' wil be displayed if breakpoint 0 is disabled

d) Enter new breakpoint address if desired

e) Press ENT

f) Next breakpoint will be displayed and open for entry

BCL — 1) Disable all breakpoints

a) Press BCL

b) 'bC1' will be displayed

c) Press ENT

d) Prompt '=' will be returned

2) Disable only one breakpoint

a) Press BCL

b) 'bC1' will be displayed

c) Enter the number of the breakpoint to be disabled

d) Press ENT

e) Prompt '=' will be returned

TR — 1) Press TR

2) The instruction located at the user PC will be executed

3) New user PC will be displayed

GO — 1) If breakpoints are enabled, the instruction at the breakpoint address will be executed and the PC of the next instruction to be executed will be displayed

2) Continue execution with the instruction at the user PC

a) Press GO

b) Current user PC is displayed

c) Press ENT

3) Begin execution at new address

a) Press GO

b) Current user PC is displayed

c) Enter the new PC address

d) Press ENT

M — 1) Press M

2) Last address will be displayed

3) Enter new address if desired

4) Press ENT

5) Address and contents of the address will be displayed in format 'aaaa xx'

6) Enter new contents if desired

7) Save (use one)

a) Press ENT (next address and contents will be displayed)

b) Press M (previous address and contents will be displayed)

PC — 1) Not alterable

2) Command sequence

a) Press PC

b) Current user PC displayed in format 'aaaa PC'

AR — 1) Alterable
2) Command sequence
a) Press AR
b) Current user accumulator contents displayed in format 'ACCA xx'
c) Enter new data if desired
d) Press ENT
e) Prompt '=' will be returned

XR — 1) Alterable
2) Command sequence
a) press XR
b) Current user index register contents displayed in format 'Idr xx'
c) Enter new data if desired
d) Press ENT
e) Prompt '=' will be returned

CC — 1) Alterable
2) Command sequence
a) Press CC
b) Current user condition code will be displayed in format 'COdE xx'
c) Enter new contents if desired
d) Press ENT
e) Prompt '=' will be returned

SP — 1) Not alterable
2) Command sequence
a) Press SP
b) Current user stack pointer will be displayed in format 'aaaa SP'

3. INTERRUPT VECTORS

At reset, CBUG05 sets up an extended JUMP instruction pointing to a default CBUG05 interrupt service routine for each of the three interrupt types. The vectors, of the three interrupt types, point to one of the three JUMP instructions. Since the JMP instructions are located in RAM, the use may alter the two-byte extended address within any of the JMP instructions. The location of the two-byte extended address for each interrupt type is listed in Table 1.

Table 1. Alterable Vector Locations

INTERRUPT TYPE		ADDR
EXTERNAL	:	$41-$42
TIMER	:	$44-$45
TIMER (FROM WAIT)	:	$47-$48

4. MC145000 CMOS MULTIPLEXED LCD DRIVER

The MC145000 LCD Driver is designed to drive LCDs in a multiplexed-by-four configuration. It can drive up to 48 LCD segments or six seven-segment plus decimal point characters. Data for each character is translated into a format that is clocked serially from the MC146805E2 (MPU) to the MC145000 LCD Driver. The MC145000 LCD Driver continuously generates the multiplexed display signals, from the internally stored serial data, without further requirements from the MPU.

The recommended display is a General Electric LXD69D7R09; an 8-digit, 7-segment multiplexed LCD with decimal point. The required connections to the MC145000 LCD Driver are shown in Figure 4.

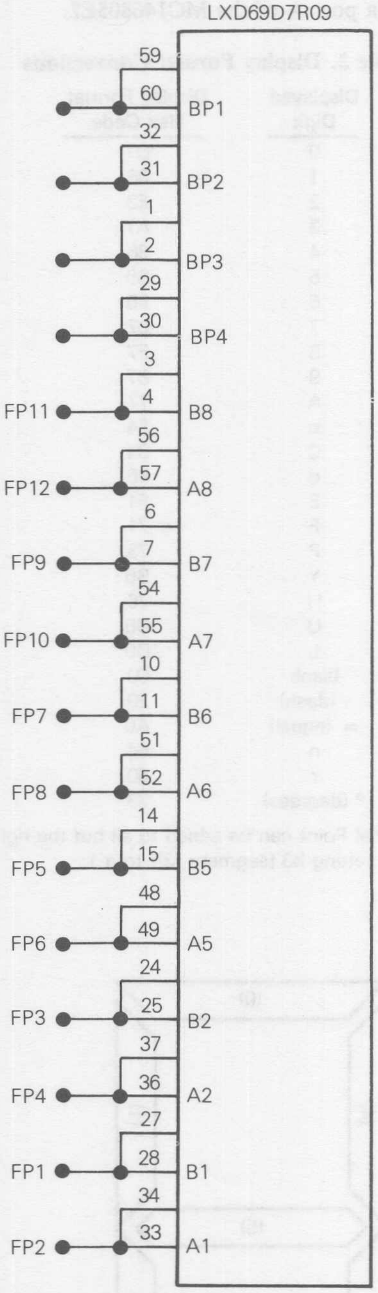


Figure 4. Liquid Crystal Display (LCD) Connections

Each segment of a seven-segment plus decimal point character is represented by one bit of an 8-bit byte. Figure 5 shows the relationship between a character segment and the bit number of the display byte (bit 7 is MSB and bit 0 is LSB). A logical "1" in any bit will activate its corresponding segment. Table 2 lists the hexadecimal code of some common seven-segment characters in display format. For example, the digit 5 is represented by $B5 (10110101) which would activate segments 0, 2, 4, 5, and 7. The decimal point is displayed by setting bit 3 of the display byte to a logical "1" (effectively adding eight to the display byte). Data in BCD or binary format is translated by CBUG05, into the display format, using a lookup table. CBUG05 then left-shifts the character to the MC145000 via port A of the MC146805E2.

Table 2. Display Format Conversions

Displayed Digit	Display Format Hex Code
0	D7
1	06
2	E3
3	A7
4	36
5	B5
6	F5
7	07
8	F7
9	B7
A	77
b	F4
C	D1
d	E6
E	F1
F	71
P	73
Y	B6
H	76
U	D6
L	D0
blank	00
- (dash)	20
= (equal)	A0
n	64
r	60
° (degrees)	33

NOTE: A Decimal Point can be added to all but the right-most display digit by setting b3 [segment (3)] to a 1.

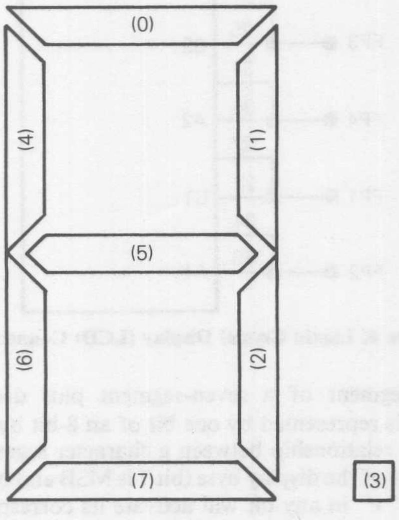


Figure 5. Display Digit Format

Several display routines are available for the user. Figure 6 describes the address, function, and use of these routines. All routines are called using a jump-to-subroutine (JSR) instruction. Most display outputs are initiated by filling a display table with all six characters in the display format to be displayed, then calling a routine (DISTAB) to display the entire table. In other words, the whole display is rewritten every time any character change is made. The display table is called DTABL (locations $49-$4E) and occupies six consecutive bytes where DTABL (location $49) is the left most digit to be displayed.

5. KEYPAD INPUT

CBUG05 requires a 4×6 keypad such as is shown schematically in Figure 7. The six column lines are derived from a three-bit output from port A bits 4-6 driving a 3-to-8 decoder. By using this method port B is saved for the user. Figure 7 shows the required layout of the 4×6 keypad and 3-to-8 decoder. The keypad is continuously scanned for input. If an input is received, a 3075 MPU cycle debounce insures against spurious input. The required debounce time places a lower limit on the MPU clock frequency. At a 1 MHz bus speed (5 MHz oscillator input), the debounce time is about 3 ms. With a 10 kHz bus speed (50 kHz time base input), the debounce time is about 0.3 seconds. Debounce times of approximately 60 milliseconds or more require the keys be held down a longer time than an operator is normally accustomed.

Five routines are listed in Figure 8 of which two (COLUMN and DEBOUNC) are branch routines and one is a look-up table (STABL). One of the other two routines, KEYSCN, checks for a keyboard input and, if valid, returns it to the accumulator in a column-row format. This format can then be converted to a hexadecimal number which corresponds to the one key that was pressed (see STABL routine and Table 3). Note that hexadecimal numbers 0 through F correspond to the keypad keys 0 through F. The last routine of Figure 8, CHARIN, checks for a character and returns a hexadecimal number to the accumulator.

6. CASSETTE TAPE OPTION

The cassette tape option is included to allow for user program storage. Programs are stored in a modified bi-phase format (see Figure 9). The storage format used defines a zero as more than 300 MPU cycles between transitions and less than 300 MPU cycles between transitions. Data is punched with a start bit of one, eight bits of data and a zero stop bit. Tapes are punched with 16K zeros as a leader followed by a BOT and the ending and beginning addresses. The program is then punched followed by the checksum. Tapes are loaded after 256 consecutive zeros are read. The BOT then synchronizes the loading program. The ending and beginning addresses are loaded and data read and stored accordingly. Finally, the checksum is read and compared to the new computed checksum.

Baud rates are determined by the MPU cycle time. The software is set up to provide a default baud rate of 2400 baud if a one microsecond cycle time is used. Cycle times greater than one microsecond will decrease the baud rate proportionally.

```
                   *
                   ****************************************
                   *                                      *
                   *      CLEAR DISPLAY TABLE             *
                   *                                      *
                   *      X REG DESTROYED                 *
                   *                                      *
                   ****************************************
                   *
1DF5 AE Ø5       A CLRTAB LDX    #5
1DF7 6F 49       A CLRLOC CLR    DTABL,X  CLEAR SIX
1DF9 5A                   DECX            LOCATIONS IN
1DFA 2A FB   1DF7         BPL    CLRLOC   DISPLAY TABLE
1DFC 81                   RTS
                   *
                   ****************************************
                   *                                      *
                   *      DISPLAY TABLE CONTENTS          *
                   *                                      *
                   *      A,X REGISTERS DESTROYED         *
                   *                                      *
                   ****************************************
                   *
1DFD AE Ø5       A DISTAB LDX    #5
1DFF E6 49       A DISCHR LDA    DTABL,X  LOAD DISPLAY
1EØ1 AD Ø9   1EØC         BSR    DISPLY   TABLE INTO
1EØ3 5A                   DECX            145ØØØ
1EØ4 2A F9   1DFF         BPL    DISCHR
1EØ6 81                   RTS
                   *
                   ****************************************
                   *                                      *
                   *      BLANK DISPLAY                   *
                   *                                      *
                   *      A,X REGISTERS DESTROYED         *
                   *                                      *
                   ****************************************
                   *
1EØ7 AD EC   1DF5  CLRDIS BSR    CLRTAB   BLANK
1EØ9 AD F2   1DFD         BSR    DISTAB   DISPLAY
1EØB 81                   RTS
                   *
                   ****************************************
                   *                                      *
                   *      SHIFT ONE CHARACTER INTO        *
                   *             DISPLAY                  *
                   *                                      *
                   *      A REGISTER DESTROYED            *
                   *                                      *
                   ****************************************
                   *
1EØC BF 5Ø       A DISPLY STX    WORK1    SAVE INDEX
1EØE 1D ØØ       A        BCLR   6,PORTA  CLEAR DATA
1E1Ø AE Ø8       A        LDX    #8
1E12 48            DIS1   LSLA            SET UP
1E13 24 Ø2   1E17         BCC    DIS2     BIT OF
1E15 1C ØØ       A        BSET   6,PORTA  ACCUMULATOR
1E17 1E ØØ       A DIS2   BSET   7,PORTA  CLOCK
1E19 1F ØØ       A        BCLR   7,PORTA  IT
1E1B 1D ØØ       A        BCLR   6,PORTA  CLEAR DATA
1E1D 5A                   DECX            COMPLETE?
1E1E 26 F2   1E12         BNE    DIS1     NO
1E2Ø BE 5Ø       A        LDX    WORK1    RESTORE INDEX
1E22 81                   RTS
```

Figure 6. Display Routines

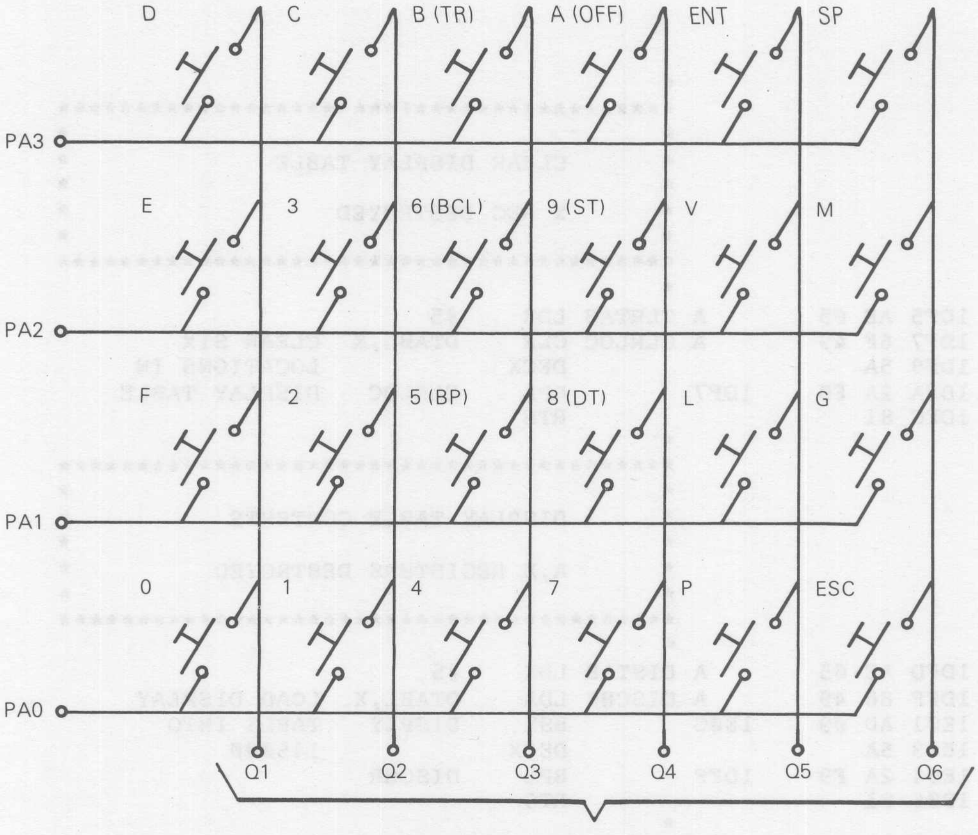


Figure 7. 4 × 6 Keypad Schematic Diagram

Table 3. Keypad Cross-Reference

KEYPAD CHARACTER		PORT-A DATA	HEXADECIMAL ($) EQUIVALENT
0	(P.C.)	11	0
F	(AR)	12	F
E	(XR)	14	E
D	(CC)	18	D
1	– –	21	1
2	– –	22	2
3	– –	24	3
C	– –	28	C
4		31	4
5	(BP)	32	5
6	(B.CL.)	34	6
B	(TR)	38	B
7		41	7
8	(DT.)	42	8
9	(ST.)	44	9
A	(OFF)	48	A
	P	51	17
	L	52	16
	V	54	15
	ENT	58	11
	ESC	61	10
	G	62	14
	M	64	13
	SP	68	12

Whatever baud rate is used, the cassette tape and recorder must have an upper frequency response 2-3 times the baud rate and a lower frequency response of 1/2 - 1/3 the baud rate to insure reliability.

7. MC146818 REAL-TIME CLOCK (RTC) OPTION

The RTC can be added to a system to provide time, data, periodic interrupt and many other user functions (see MC146818 ADI-856). The RTC time may be set and displayed using CBUG05 software; however, only the 12-hour mode is available. The displayed time is updated once per second after polling the Update-In-Progress bit (UIP) for a zero. All MC146818 functions are available to the user. The CBUG05 software set and display time routines require that a 4.194304 MHz crystal be used; however, if power consumption is critical then either a 1.04576 MHz or 32.678 KHz oscillator input could be used. The user would be required to set-up the divider chain in the RTC for the particular time base used.

8. INTERNAL AND EXTERNAL MEMORY SPACE

The internal memory space is located in the first 128 bytes of memory and contains the timer registers, I/O port registers, and 112 bytes of RAM. External memory can be mapped at the same addresses as the internal memory space. An MPU write to internal memory space is duplicated externally; however, an MPU read of internal locations will result in only the internal data being recognized. This allows the user to map large memories externally without requiring that accesses to internal memory locations be excluded from the external memory, thus, simplifying external address decoding.

```
                   ****************************************
                   *                                      *
                   *      KEYPAD SCAN                     *
                   *                                      *
                   *      X REGISTER DESTROYED            *
                   *                                      *
                   *      A REGISTER CONTAINS VALUE       *
                   *                                      *
                   *      CARRY SET IF VALID OUTPUT       *
                   *                                      *
                   ****************************************
                   *
1E23 98            KEYSCN CLC
1E24 4F                   CLRA
1E25 AE Ø6       A        LDX    #6       SETUP
1E27 AB 1Ø       A KEY1   ADD    #$1Ø     ROW
1E29 B7 ØØ       A        STA    PORTA
1E2B AD Ø6    1E33        BSR    COLUMN   CHECK COLUMNS
1E2D 25 Ø3    1E32        BCS    KEY2     IF VALID GET OUT
1E2F 5A                   DECX            ELSE TRY
1E3Ø 26 F5    1E27        BNE    KEY1     NEXT ROW
1E32 81            KEY2   RTS
                   *
                   ****************************************
                   *                                      *
                   *      CHECK FOR KEY CLOSURE           *
                   *      WITHIN COLUMN AND DEBOUNCE      *
                   *                                      *
                   *      A REGISTER CONTAINS VALUE       *
                   *                                      *
                   *      CARRY SET IF VALID OUTPUT       *
                   *                                      *
                   ****************************************
                   *
1E33 B6 ØØ       A COLUMN LDA    PORTA    READ KEYPAD
1E35 B7 5Ø       A        STA    WORK1    STORE IT
1E37 A5 ØF       A        BIT    #$ØF     KEY CLOSED?
1E39 27 19    1E54        BEQ    COLRET   NO GET OUT
1E3B AD 18    1E55        BSR    DBOUNC   ELSE DEBOUNCE
1E3D B6 ØØ       A        LDA    PORTA    RE-READ KEYPAD
1E3F B1 5Ø       A        CMP    WORK1    SAME KEY CLOSED?
1E41 26 11    1E54        BNE    COLRET   NO GET OUT
1E43 99                   SEC             SET FLAG FOR VALID
1E44 B6 ØØ       A COL1   LDA    PORTA    KEY
1E46 A5 ØF       A        BIT    #$ØF     RELEASED?
1E48 26 FA    1E44        BNE    COL1     NO TRY AGAIN
1E4A AD Ø9    1E55        BSR    DBOUNC   YES DEBOUNCE
1E4C B6 ØØ       A        LDA    PORTA    STILL
1E4E A5 ØF       A        BIT    #$ØF     RELEASED?
1E5Ø 26 F2    1E44        BNE    COL1     NO TRY AGAIN
1E52 B6 5Ø       A        LDA    WORK1    RETURN CHAR IN A-REG
```

Figure 8. KEYSCN, COLUMN, DEBOUNC, CHRIN, and STABL Routines

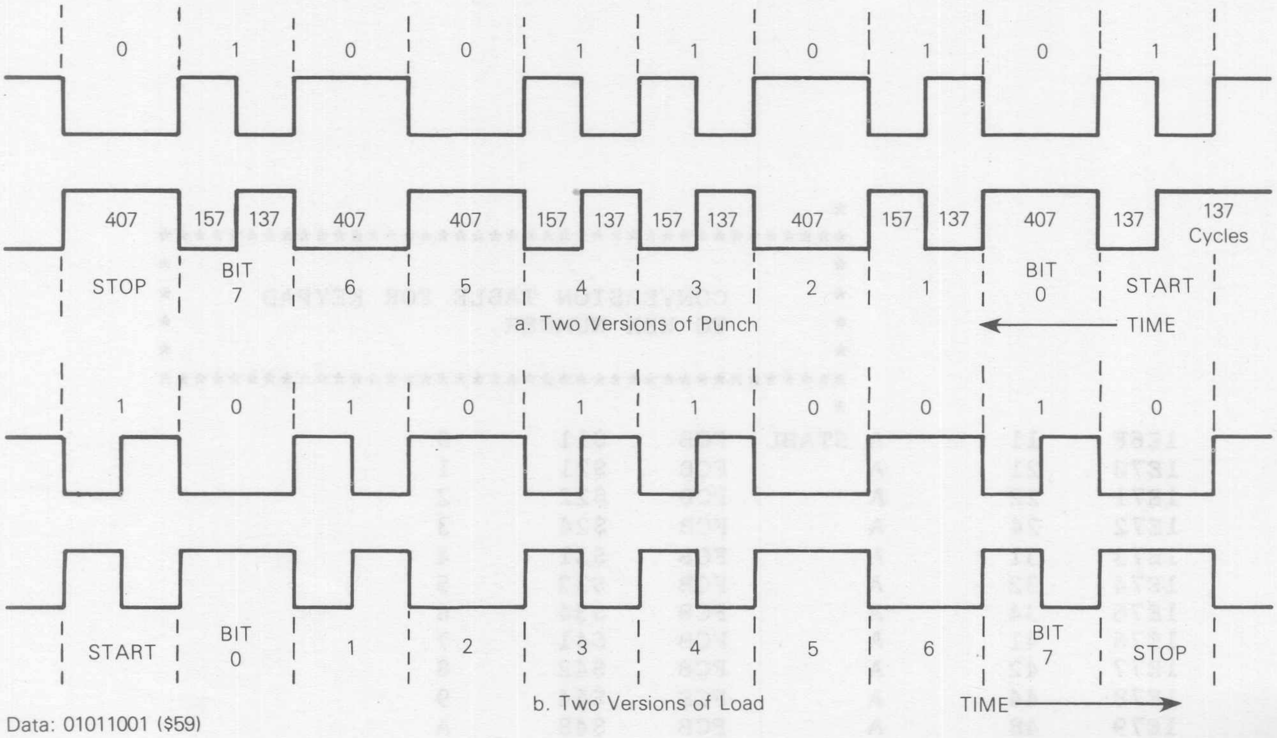
```
1E54 81             COLRET RTS              YES GO HOME
                    *
                    ***************************************
                    *                                     *
                    *     PAUSE FOR 3Ø75 CYCLES           *
                    *                                     *
                    *     A REGISTER DESTROYED            *
                    *                                     *
                    ***************************************
                    *
1E55 A6 FF        A DBOUNC LDA    #$FF      PAUSE
1E57 21 FE   1E57   DLOOP  BRN    *         256X12
1E59 21 FE   1E59          BRN    *         CYCLES
1E5B 4A                    DECA             OR AT
1E5C 26 F9   1E57          BNE    DLOOP     LEAST
1E5E 81                    RTS              3.Ø MS
                    *


                    *
                    ***************************************
                    *                                     *
                    *     INPUT ONE CHARACTER             *
                    *                                     *
                    *     A REGISTER CONTAINS HEX VALUE   *
                    *                                     *
                    *     X REGISTER CONTAINS HEX VALUE   *
                    *                                     *
                    ***************************************
                    *
        1E5F      A CHRIN  EQU    *
1E5F CD 1E23      A        JSR    KEYSCN    GET KEY
1E62 24 FB   1E5F          BCC    CHRIN     IF NOT VALID RETRY
1E64 5F                    CLRX
1E65 D1 1E6F      A CHRIN1 CMP    STABL,X   CONVERT
1E68 27 Ø3   1E6D          BEQ    CHRIN2    TO HEX
1E6A 5C                    INCX
1E6B 2Ø F8   1E65          BRA    CHRIN1
1E6D 9F             CHRIN2 TXA              IF CANCEL
1E6E 81                    RTS
```

Figure 8. KEYSCN, COLUMN, DEBOUNC, CHRIN, and STABL Routines (Cont'd)

```
                   *
                   ****************************************
                   *                                      *
                   *      CONVERSION TABLE FOR KEYPAD     *
                   *      TO HEX NUMBER                   *
                   *                                      *
                   ****************************************
                   *
1E6F    11       A STABL  FCB    $11      Ø
1E7Ø    21       A        FCB    $21      1
1E71    22       A        FCB    $22      2
1E72    24       A        FCB    $24      3
1E73    31       A        FCB    $31      4
1E74    32       A        FCB    $32      5
1E75    34       A        FCB    $34      6
1E76    41       A        FCB    $41      7
1E77    42       A        FCB    $42      8
1E78    44       A        FCB    $44      9
1E79    48       A        FCB    $48      A
1E7A    38       A        FCB    $38      B
1E7B    28       A        FCB    $28      C
1E7C    18       A        FCB    $18      D
1E7D    14       A        FCB    $14      E
1E7E    12       A        FCB    $12      F
1E7F    61       A        FCB    $61      CANCEL COMMAND
1E8Ø    58       A        FCB    $58      ENTER COMMAND
1E81    68       A        FCB    $68      STACK POINTER
1E82    64       A        FCB    $64      MEMORY
1E83    62       A        FCB    $62      GO
1E84    54       A        FCB    $54      VERIFY TAPE
1E85    52       A        FCB    $52      LOAD TAPE
1E86    51       A        FCB    $51      PUNCH TAPE
                   *
                   ****************************************
                   *                                      *
                   *      HEX TO MUX DISPLAY              *
                   *      CONVERSION TABLE                *
```

Figure 8. KEYSCN, COLUMN, DEBOUNC, CHRIN, and STBL Routines (Cont'd)



a. Two Versions of Punch

b. Two Versions of Load

Figure 9. Example of Serial Data Formats for Punch and Load

```
PAGE  ØØ1  CBUGØ5   .SA:1

ØØØØ1                           OPT    CMOS
ØØØØ2                    *
ØØØØ3            ØØØØ   A PORTA   EQU    Ø
ØØØØ4            ØØØ4   A PORTAD  EQU    4
ØØØØ5            ØØØ1   A PORTB   EQU    1
ØØØØ6            ØØØ8   A TIMER   EQU    8
ØØØØ7            ØØØ9   A TIMEC   EQU    9
ØØØØ8            17ØA   A CR1     EQU    $17ØA
ØØØØ9            17ØB   A CR2     EQU    $17ØB
ØØØ1Ø            17ØØ   A SEC     EQU    $17ØØ
ØØØ11            17Ø2   A MIN     EQU    $17Ø2
ØØØ12            17Ø4   A HOUR    EQU    $17Ø4
ØØØ13            17Ø7   A DAY     EQU    $17Ø7
ØØØ14            17Ø8   A MONTH   EQU    $17Ø8
ØØØ15            17Ø9   A YEAR    EQU    $17Ø9
ØØØ16            18ØØ   A MONSTR  EQU    $18ØØ
ØØØ17            ØØ1F   A PCMASK  EQU    $1F
ØØØ18            ØØØ3   A NUMBKP  EQU    3
ØØØ19            ØØAØ   A PROMPT  EQU    $AØ
ØØØ2Ø            ØØCC   A LJMP    EQU    $CC
ØØØ21            ØØ83   A SWIOP   EQU    $83
ØØØ22                    *
ØØØ23A ØØ4Ø                       ORG    $4Ø
ØØØ24                    *
ØØØ25            ØØ37   A BKPTBL  EQU    *-3*NUMBKP
ØØØ26A ØØ4Ø      ØØØ3   A IRQ     RMB    3
ØØØ27A ØØ43      ØØØ3   A TIRQ    RMB    3
ØØØ28A ØØ46      ØØØ3   A TIRQW   RMB    3
ØØØ29A ØØ49      ØØØ6   A DTABL   RMB    6
ØØØ3ØA ØØ4F      ØØØ1   A SWIFLG  RMB    1
ØØØ31A ØØ5Ø      ØØØ1   A WORK1   RMB    1
ØØØ32A ØØ51      ØØØ1   A WORK2   RMB    1
ØØØ33A ØØ52      ØØØ1   A ADDRH   RMB    1
ØØØ34A ØØ53      ØØØ1   A ADDRL   RMB    1
ØØØ35A ØØ54      ØØØ1   A WORK3   RMB    1
ØØØ36A ØØ55      ØØØ1   A WORK4   RMB    1
ØØØ37A ØØ56      ØØØ1   A WORK5   RMB    1
ØØØ38A ØØ57      ØØØ1   A WORK6   RMB    1
ØØØ39A ØØ58      ØØØ2   A TEMP    RMB    2
ØØØ4ØA ØØ5A      ØØØ1   A PNCNT   RMB    1
ØØØ41A ØØ5B      ØØØ1   A CHKSUM  RMB    1
ØØØ42A ØØ5C      ØØØ1   A SREF    RMB    1
ØØØ43A ØØ5D      ØØØ1   A LCNT    RMB    1
ØØØ44A ØØ5E      ØØØ1   A PCNT1   RMB    1
ØØØ45A ØØ5F      ØØØ1   A PCNTØ   RMB    1
ØØØ46                    *
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ØØØ48                     *
ØØØ49A 18ØØ                      ORG    $18ØØ
ØØØ5Ø                     *
ØØØ51A 18ØØ A6 FØ       A RESET  LDA    #$FØ     SETUP PORT
ØØØ52A 18Ø2 B7 Ø4       A        STA    PORTAD   FOR KEYPAD
ØØØ53A 18Ø4 3F ØØ       A        CLR    PORTA    AND DISPLAY
ØØØ54A 18Ø6 3F 5C       A        CLR    SREF     INITIALIZE
ØØØ55A 18Ø8 A6 ØF       A        LDA    #$F      TAPE SOFTWARE
ØØØ56A 18ØA B7 5D       A        STA    LCNT     FOR 24ØØ BAUD
ØØØ57A 18ØC A6 12       A        LDA    #$12
ØØØ58A 18ØE B7 5E       A        STA    PCNT1
ØØØ59A 181Ø A6 26       A        LDA    #$26
ØØØ6ØA 1812 B7 5F       A        STA    PCNTØ
ØØØ61                     *
ØØØ62A 1814 1FC5        A VECTOR FDB    IRQV     SET-UP
ØØØ63A 1816 1FC7        A        FDB    TIRQV    INTERRUPT
ØØØ64A 1818 1FC4        A        FDB    TIRQWV   VECTORS
ØØØ65A 181A A6 CC       A        LDA    #LJMP    IN RAM
ØØØ66A 181C B7 4Ø       A        STA    IRQ
ØØØ67A 181E B7 43       A        STA    TIRQ
ØØØ68A 182Ø B7 46       A        STA    TIRQW
ØØØ69A 1822 C6 1814     A        LDA    VECTOR
ØØØ7ØA 1825 B7 41       A        STA    IRQ+1
ØØØ71A 1827 C6 1815     A        LDA    VECTOR+1
ØØØ72A 182A B7 42       A        STA    IRQ+2
ØØØ73A 182C C6 1816     A        LDA    VECTOR+2
ØØØ74A 182F B7 44       A        STA    TIRQ+1
ØØØ75A 1831 C6 1817     A        LDA    VECTOR+3
ØØØ76A 1834 B7 45       A        STA    TIRQ+2
ØØØ77A 1836 C6 1818     A        LDA    VECTOR+4
ØØØ78A 1839 B7 47       A        STA    TIRQW+1
ØØØ79A 183B C6 1819     A        LDA    VECTOR+5
ØØØ8ØA 183E B7 48       A        STA    TIRQW+2
ØØØ81                     *
ØØØ82A 184Ø AE 4F       A        LDX    #SWIFLG
ØØØ83A 1842 7F            INIT   CLR    Ø,X      CLEAR
ØØØ84A 1843 5C                   INCX            WORKING
ØØØ85A 1844 A3 56       A        CPX    #WORK5   STORAGE
ØØØ86A 1846 23 FA    1842        BLS    INIT
ØØØ87A 1848 CD 1DD3     A        JSR    SCNBKP   CLEAR
ØØØ88A 184B A6 FF       A        LDA    #$FF     ALL
ØØØ89A 184D F7            REBCLR STA    Ø,X      BREAKPOINTS
ØØØ9ØA 184E 5C                   INCX
ØØØ91A 184F 5C                   INCX
ØØØ92A 185Ø 5C                   INCX
ØØØ93A 1851 3A 5A       A        DEC    PNCNT
ØØØ94A 1853 26 F8    184D        BNE    REBCLR
ØØØ95A 1855 83                   SWI
ØØØ96                     *
ØØØ97          1856     A SWI    EQU    *
ØØØ98A 1856 ØØ 4F Ø4 185D        BRSET  Ø,SWIFLG,SWICHK FROM RESET?
ØØØ99A 1859 1Ø 4F       A        BSET   Ø,SWIFLG YES
ØØ1ØØA 185B 2Ø 4E    18AB        BRA    GETCMD
ØØ1Ø1A 185D CD 1DD3     A SWICHK JSR    SCNBKP   REMOVE
ØØ1Ø2A 186Ø F6            SWIREP LDA    Ø,X      BREAKPOINTS
ØØ1Ø3A 1861 2B ØB    186E        BMI    SWINOB
ØØ1Ø4A 1863 B7 52       A        STA    ADDRH
ØØ1Ø5A 1865 E6 Ø1       A        LDA    1,X
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ØØ106A 1867 B7 53       A        STA    ADDRL
ØØ107A 1869 E6 Ø2       A        LDA    2,X
ØØ108A 186B CD 1F24     A        JSR    STORE
ØØ109A 186E 5C            SWINOB INCX            GET NEXT B.P.
ØØ11ØA 186F 5C                   INCX
ØØ111A 187Ø 5C                   INCX
ØØ112A 1871 3A 5A       A        DEC    PNCNT
ØØ113A 1873 26 EB    186Ø        BNE    SWIREP
ØØ114                     *
ØØ115A 1875 CD 1916     A        JSR    LOCSTK   FIND STACK
ØØ116A 1878 E6 Ø8       A        LDA    8,X
ØØ117A 187A AØ Ø1       A        SUB    #1       ADJUST
ØØ118A 187C B7 59       A        STA    TEMP+1
ØØ119A 187E E6 Ø7       A        LDA    7,X
ØØ12ØA 188Ø A2 ØØ       A        SBC    #Ø
ØØ121A 1882 B7 58       A        STA    TEMP
ØØ122A 1884 BF 57       A        STX    WORK6    SAVE STACK LOCATION
ØØ123A 1886 CD 1DD3     A        JSR    SCNBKP   SETUP B.P. SCAN
ØØ124A 1889 F6            SWITRY LDA    Ø,X      ADJUSTED P.C.
ØØ125A 188A 2B 15    18A1        BMI    SWICMP   IN B.P. TABLE?
ØØ126A 188C B1 58       A        CMP    TEMP
ØØ127A 188E 26 11    18A1        BNE    SWICMP
ØØ128A 189Ø E6 Ø1       A        LDA    1,X
ØØ129A 1892 B1 59       A        CMP    TEMP+1
ØØ13ØA 1894 26 ØB    18A1        BNE    SWICMP   NO,TRY AGAIN
ØØ131A 1896 BE 57       A        LDX    WORK6    YES,RESTORE S.P.
ØØ132A 1898 E7 Ø8       A        STA    8,X      PUT ADJUSTED P.C.
ØØ133A 189A B6 58       A        LDA    TEMP     INTO STACK
ØØ134A 189C E7 Ø7       A        STA    7,X
ØØ135A 189E CC 1B31     A        JMP    TRACE    EXECUTE 1 INSTRUCTION
ØØ136A 18A1 5C            SWICMP INCX            NEXT B.P.
ØØ137A 18A2 5C                   INCX
ØØ138A 18A3 5C                   INCX
ØØ139A 18A4 3A 5A       A        DEC    PNCNT
ØØ14ØA 18A6 26 E1    1889        BNE    SWITRY   DONE?
ØØ141A 18A8 CC 1928     A        JMP    PCOUNT   YES PRINT P.C.
ØØ142                     *
ØØ143          18AB     A GETCMD EQU    *
ØØ144A 18AB CD 1DF5     A        JSR    CLRTAB
ØØ145A 18AE A6 AØ       A        LDA    #PROMPT  PRINT
ØØ146A 18BØ B7 49       A        STA    DTABL    '='
ØØ147A 18B2 CD 1DFD     A        JSR    DISTAB   PROMPT
ØØ148                     *
ØØ149A 18B5 CD 1E23     A CMDSCN JSR    KEYSCN   CHECK KEYPAD
ØØ15ØA 18B8 24 FB    18B5        BCC    CMDSCN
ØØ151A 18BA 5F                   CLRX
ØØ152A 18BB B7 5Ø       A        STA    WORK1
ØØ153A 18BD D6 18D2     A RJUMP  LDA    PTABL,X  THIS COMMAND?
ØØ154A 18CØ B1 5Ø       A        CMP    WORK1
ØØ155A 18C2 27 ØA    18CE        BEQ    PJUMP    YES
ØØ156A 18C4 A1 68       A        CMP    #$68
ØØ157A 18C6 27 E3    18AB        BEQ    GETCMD
ØØ158A 18C8 5C                   INCX            NO
ØØ159A 18C9 5C                   INCX            GO TO
ØØ16ØA 18CA 5C                   INCX            NEXT
ØØ161A 18CB 5C                   INCX            POSSIBLE
ØØ162A 18CC 2Ø EF    18BD        BRA    RJUMP    TRY AGAIN
ØØ163A 18CE 5C            PJUMP  INCX            GO TO
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ØØ164A 18CF DC 18D2    A       JMP    PTABL,X COMMAND
ØØ165                  *
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ØØ167                     *
ØØ168A 18D2    11       A PTABL  FCB    $11
ØØ169A 18D3    CC       A        FCB    LJMP
ØØ17ØA 18D4    1928     A        FDB    PCOUNT   PROGRAM COUNTER
ØØ171A 18D6    12       A        FCB    $12
ØØ172A 18D7    CC       A        FCB    LJMP
ØØ173A 18D8    194Ø     A        FDB    AREG     ACCUMULATOR
ØØ174A 18DA    14       A        FCB    $14
ØØ175A 18DB    CC       A        FCB    LJMP
ØØ176A 18DC    195A     A        FDB    XREG     INDEX REGISTER
ØØ177A 18DE    18       A        FCB    $18
ØØ178A 18DF    CC       A        FCB    LJMP
ØØ179A 18EØ    1977     A        FDB    CCODE    CONDITION CODE
ØØ18Ø                     *
ØØ181A 18E2    28       A        FCB    $28
ØØ182A 18E3    CC       A        FCB    LJMP
ØØ183A 18E4    1FD7     A        FDB    PWRDWN   UNUSED
ØØ184                     *
ØØ185A 18E6    32       A        FCB    $32
ØØ186A 18E7    CC       A        FCB    LJMP
ØØ187A 18E8    1A78     A        FDB    BPDIS    DISPLAY/SET BP
ØØ188A 18EA    34       A        FCB    $34
ØØ189A 18EB    CC       A        FCB    LJMP
ØØ19ØA 18EC    1AD6     A        FDB    BPCLR    CLEAR BP
ØØ191A 18EE    38       A        FCB    $38
ØØ192A 18EF    CC       A        FCB    LJMP
ØØ193A 18FØ    1B31     A        FDB    TRACE    TRACE ONE INSTRUCTION
ØØ194                     *
ØØ195A 18F2    42       A        FCB    $42
ØØ196A 18F3    CC       A        FCB    LJMP
ØØ197A 18F4    1CØB     A        FDB    DTIME    DISPLAY TIME
ØØ198A 18F6    44       A        FCB    $44
ØØ199A 18F7    CC       A        FCB    LJMP
ØØ2ØØA 18F8    1B86     A        FDB    STIME    SET TIME
ØØ2Ø1A 18FA    48       A        FCB    $48
ØØ2Ø2A 18FB    CC       A        FCB    LJMP
ØØ2Ø3A 18FC    19E5     A        FDB    OFFSET   OFFSET CALCULATION
ØØ2Ø4                     *
ØØ2Ø5A 18FE    51       A        FCB    $51
ØØ2Ø6A 18FF    CC       A        FCB    LJMP
ØØ2Ø7A 19ØØ    1C35     A        FDB    PUNCH    PUNCH TAPE
ØØ2Ø8A 19Ø2    52       A        FCB    $52
ØØ2Ø9A 19Ø3    CC       A        FCB    LJMP
ØØ21ØA 19Ø4    1CDD     A        FDB    TLOAD    LOAD TAPE
ØØ211A 19Ø6    54       A        FCB    $54
ØØ212A 19Ø7    CC       A        FCB    LJMP
ØØ213A 19Ø8    1D81     A        FDB    VERIFY   VERIFY TAPE
ØØ214                     *
ØØ215A 19ØA    62       A        FCB    $62
ØØ216A 19ØB    CC       A        FCB    LJMP
ØØ217A 19ØC    1D8F     A        FDB    GO       GO
ØØ218A 19ØE    64       A        FCB    $64
ØØ219A 19ØF    CC       A        FCB    LJMP
ØØ22ØA 191Ø    1EAA     A        FDB    MEMEX    MEMORY
ØØ221A 1912    68       A        FCB    $68
ØØ222A 1913    CC       A        FCB    LJMP
ØØ223A 1914    1DDA     A        FDB    STACK    STACK
ØØ224                     *
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ØØ226                     ****************************************
ØØ227                     *                                      *
ØØ228                     *      SEARCH FOR STACK POINTER        *
ØØ229                     *                                      *
ØØ23Ø                     *      X-REG CONTAINS SP-3             *
ØØ231                     *                                      *
ØØ232                     *      A-REG DESTROYED                 *
ØØ233                     *                 *
ØØ234                     ****************************************
ØØ235                     *
ØØ236A 1916 AD Ø1    1919 LOCSTK BSR    LOCST2
ØØ237          ØØ19     A STKHI  EQU    */256
ØØ238          ØØ18     A STKLOW EQU    *-(*/256)*256
ØØ239A 1918 81                   RTS
ØØ24ØA 1919 AE 7F       A LOCST2 LDX    #$7F
ØØ241A 191B A6 19       A LOCLOP LDA    #STKHI
ØØ242A 191D 5A            LOCDWN DECX
ØØ243A 191E F1                   CMP    Ø,X
ØØ244A 191F 26 FC    191D        BNE    LOCDWN
ØØ245A 1921 A6 18                LDA    #STKLOW
ØØ246A 1923 E1 Ø1       A        CMP    1,X
ØØ247A 1925 26 F4    191B        BNE    LOCLOP
ØØ248A 1927 81                   RTS
ØØ249                     *
ØØ25Ø                     ****************************************
ØØ251                     *                                      *
ØØ252                     *      DISPLAY PROGRAM COUNTER         *
ØØ253                     *                                      *
ØØ254                     ****************************************
ØØ255                     *
ØØ256          1928     A PCOUNT EQU    *
ØØ257A 1928 A6 73       A        LDA    #$73     PRINT
ØØ258A 192A B7 4D       A        STA    DTABL+4  'PC'
ØØ259A 192C A6 D1       A        LDA    #$D1
ØØ26ØA 192E B7 4E       A        STA    DTABL+5
ØØ261A 193Ø AD E4    1916        BSR    LOCSTK   FIND USER PC
ØØ262A 1932 E6 Ø7       A        LDA    7,X      HIGH BYTE
ØØ263A 1934 B7 52       A        STA    ADDRH
ØØ264A 1936 E6 Ø8       A        LDA    8,X      LOW BYTE
ØØ265A 1938 B7 53       A        STA    ADDRL    PRINT IT
ØØ266A 193A CD 1FBØ     A        JSR    PRTADR
ØØ267A 193D CC 18B5     A        JMP    CMDSCN
ØØ268                     *
ØØ269                     ****************************************
ØØ27Ø                     *                                      *
ØØ271                     *      ACCUMULATOR EXAMINE/CHANGE      *
ØØ272                     *                                      *
ØØ273                     ****************************************
ØØ274                     *
ØØ275          194Ø     A AREG   EQU    *
ØØ276A 194Ø A6 77       A        LDA    #$77     PRINT 'ACCA'
ØØ277A 1942 B7 49       A        STA    DTABL
ØØ278A 1944 B7 4C       A        STA    DTABL+3
ØØ279A 1946 A6 D1       A        LDA    #$D1
ØØ28ØA 1948 B7 4A       A        STA    DTABL+1
ØØ281A 194A B7 4B       A        STA    DTABL+2
ØØ282A 194C AD C8    1916        BSR    LOCSTK   FIND ACCUM. VALUE
ØØ283A 194E 9F                   TXA
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ØØ284A 194F AB Ø5        A       ADD    #5
ØØ285A 1951 3F 52        A       CLR    ADDRH     SETUP FOR
ØØ286A 1953 B7 53        A       STA    ADDRL     EXAMINE/CHANGE
ØØ287A 1955 1C 4F        A       BSET   6,SWIFLG
ØØ288A 1957 CC 1EB1      A       JMP    MEMEX3    USING MEMORY ROUTINE
ØØ289                      *
ØØ29Ø                      ***************************************
ØØ291                      *                                     *
ØØ292                      *     INDEX REGISTER EXAMINE/CHANGE   *
ØØ293                      *                                     *
ØØ294                      ***************************************
ØØ295                      *
ØØ296               195A A XREG  EQU    *
ØØ297A 195A A6 Ø6        A       LDA    #6        PRINT 'ID'
ØØ298A 195C CD 1DF5      A       JSR    CLRTAB
ØØ299A 195F B7 4A        A       STA    DTABL+1
ØØ3ØØA 1961 A6 E6        A       LDA    #$E6
ØØ3Ø1A 1963 B7 4B        A       STA    DTABL+2
ØØ3Ø2A 1965 A6 6Ø        A       LDA    #$6Ø
ØØ3Ø3A 1967 B7 4C        A       STA    DTABL+3
ØØ3Ø4A 1969 AD AB   1916         BSR    LOCSTK    FIND INDEX
ØØ3Ø5A 196B 9F                   TXA              REGISTER VALUE
ØØ3Ø6A 196C AB Ø6        A       ADD    #6
ØØ3Ø7A 196E 3F 52        A       CLR    ADDRH     SETUP FOR
ØØ3Ø8A 197Ø B7 53        A       STA    ADDRL     EXAMINE/CHANGE
ØØ3Ø9A 1972 1C 4F        A       BSET   6,SWIFLG
ØØ31ØA 1974 CC 1EB1      A       JMP    MEMEX3    USING MEMORY ROUTINE
ØØ311                      *
ØØ312                      ***************************************
ØØ313                      *                                     *
ØØ314                      *     CONDITION CODE                  *
ØØ315                      *     EXAMINE/CHANGE                  *
ØØ316                      *                                     *
ØØ317                      ***************************************
ØØ318                      *
ØØ319               1977 A CCODE EQU    *
ØØ32ØA 1977 CD 1DF5      A       JSR    CLRTAB
ØØ321A 197A A6 D1        A       LDA    #$D1
ØØ322A 197C B7 49        A       STA    DTABL
ØØ323A 197E A6 D7        A       LDA    #$D7
ØØ324A 198Ø B7 4A        A       STA    DTABL+1
ØØ325A 1982 A6 E6        A       LDA    #$E6
ØØ326A 1984 B7 4B        A       STA    DTABL+2
ØØ327A 1986 A6 F1        A       LDA    #$F1
ØØ328A 1988 B7 4C        A       STA    DTABL+3
ØØ329A 198A AD 8A   1916         BSR    LOCSTK    FIND CONDITION
ØØ33ØA 198C 9F                   TXA              CODES
ØØ331A 198D AB Ø4        A       ADD    #4
ØØ332A 198F 3F 52        A       CLR    ADDRH     SETUP FOR
ØØ333A 1991 B7 53        A       STA    ADDRL     EXAMINE/CHANGE
ØØ334A 1993 1C 4F        A       BSET   6,SWIFLG
ØØ335A 1995 CC 1EB1      A       JMP    MEMEX3    USING MEMORY ROUTINE
ØØ336                      *
ØØ337                      ***************************************
ØØ338                      *                                     *
ØØ339                      *            BUILD A BEGINNING        *
ØØ34Ø                      *            AND ENDING               *
ØØ341                      *            ADDRESS RANGE            *
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ØØ342                     *                                      *
ØØ343                     *             TEMP,TEMP+1 : BEGINNING  *
ØØ344                     *             ADDRH,ADDRL : ENDING     *
ØØ345                     *                                      *
ØØ346                     ****************************************
ØØ347                     *
ØØ348A 1998 19 4F       A BLDRNG BCLR   4,SWIFLG
ØØ349A 199A 17 4F       A        BCLR   3,SWIFLG
ØØ35ØA 199C CD 1DF5     A        JSR    CLRTAB   PRINT
ØØ351A 199F A6 F4       A        LDA    #$F4     'BA'
ØØ352A 19A1 B7 4D       A        STA    DTABL+4
ØØ353A 19A3 A6 77       A        LDA    #$77
ØØ354A 19A5 B7 4E       A        STA    DTABL+5
ØØ355A 19A7 CD 1DFD     A        JSR    DISTAB
ØØ356A 19AA CD 1F58     A        JSR    BLDADR   GET SOURCE ADDR.
ØØ357A 19AD 24 2C    19DB        BCC    BLDRN1   VALID?
ØØ358A 19AF B6 52       A        LDA    ADDRH    YES
ØØ359A 19B1 A1 1F       A        CMP    #PCMASK  TOO BIG?
ØØ36ØA 19B3 22 2A    19DF        BHI    BLDRN2   YES
ØØ361A 19B5 B7 58       A        STA    TEMP     NO SAVE IT
ØØ362A 19B7 B6 53       A        LDA    ADDRL
ØØ363A 19B9 B7 59       A        STA    TEMP+1
ØØ364A 19BB CD 1F15     A        JSR    LOAD     FETCH OPCODE OF INSTR.
ØØ365A 19BE B7 57       A        STA    WORK6    SAVE IT
ØØ366A 19CØ CD 1DF5     A        JSR    CLRTAB
ØØ367A 19C3 A6 F1       A        LDA    #$F1     PRINT 'EA'
ØØ368A 19C5 B7 4D       A        STA    DTABL+4
ØØ369A 19C7 A6 77       A        LDA    #$77
ØØ37ØA 19C9 B7 4E       A        STA    DTABL+5
ØØ371A 19CB CD 1DFD     A        JSR    DISTAB
ØØ372A 19CE CD 1F58     A        JSR    BLDADR   GET DESTINATION ADDR
ØØ373A 19D1 24 Ø8    19DB        BCC    BLDRN1   VALID?
ØØ374A 19D3 B6 52       A        LDA    ADDRH    YES
ØØ375A 19D5 A1 1F       A        CMP    #PCMASK  TOO BIG?
ØØ376A 19D7 22 Ø6    19DF        BHI    BLDRN2   YES
ØØ377A 19D9 2Ø Ø6    19E1        BRA    BLDRET
ØØ378A 19DB 18 4F       A BLDRN1 BSET   4,SWIFLG INVALID
ØØ379A 19DD 2Ø Ø2    19E1        BRA    BLDRET
ØØ38ØA 19DF 16 4F       A BLDRN2 BSET   3,SWIFLG TOO BIG
ØØ381A 19E1 81            BLDRET RTS
ØØ382                     *
ØØ383                     ****************************************
ØØ384                     *                                      *
ØØ385                     *             CALCULATE BRANCH OFFSET  *
ØØ386                     *             FOR BIT AND CONDITIONAL  *
ØØ387                     *             BRANCHES                 *
ØØ388                     *                                      *
ØØ389                     *             OPCODE MUST BE AT        *
ØØ39Ø                     *             BEGINNING ADDRESS        *
ØØ391                     *                                      *
ØØ392                     *             OFFSET WILL BE INSERTED  *
ØØ393                     *             INTO BRANCH INSTRUCTION  *
ØØ394                     *                                      *
ØØ395                     ****************************************
ØØ396                     *
ØØ397A 19E2 CC 1E97     A OFFERR JMP    ERROR
ØØ398                     *
ØØ399          19E5     A OFFSET EQU    *
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ØØ400A 19E5 AD B1     1998        BSR    BLDRNG
ØØ401A 19E7 Ø8 4F  2B 1A15        BRSET  4,SWIFLG,ORET
ØØ402A 19EA Ø6 4F  F5 19E2        BRSET  3,SWIFLG,OFFERR
ØØ403A 19ED B6 53        A        LDA    ADDRL       NO FIND APPARRENT
ØØ404A 19EF BØ 59        A        SUB    TEMP+1      OFFSET
ØØ405A 19F1 AØ Ø2        A        SUB    #2
ØØ406A 19F3 B7 53        A        STA    ADDRL
ØØ407A 19F5 B6 52        A        LDA    ADDRH
ØØ408A 19F7 B2 58        A        SBC    TEMP
ØØ409A 19F9 B7 52        A        STA    ADDRH
ØØ41ØA 19FB B6 57        A        LDA    WORK6       CHECK OPCODE
ØØ411A 19FD A1 1F        A        CMP    #$1F        FOR BIT BRANCH
ØØ412A 19FF 23 41     1A42        BLS    OFFST1
ØØ413A 1AØ1 B6 52        A        LDA    ADDRH
ØØ414A 1AØ3 A1 FF        A        CMP    #$FF        + OR - OFFSET?
ØØ415A 1AØ5 27 Ø3     1AØA        BEQ    OFFST2
ØØ416A 1AØ7 4D                    TSTA               CHECK OFFSET
ØØ417A 1AØ8 26 6Ø     1A6A        BNE    OVRERR      FOR +/- Ø
ØØ418A 1AØA B6 53        A OFFST2 LDA    ADDRL
ØØ419A 1AØC A1 FF        A        CMP    #$FF
ØØ42ØA 1AØE 27 5A     1A6A        BEQ    OVRERR
ØØ421A 1A1Ø AD Ø6     1A18        BSR    USE         PRINT IT IF VALID
ØØ422A 1A12 CC 18B5      A        JMP    CMDSCN
ØØ423A 1A15 CC 18AB      A ORET   JMP    GETCMD
ØØ424                      *
ØØ425A 1A18 CD 1DF5      A USE    JSR    CLRTAB
ØØ426A 1A1B A6 D6        A        LDA    #$D6        PRINT 'USED'
ØØ427A 1A1D B7 49        A        STA    DTABL
ØØ428A 1A1F A6 B5        A        LDA    #$B5
ØØ429A 1A21 B7 4A        A        STA    DTABL+1
ØØ43ØA 1A23 A6 F1        A        LDA    #$F1
ØØ431A 1A25 B7 4B        A        STA    DTABL+2
ØØ432A 1A27 A6 E6        A        LDA    #$E6
ØØ433A 1A29 B7 4C        A        STA    DTABL+3
ØØ434A 1A2B B6 53        A        LDA    ADDRL       PRINT OFFSET
ØØ435A 1A2D CD 1F8C      A        JSR    PRTDAT
ØØ436A 1A3Ø 97                    TAX
ØØ437A 1A31 B6 59        A        LDA    TEMP+1
ØØ438A 1A33 AB Ø1        A        ADD    #1
ØØ439A 1A35 B7 53        A        STA    ADDRL
ØØ44ØA 1A37 B6 58        A        LDA    TEMP
ØØ441A 1A39 A9 ØØ        A        ADC    #Ø          PUT INTO
ØØ442A 1A3B B7 52        A        STA    ADDRH       INSTRUCTION
ØØ443A 1A3D 9F                    TXA
ØØ444A 1A3E CD 1F24      A        JSR    STORE
ØØ445A 1A41 81                    RTS
ØØ446                      *
ØØ447A 1A42 B6 53        A OFFST1 LDA    ADDRL       ADJUST FOR
ØØ448A 1A44 AØ Ø1        A        SUB    #1          BIT BRANCH
ØØ449A 1A46 B7 53        A        STA    ADDRL
ØØ45ØA 1A48 B6 52        A        LDA    ADDRH
ØØ451A 1A4A A2 ØØ        A        SBC    #Ø
ØØ452A 1A4C B7 52        A        STA    ADDRH
ØØ453A 1A4E A1 FF        A        CMP    #$FF        NEG OFFSET?
ØØ454A 1A5Ø 27 Ø3     1A55        BEQ    OFFST3      YES
ØØ455A 1A52 4D                    TSTA               CHECK FOR
ØØ456A 1A53 26 15     1A6A        BNE    OVRERR      +/- Ø AND -1
ØØ457A 1A55 B6 53        A OFFST3 LDA    ADDRL
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ØØ458A 1A57 A1 FF          A        CMP     #$FF
ØØ459A 1A59 27 ØF     1A6A A        BEQ     OVRERR
ØØ46ØA 1A5B A1 FE          A        CMP     #$FE
ØØ461A 1A5D 27 ØB     1A6A A        BEQ     OVRERR
ØØ462A 1A5F 3C 59          A        INC     TEMP+1
ØØ463A 1A61 26 Ø2     1A65 A        BNE     OFFITS
ØØ464A 1A63 3C 58          A        INC     TEMP
ØØ465A 1A65 AD B1     1A18 OFFITS   BSR     USE          PRINT IF VALID
ØØ466A 1A67 CC 18B5        A        JMP     CMDSCN
ØØ467                      *
ØØ468A 1A6A A6 D7          A OVRERR LDA     #$D7         PRINT 'OR'
ØØ469A 1A6C B7 4D          A        STA     DTABL+4
ØØ47ØA 1A6E A6 6Ø          A        LDA     #$6Ø
ØØ471A 1A7Ø B7 4E          A        STA     DTABL+5
ØØ472A 1A72 CD 1FBØ        A        JSR     PRTADR
ØØ473A 1A75 CC 18B5        A        JMP     CMDSCN
ØØ474                      *
ØØ475                      *******************************************
ØØ476                      *                                         *
ØØ477                      *            DISPLAY/SET BREAKPOINTS      *
ØØ478                      *                                         *
ØØ479                      *******************************************
ØØ48Ø                      *
ØØ481            1A78      A BPDIS  EQU     *
ØØ482A 1A78 3F 57          A        CLR     WORK6
ØØ483A 1A7A 3A 57          A        DEC     WORK6
ØØ484A 1A7C CD 1DD3        A        JSR     SCNBKP       FIND B.P. TABLE
ØØ485A 1A7F BF 51          A        STX     WORK2
ØØ486A 1A81 3F 4D          A BPDIS1 CLR     DTABL+4
ØØ487A 1A83 F6             A        LDA     Ø,X          GET B.P.
ØØ488A 1A84 2A 1Ø     1A96 A        BPL     BPDIS2       VALID?
ØØ489A 1A86 A6 F4          A        LDA     #$F4         NO
ØØ49ØA 1A88 B7 49          A        STA     DTABL        PRINT 'BOFF'
ØØ491A 1A8A A6 D7          A        LDA     #$D7
ØØ492A 1A8C B7 4A          A        STA     DTABL+1
ØØ493A 1A8E A6 71          A        LDA     #$71
ØØ494A 1A9Ø B7 4B          A        STA     DTABL+2
ØØ495A 1A92 B7 4C          A        STA     DTABL+3
ØØ496A 1A94 2Ø Ø9     1A9F A        BRA     BPDIS4
ØØ497A 1A96 B7 52          A BPDIS2 STA     ADDRH        PRINT B.P.
ØØ498A 1A98 E6 Ø1          A        LDA     1,X
ØØ499A 1A9A B7 53          A        STA     ADDRL
ØØ5ØØA 1A9C CD 1FBØ        A        JSR     PRTADR
ØØ5Ø1A 1A9F 3C 57          A BPDIS4 INC     WORK6        PRINT B.P. #
ØØ5Ø2A 1AA1 BE 57          A        LDX     WORK6
ØØ5Ø3A 1AA3 D6 1E87        A        LDA     CTABL,X
ØØ5Ø4A 1AA6 B7 4E          A        STA     DTABL+5
ØØ5Ø5A 1AA8 CD 1DFD        A        JSR     DISTAB
ØØ5Ø6A 1AAB CD 1F58        A        JSR     BLDADR       NEW B.P.
ØØ5Ø7A 1AAE BE 51          A        LDX     WORK2
ØØ5Ø8A 1ABØ 25 Ø8     1ABA A        BCS     BPDIS7       YES
ØØ5Ø9A 1AB2 A1 1Ø          A        CMP     #$1Ø         NO,ESC?
ØØ51ØA 1AB4 27 1A     1ADØ A        BEQ     BPRET        GET OUT
ØØ511A 1AB6 A1 11          A        CMP     #$11         ENTER?
ØØ512A 1AB8 27 ØB     1AC5 A        BEQ     BPDIS5       GET NEXT B.P.
ØØ513A 1ABA B6 52          A BPDIS7 LDA     ADDRH        TOO BIG?
ØØ514A 1ABC A1 1F          A        CMP     #PCMASK
ØØ515A 1ABE 22 13     1AD3 A        BHI     BPERR        YES
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ØØ516A 1ACØ F7                          STA     Ø,X        NO,STORE NEW B.P.
ØØ517A 1AC1 B6 53           A           LDA     ADDRL
ØØ518A 1AC3 E7 Ø1           A           STA     1,X
ØØ519A 1AC5 5C                BPDIS5    INCX               GET NEXT B.P.
ØØ52ØA 1AC6 5C                          INCX
ØØ521A 1AC7 5C                          INCX
ØØ522A 1AC8 BF 51           A           STX     WORK2
ØØ523A 1ACA 3A 5A           A           DEC     PNCNT
ØØ524A 1ACC 26 B3       1A81            BNE     BPDIS1     DONE?
ØØ525A 1ACE 2Ø A8       1A78            BRA     BPDIS      YES START OVER
ØØ526A 1ADØ CC 18AB         A BPRET     JMP     GETCMD
ØØ527                         *
ØØ528A 1AD3 CC 1E97         A BPERR     JMP     ERROR
ØØ529                         *
ØØ53Ø                         *************************************************
ØØ531                         *                                               *
ØØ532                         *               BREAKPOINT CLEAR                *
ØØ533                         *                                               *
ØØ534                         *               TYPE # FOR SINGLE               *
ØØ535                         *               CLEAR AND ENT FOR ALL           *
ØØ536                         *                                               *
ØØ537                         *************************************************
ØØ538                         *
ØØ539     1AD6              A BPCLR     EQU     *
ØØ54ØA 1AD6 CD 1DF5         A           JSR     CLRTAB     PRINT 'BCLR'
ØØ541A 1AD9 A6 F4           A           LDA     #$F4
ØØ542A 1ADB B7 49           A           STA     DTABL
ØØ543A 1ADD A6 D1           A           LDA     #$D1
ØØ544A 1ADF B7 4A           A           STA     DTABL+1
ØØ545A 1AE1 A6 DØ           A           LDA     #$DØ
ØØ546A 1AE3 B7 4B           A           STA     DTABL+2
ØØ547A 1AE5 A6 6Ø           A           LDA     #$6Ø
ØØ548A 1AE7 B7 4C           A           STA     DTABL+3
ØØ549A 1AE9 CD 1DFD         A           JSR     DISTAB
ØØ55ØA 1AEC CD 1DD3         A           JSR     SCNBKP     FIND B.P. TABLE
ØØ551A 1AEF BF 51           A           STX     WORK2
ØØ552A 1AF1 CD 1F49         A           JSR     GETNYB
ØØ553A 1AF4 25 12       1BØ8            BCS     BPCLR1     ENTER?
ØØ554A 1AF6 A1 11           A           CMP     #$11
ØØ555A 1AF8 26 34       1B2E            BNE     BPCRET     NO
ØØ556A 1AFA A6 FF           A           LDA     #$FF       YES,CLEAR ALL
ØØ557A 1AFC BE 51           A           LDX     WORK2
ØØ558A 1AFE F7                BPCLR2    STA     Ø,X
ØØ559A 1AFF 5C                          INCX
ØØ56ØA 1BØØ 5C                          INCX
ØØ561A 1BØ1 5C                          INCX
ØØ562A 1BØ2 3A 5A           A           DEC     PNCNT
ØØ563A 1BØ4 26 F8       1AFE            BNE     BPCLR2
ØØ564A 1BØ6 2Ø 26       1B2E            BRA     BPCRET
ØØ565A 1BØ8 A1 Ø3           A BPCLR1    CMP     #NUMBKP    VALID B.P. #?
ØØ566A 1BØA 24 C7       1AD3            BHS     BPERR      NO
ØØ567A 1BØC 97                          TAX                YES
ØØ568A 1BØD D6 1E87         A           LDA     CTABL,X    PRINT B.P. #
ØØ569A 1B1Ø B7 4E           A           STA     DTABL+5
ØØ57ØA 1B12 4F                          CLRA               FIND IT
ØØ571A 1B13 AØ Ø3           A           SUB     #3
ØØ572A 1B15 AB Ø3           A BPCLR3    ADD     #3
ØØ573A 1B17 5A                          DECX
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ØØ574A 1B18 2A FB    1B15          BPL    BPCLR3
ØØ575A 1B1A B7 57       A          STA    WORK6
ØØ576A 1B1C CD 1DFD     A          JSR    DISTAB      PRINT B.P.
ØØ577A 1B1F CD 1E5F     A          JSR    CHRIN
ØØ578A 1B22 A1 11       A          CMP    #$11        CLEAR IT?
ØØ579A 1B24 26 Ø8    1B2E          BNE    BPCRET      NO
ØØ580A 1B26 A6 37       A          LDA    #BKPTBL     YES
ØØ581A 1B28 BB 57       A          ADD    WORK6
ØØ582A 1B2A 97                     TAX
ØØ583A 1B2B A6 FF       A          LDA    #$FF
ØØ584A 1B2D F7                     STA    Ø,X
ØØ585A 1B2E CC 18AB     A BPCRET JMP    GETCMD
ØØ586                     *
ØØ587                     ***************************************
ØØ588                     *                                     *
ØØ589                     *          TRACE ONE INSTRUCTION      *
ØØ590                     *                                     *
ØØ591                     *          TIMER INTERRUPT IS         *
ØØ592                     *          USED                       *
ØØ593                     *                                     *
ØØ594                     ***************************************
ØØ595                     *
ØØ596           1B31    A TRACE  EQU    *
ØØ597A 1B31 CD 1916     A          JSR    LOCSTK      FIND S.P.
ØØ598A 1B34 E6 Ø4       A          LDA    4,X
ØØ599A 1B36 A4 Ø8       A          AND    #8
ØØ600A 1B38 B7 57       A          STA    WORK6
ØØ601A 1B3A E6 Ø7       A          LDA    7,X
ØØ602A 1B3C B7 52       A          STA    ADDRH
ØØ603A 1B3E E6 Ø8       A          LDA    8,X
ØØ604A 1B4Ø B7 53       A          STA    ADDRL
ØØ605A 1B42 CD 1F15     A          JSR    LOAD        GET OPCODE
ØØ606A 1B45 A1 83       A          CMP    #$83        SWI?
ØØ607A 1B47 26 ØF    1B58          BNE    TRACE3
ØØ608A 1B49 B6 53       A          LDA    ADDRL       YES
ØØ609A 1B4B AB Ø1       A          ADD    #1          INC PC
ØØ610A 1B4D E7 Ø8       A          STA    8,X
ØØ611A 1B4F B6 52       A          LDA    ADDRH
ØØ612A 1B51 A9 ØØ       A          ADC    #Ø
ØØ613A 1B53 E7 Ø7       A          STA    7,X
ØØ614A 1B55 CC 1928     A          JMP    PCOUNT
ØØ615A 1B58 A1 9B       A TRACE3 CMP    #$9B        SEI?
ØØ616A 1B5A 26 15    1B71          BNE    TRACE2
ØØ617A 1B5C E6 Ø4       A          LDA    4,X         YES
ØØ618A 1B5E AA Ø8       A          ORA    #8          SET IT IN
ØØ619A 1B6Ø E7 Ø4       A          STA    4,X         STACK
ØØ620A 1B62 B6 53       A          LDA    ADDRL
ØØ621A 1B64 AB Ø1       A          ADD    #1
ØØ622A 1B66 E7 Ø8       A          STA    8,X
ØØ623A 1B68 B6 52       A          LDA    ADDRH
ØØ624A 1B6A A9 ØØ       A          ADC    #Ø
ØØ625A 1B6C E7 Ø7       A          STA    7,X
ØØ626A 1B6E CC 1928     A          JMP    PCOUNT
ØØ627A 1B71 A1 9A       A TRACE2 CMP    #$9A        CLI?
ØØ628A 1B73 26 Ø2    1B77          BNE    TRACE1
ØØ629A 1B75 3F 57       A          CLR    WORK6       YES,CLEAR IT ON STACK
ØØ630A 1B77 E6 Ø4       A TRACE1 LDA    4,X         GET COND. CODE
ØØ631A 1B79 A4 F7       A          AND    #$F7        CLEAR IRQ BIT
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ØØ632A 1B7B E7 Ø4       A        STA    4,X      RETURN TO STACK
ØØ633A 1B7D A6 1Ø       A        LDA    #16
ØØ634A 1B7F B7 Ø8       A        STA    TIMER
ØØ635A 1B81 A6 Ø8       A        LDA    #8
ØØ636A 1B83 B7 Ø9       A        STA    TIMEC
ØØ637A 1B85 8Ø          A        RTI             EXECUTE
ØØ638                     *
ØØ639                     ****************************************
ØØ64Ø                     *                                      *
ØØ641                     *             SET CURRENT TIME         *
ØØ642                     *             USING MC146818           *
ØØ643                     *                                      *
ØØ644                     *             12-HOUR FORMAT           *
ØØ645                     *                                      *
ØØ646                     ****************************************
ØØ647                     *
ØØ648          1B86     A STIME  EQU    *
ØØ649A 1B86 CD 1DF5     A        JSR    CLRTAB
ØØ65ØA 1B89 A6 77       A        LDA    #$77     AM BY DEFAULT
ØØ651A 1B8B B7 4E       A        STA    DTABL+5
ØØ652A 1B8D 3F 53       A        CLR    ADDRL
ØØ653A 1B8F 3F 52       A        CLR    ADDRH
ØØ654A 1B91 CD 1FBØ     A STIME2 JSR    PRTADR
ØØ655A 1B94 CD 1F49     A        JSR    GETNYB   GET INPUT
ØØ656A 1B97 25 12    1BAB        BCS    STIME1
ØØ657A 1B99 A1 1Ø       A        CMP    #$1Ø     ESC?
ØØ658A 1B9B 27 4F    1BEC        BEQ    STMRET
ØØ659A 1B9D A1 11       A        CMP    #$11     ENT?
ØØ66ØA 1B9F 27 1D    1BBE        BEQ    STIME4
ØØ661A 1BA1 A1 17       A        CMP    #$17     P?
ØØ662A 1BA3 26 EC    1B91        BNE    STIME2
ØØ663A 1BA5 A6 73       A        LDA    #$73     YES,
ØØ664A 1BA7 B7 4E       A        STA    DTABL+5  PRINT P
ØØ665A 1BA9 2Ø E6    1B91        BRA    STIME2
ØØ666A 1BAB A1 Ø9       A STIME1 CMP    #9       GT 9?
ØØ667A 1BAD 22 4Ø    1BEF        BHI    STERR
ØØ668A 1BAF AE Ø4       A        LDX    #4       SHIFT IN NEW
ØØ669A 1BB1 38 53       A STIME3 LSL    ADDRL    INPUT
ØØ67ØA 1BB3 39 52       A        ROL    ADDRH
ØØ671A 1BB5 5A                   DECX
ØØ672A 1BB6 26 F9    1BB1        BNE    STIME3
ØØ673A 1BB8 BA 53       A        ORA    ADDRL
ØØ674A 1BBA B7 53       A        STA    ADDRL
ØØ675A 1BBC 2Ø D3    1B91        BRA    STIME2
ØØ676A 1BBE B6 52       A STIME4 LDA    ADDRH    HOURS GT 12?
ØØ677A 1BCØ A1 12       A        CMP    #$12
ØØ678A 1BC2 22 2B    1BEF        BHI    STERR
ØØ679A 1BC4 4D                   TSTA            HOURS EQ Ø?
ØØ68ØA 1BC5 27 28    1BEF        BEQ    STERR
ØØ681A 1BC7 B6 53       A        LDA    ADDRL    MIN? GT 59?
ØØ682A 1BC9 A1 59       A        CMP    #$59
ØØ683A 1BCB 22 22    1BEF        BHI    STERR
ØØ684A 1BCD A6 8Ø       A        LDA    #$8Ø     PUT IN
ØØ685A 1BCF C7 17ØB     A        STA    CR2      SET TIME MODE
ØØ686A 1BD2 4F                   CLRA
ØØ687A 1BD3 C7 17ØA     A        STA    CR1
ØØ688A 1BD6 Ø4 4E Ø2 1BDB        BRSET  2,DTABL+5,STIME5 PM?
ØØ689A 1BD9 1E 52       A        BSET   7,ADDRH  YES
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ØØ69ØA 1BDB B6 53        A STIME5 LDA    ADDRL    PUT TIME INTO
ØØ691A 1BDD C7 17Ø2      A        STA    MIN      MC146818
ØØ692A 1BEØ B6 52        A        LDA    ADDRH
ØØ693A 1BE2 C7 17Ø4      A        STA    HOUR
ØØ694A 1BE5 4F                    CLRA
ØØ695A 1BE6 C7 17ØB      A        STA    CR2      ALLOW TO RUN
ØØ696A 1BE9 C7 17ØØ      A        STA    SEC      CLR SECONDS
ØØ697A 1BEC CC 18AB      A STMRET JMP    GETCMD
ØØ698                      *
ØØ699A 1BEF CC 1E97      A STERR  JMP    ERROR
ØØ7ØØ                      *
ØØ7Ø1                      ****************************************
ØØ7Ø2                      *                                      *
ØØ7Ø3                      *             WAIT FOR THE END         *
ØØ7Ø4                      *             OF UPDATE CYCLE          *
ØØ7Ø5                      *                                      *
ØØ7Ø6                      ****************************************
ØØ7Ø7                      *
ØØ7Ø8A 1BF2 CD 1E23      A VALID  JSR    KEYSCN
ØØ7Ø9A 1BF5 25 13    1CØA         BCS    VALRET
ØØ71ØA 1BF7 C6 17ØA      A        LDA    CR1      IS UIP LOW?
ØØ711A 1BFA A4 8Ø        A        AND    #$8Ø
ØØ712A 1BFC 27 F4    1BF2         BEQ    VALID    YES,WAIT UNTIL HIGH
ØØ713A 1BFE CD 1E23      A VALID2 JSR    KEYSCN
ØØ714A 1CØ1 25 Ø7    1CØA         BCS    VALRET
ØØ715A 1CØ3 C6 17ØA      A        LDA    CR1      UIP MADE NEG TRANSITION
ØØ716A 1CØ6 A4 8Ø        A        AND    #$8Ø
ØØ717A 1CØ8 26 F4    1BFE         BNE    VALID2
ØØ718A 1CØA 81                  VALRET RTS
ØØ719                      *
ØØ72Ø                      ****************************************
ØØ721                      *                                      *
ØØ722                      *             DISPLAY CURRENT TIME     *
ØØ723                      *             FROM MC146818            *
ØØ724                      *                                      *
ØØ725                      *             USES 12-HOUR FORMAT      *
ØØ726                      *                                      *
ØØ727                      ****************************************
ØØ728                      *
ØØ729          1CØB      A DTIME  EQU    *
ØØ73ØA 1CØB CD 1DF5      A        JSR    CLRTAB
ØØ731A 1CØE A6 77        A        LDA    #$77
ØØ732A 1C1Ø B7 4E        A        STA    DTABL+5
ØØ733A 1C12 AD DE    1BF2         BSR    VALID    UPDATE OVER
ØØ734A 1C14 24 Ø4    1C1A         BCC    DTIME2
ØØ735A 1C16 5F                    CLRX
ØØ736A 1C17 CC 18BD      A        JMP    RJUMP
ØØ737A 1C1A C6 17Ø4      A DTIME2 LDA    HOUR
ØØ738A 1C1D B7 52        A        STA    ADDRH
ØØ739A 1C1F ØF 52 Ø6 1C28         BRCLR  7,ADDRH,DTIME1 PM?
ØØ74ØA 1C22 1F 52        A        BCLR   7,ADDRH
ØØ741A 1C24 A6 73        A        LDA    #$73     PRINT IT
ØØ742A 1C26 B7 4E        A        STA    DTABL+5
ØØ743A 1C28 C6 17Ø2      A DTIME1 LDA    MIN
ØØ744A 1C2B B7 53        A        STA    ADDRL
ØØ745A 1C2D CD 1FBØ      A        JSR    PRTADR   PRINT TIME
ØØ746A 1C3Ø 2Ø D9    1CØB         BRA    DTIME
ØØ747                      *
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ØØ748                      ***************************************
ØØ749                      *                                     *
ØØ75Ø                      *              PUNCH TAPE             *
ØØ751                      *                                     *
ØØ752                      *              LAST ADDRESS WILL      *
ØØ753                      *              REMAIN UNTIL PUNCH     *
ØØ754                      *              IS COMPLETE            *
ØØ755                      *                                     *
ØØ756                      *              24ØØ BAUD IS DEFAULT   *
ØØ757                      *                                     *
ØØ758                      ***************************************
ØØ759                      *
ØØ76ØA 1C32 CC 1E97      A PUNERR JMP     ERROR
ØØ761                      *
ØØ762       1C35         A PUNCH  EQU     *
ØØ763A 1C35 CD 1998      A        JSR     BLDRNG    BUILD RANGE
ØØ764A 1C38 Ø8 4F 49 1C84         BRSET   4,SWIFLG,PUNRET VALID?
ØØ765A 1C3B Ø6 4F F4 1C32         BRSET   3,SWIFLG,PUNERR VAILD?
ØØ766A 1C3E BE 58        A        LDX     TEMP      SWAP ADDRESSES
ØØ767A 1C4Ø B7 58        A        STA     TEMP
ØØ768A 1C42 BF 52        A        STX     ADDRH
ØØ769A 1C44 B6 53        A        LDA     ADDRL
ØØ77ØA 1C46 BE 59        A        LDX     TEMP+1
ØØ771A 1C48 BF 53        A        STX     ADDRL     ADJUST
ØØ772A 1C4A 4C                    INCA              ENDING
ØØ773A 1C4B 26 Ø2   1C4F          BNE     PUN3      ADDRESS
ØØ774A 1C4D 3C 58        A        INC     TEMP
ØØ775A 1C4F B7 59        A PUN3   STA     TEMP+1
ØØ776A 1C51 AD 3F   1C92          BSR     PUNLDR    PUNCH LEADER
ØØ777A 1C53 A6 B3        A        LDA     #$B3      PUNCH BOT
ØØ778A 1C55 AD 5Ø   1CA7          BSR     PUNBYT
ØØ779A 1C57 3F 5B        A        CLR     CHKSUM    INITIALIZE CHECKSUM
ØØ78ØA 1C59 B6 58        A        LDA     TEMP      PUNCH
ØØ781A 1C5B AD 2A   1C87          BSR     PUNIT     ENDING ADDRESS
ØØ782A 1C5D B6 59        A        LDA     TEMP+1
ØØ783A 1C5F AD 26   1C87          BSR     PUNIT
ØØ784A 1C61 B6 52        A        LDA     ADDRH     PUNCH
ØØ785A 1C63 AD 22   1C87          BSR     PUNIT     BEGINNING ADDRESS
ØØ786A 1C65 B6 53        A        LDA     ADDRL
ØØ787A 1C67 AD 1E   1C87          BSR     PUNIT
ØØ788A 1C69 CD 1F15      A PUN5   JSR     LOAD      GET BYTE FROM MEMORY
ØØ789A 1C6C AD 19   1C87          BSR     PUNIT     PUNCH IT
ØØ79ØA 1C6E 3C 53        A        INC     ADDRL
ØØ791A 1C7Ø 26 Ø2   1C74          BNE     PUN4
ØØ792A 1C72 3C 52        A        INC     ADDRH
ØØ793A 1C74 B6 58        A PUN4   LDA     TEMP      FINISHED?
ØØ794A 1C76 B1 52        A        CMP     ADDRH
ØØ795A 1C78 26 EF   1C69          BNE     PUN5
ØØ796A 1C7A B6 59        A        LDA     TEMP+1
ØØ797A 1C7C B1 53        A        CMP     ADDRL
ØØ798A 1C7E 26 E9   1C69          BNE     PUN5
ØØ799A 1C8Ø B6 5B        A        LDA     CHKSUM    YES, PUNCH
ØØ8ØØA 1C82 AD 23   1CA7          BSR     PUNBYT    CHECKSUM
ØØ8Ø1A 1C84 CC 18AB      A PUNRET JMP     GETCMD
ØØ8Ø2                      *
ØØ8Ø3A 1C87 B7 56        A PUNIT  STA     WORK5
ØØ8Ø4A 1C89 AD 1C   1CA7          BSR     PUNBYT    PUNCH BYTE
ØØ8Ø5A 1C8B B6 56        A        LDA     WORK5     AND UPDATE
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ØØ8Ø6A 1C8D BB 5B       A        ADD    CHKSUM   CHECKSUM
ØØ8Ø7A 1C8F B7 5B       A        STA    CHKSUM
ØØ8Ø8A 1C91 81          A        RTS
ØØ8Ø9                     *
ØØ81ØA 1C92 A6 3F       A PUNLDR LDA    #$3F     PUNCH 16K
ØØ811A 1C94 B7 5Ø       A        STA    WORK1    ZEROS
ØØ812A 1C96 A6 FF       A        LDA    #$FF
ØØ813A 1C98 B7 51       A        STA    WORK2
ØØ814A 1C9A AD 24    1CCØ PUNLD1 BSR    COMO
ØØ815A 1C9C AD 35    1CD3        BSR    NOCO
ØØ816A 1C9E 3A 51       A        DEC    WORK2
ØØ817A 1CAØ 26 F8    1C9A        BNE    PUNLD1
ØØ818A 1CA2 3A 5Ø       A        DEC    WORK1
ØØ819A 1CA4 26 F4    1C9A        BNE    PUNLD1
ØØ82ØA 1CA6 81          A        RTS
ØØ821                     *
ØØ822A 1CA7 AE Ø8       A PUNBYT LDX    #8       PUNCH
ØØ823A 1CA9 AD 15    1CCØ        BSR    COMO     SYNC
ØØ824A 1CAB AD 13    1CCØ        BSR    COMO     START
ØØ825A 1CAD AD 11    1CCØ PUNBY1 BSR    COMO     SYNC
ØØ826A 1CAF 46                   RORA
ØØ827A 1CBØ 24 Ø4    1CB6        BCC    PUNBY2   1 OR Ø?
ØØ828A 1CB2 AD ØC    1CCØ        BSR    COMO     1
ØØ829A 1CB4 2Ø Ø2    1CB8        BRA    PUNBY3
ØØ83ØA 1CB6 AD 1B    1CD3 PUNBY2 BSR    NOCO     Ø
ØØ831A 1CB8 5A            PUNBY3 DECX            ALL
ØØ832A 1CB9 26 F2    1CAD        BNE    PUNBY1   DONE?
ØØ833A 1CBB AD Ø3    1CCØ        BSR    COMO     YES,SYNC
ØØ834A 1CBD AD 14    1CD3        BSR    NOCO     STOP BIT
ØØ835A 1CBF 81          A        RTS
ØØ836                     *
ØØ837A 1CCØ BF 54       A COMO   STX    WORK3    MAKE A TRANSITION
ØØ838A 1CC2 ØD ØØ Ø4 1CC9        BRCLR  6,PORTA,COMO1
ØØ839A 1CC5 1D ØØ       A        BCLR   6,PORTA
ØØ84ØA 1CC7 2Ø Ø2    1CCB        BRA    DELAY    PAUSE
ØØ841A 1CC9 1C ØØ       A COMO1  BSET   6,PORTA
ØØ842A 1CCB BE 5E       A DELAY  LDX    PCNT1
ØØ843A 1CCD 5A            COMO2  DECX
ØØ844A 1CCE 26 FD    1CCD        BNE    COMO2
ØØ845A 1CDØ BE 54       A        LDX    WORK3
ØØ846A 1CD2 81          A        RTS
ØØ847                     *
ØØ848A 1CD3 BF 54       A NOCO   STX    WORK3    NO TRANSITION
ØØ849A 1CD5 BE 5F       A        LDX    PCNTØ    DOUBLE DELAY
ØØ85ØA 1CD7 5A            NOCO1  DECX
ØØ851A 1CD8 26 FD    1CD7        BNE    NOCO1
ØØ852A 1CDA BE 54       A        LDX    WORK3
ØØ853A 1CDC 81          A        RTS
ØØ854                     *
ØØ855                     ****************************************
ØØ856                     *                                      *
ØØ857                     *             LOAD TAPE OR             *
ØØ858                     *             COMPARE TAPE             *
ØØ859                     *                                      *
ØØ86Ø                     ****************************************
ØØ861                     *
ØØ862           1CDD    A TLOAD  EQU    *
ØØ863A 1CDD 1B 4F       A        BCLR   5,SWIFLG
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ØØ864A 1CDF CD 1EØ7     A        JSR    CLRDIS
ØØ865A 1CE2 A6 FF       A LOADØ  LDA    #$FF           LOAD 256
ØØ866A 1CE4 AD 78    1D5E LOAD1  BSR    EDGE           CONSECUTIVE
ØØ867A 1CE6 25 FA    1CE2        BCS    LOADØ          ZEROS
ØØ868A 1CE8 4A                   DECA
ØØ869A 1CE9 26 F9    1CE4        BNE    LOAD1
ØØ87ØA 1CEB AD 5Ø    1D3D LOAD2  BSR    LOADBY
ØØ871A 1CED A1 B3       A        CMP    #$B3           BOT?
ØØ872A 1CEF 26 FA    1CEB        BNE    LOAD2
ØØ873                     *
ØØ874A 1CF1 3F 5B       A        CLR    CHKSUM         YES, INIT CHECKSUM
ØØ875A 1CF3 CD 1D76     A        JSR    LOADIT         GET ENDING
ØØ876A 1CF6 B7 58       A        STA    TEMP           ADDRESS
ØØ877A 1CF8 AD 7C    1D76        BSR    LOADIT
ØØ878A 1CFA B7 59       A        STA    TEMP+1
ØØ879A 1CFC AD 78    1D76        BSR    LOADIT         GET BEGINNING
ØØ88ØA 1CFE B7 52       A        STA    ADDRH          ADDRESS
ØØ881A 1DØØ AD 74    1D76        BSR    LOADIT
ØØ882A 1DØ2 B7 53       A        STA    ADDRL
ØØ883                     *
ØØ884A 1DØ4 AD 7Ø    1D76 LOAD4  BSR    LOADIT         GET BYTE
ØØ885A 1DØ6 ØB 4F ØB 1D14        BRCLR  5,SWIFLG,LOAD5 COMPARE?
ØØ886A 1DØ9 B7 57       A        STA    WORK6          YES, IS IT
ØØ887A 1DØB CD 1F15     A        JSR    LOAD           SAME?
ØØ888A 1DØE B1 57       A        CMP    WORK6
ØØ889A 1D1Ø 26 25    1D37        BNE    DISADR         NO
ØØ89ØA 1D12 2Ø Ø5    1D19        BRA    LOAD6          YES
ØØ891A 1D14 CD 1F24     A LOAD5  JSR    STORE          NOT COMPARE, SAVE IT
ØØ892A 1D17 25 1E    1D37        BCS    DISADR
ØØ893A 1D19 3C 53       A LOAD6  INC    ADDRL          INC ADDRESS
ØØ894A 1D1B 26 Ø2    1D1F        BNE    LOAD3
ØØ895A 1D1D 3C 52       A        INC    ADDRH
ØØ896A 1D1F B6 58       A LOAD3  LDA    TEMP           FINSHED?
ØØ897A 1D21 B1 52       A        CMP    ADDRH
ØØ898A 1D23 26 DF    1DØ4        BNE    LOAD4
ØØ899A 1D25 B6 59       A        LDA    TEMP+1
ØØ9ØØA 1D27 B1 53       A        CMP    ADDRL
ØØ9Ø1A 1D29 26 D9    1DØ4        BNE    LOAD4
ØØ9Ø2A 1D2B AD 1Ø    1D3D        BSR    LOADBY         YES,GET
ØØ9Ø3A 1D2D B1 5B       A        CMP    CHKSUM         CHECKSUM
ØØ9Ø4A 1D2F 26 Ø3    1D34        BNE    LDERR          NOT SAME -- ERROR
ØØ9Ø5A 1D31 CC 18AB     A        JMP    GETCMD
ØØ9Ø6                     *
ØØ9Ø7A 1D34 CC 1E97     A LDERR  JMP    ERROR
ØØ9Ø8                     *
ØØ9Ø9A 1D37 CD 1FBØ     A DISADR JSR    PRTADR         DISPLAY ADDRESS
ØØ91ØA 1D3A CC 18B5     A        JMP    CMDSCN         FOR ERROR
ØØ911                     *
ØØ912A 1D3D BF 5Ø       A LOADBY STX    WORK1
ØØ913A 1D3F AE Ø8       A        LDX    #8
ØØ914A 1D41 AD 1B    1D5E        BSR    EDGE           SET START
ØØ915A 1D43 AD 19    1D5E LODBY1 BSR    EDGE           BIT
ØØ916A 1D45 24 FC    1D43        BCC    LODBY1
ØØ917A 1D47 AD 15    1D5E        BSR    EDGE           SYNC
ØØ918A 1D49 5A            LODBY2 DECX
ØØ919A 1D4A 2B ØF    1D5B        BMI    LODBYR         FINISHED?
ØØ92ØA 1D4C 44                   LSRA                  NO, SHIFT
ØØ921A 1D4D AD ØF    1D5E        BSR    EDGE           GET BIT
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ØØ922A 1D4F 24 Ø6    1D57        BCC    LODBY3   1 OR Ø?
ØØ923A 1D51 AD ØB    1D5E        BSR    EDGE     IF 1 GET CLEAR NEXT
ØØ924A 1D53 AA 8Ø       A        ORA    #$8Ø     TRANSITION
ØØ925A 1D55 2Ø F2    1D49        BRA    LODBY2   SHIFT IN 1
ØØ926A 1D57 AA ØØ       A LODBY3 ORA    #Ø       SHIFT IN Ø
ØØ927A 1D59 2Ø EE    1D49        BRA    LODBY2
ØØ928A 1D5B BE 5Ø       A LODBYR LDX    WORK1
ØØ929A 1D5D 81          A        RTS
ØØ93Ø                     *
ØØ931A 1D5E B7 51       A EDGE   STA    WORK2
ØØ932A 1D6Ø BF 54       A        STX    WORK3
ØØ933A 1D62 5F                   CLRX
ØØ934A 1D63 5C            EDGE1  INCX            LOOP TILL
ØØ935A 1D64 4F                   CLRA            TRANSITION
ØØ936A 1D65 2E Ø1    1D68        BIL    EDGE2
ØØ937A 1D67 4C                   INCA
ØØ938A 1D68 B1 5C       A EDGE2  CMP    SREF
ØØ939A 1D6A 27 F7    1D63        BEQ    EDGE1
ØØ94ØA 1D6C B7 5C       A        STA    SREF     UPDATE LEVEL
ØØ941A 1D6E 9F                   TXA             STATUS
ØØ942A 1D6F BØ 5D       A        SUB    LCNT     SET CARRY FOR
ØØ943A 1D71 B6 51       A        LDA    WORK2    1 OR Ø
ØØ944A 1D73 BE 54       A        LDX    WORK3
ØØ945A 1D75 81          A        RTS
ØØ946                     *
ØØ947A 1D76 AD C5    1D3D LOADIT BSR    LOADBY   GET BYTE
ØØ948A 1D78 B7 55       A        STA    WORK4    AND UPDATE
ØØ949A 1D7A BB 5B       A        ADD    CHKSUM   CHECKSUM
ØØ95ØA 1D7C B7 5B       A        STA    CHKSUM
ØØ951A 1D7E B6 55       A        LDA    WORK4
ØØ952A 1D8Ø 81          A        RTS
ØØ953                     *
ØØ954                     *****************************************
ØØ955                     *                                       *
ØØ956                     *             VERIFY TAPE               *
ØØ957                     *                                       *
ØØ958                     *****************************************
ØØ959                     *
ØØ96Ø          1D81     A VERIFY EQU    *
ØØ961A 1D81 1A 4F       A        BSET   5,SWIFLG
ØØ962A 1D83 CD 1EØ7     A        JSR    CLRDIS
ØØ963A 1D86 CC 1CE2     A        JMP    LOADØ
ØØ964                     *
ØØ965A 1D89 CC 1E97     A GOERR  JMP    ERROR
ØØ966                     *
ØØ967A 1D8C CC 18AB     A GOBACK JMP    GETCMD
ØØ968                     *
ØØ969          1D8F     A GO     EQU    *
ØØ97ØA 1D8F CD 1916     A        JSR    LOCSTK
ØØ971A 1D92 E6 Ø8       A        LDA    8,X
ØØ972A 1D94 B7 53       A        STA    ADDRL
ØØ973A 1D96 E6 Ø7       A        LDA    7,X
ØØ974A 1D98 B7 52       A        STA    ADDRH
ØØ975A 1D9A CD 1F53     A        JSR    GETADR
ØØ976A 1D9D 25 Ø8    1DA7        BCS    GOON     ADDR VALID?
ØØ977A 1D9F A1 1Ø       A        CMP    #$1Ø
ØØ978A 1DA1 27 E9    1D8C        BEQ    GOBACK
ØØ979A 1DA3 A1 11       A        CMP    #$11
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ØØ98ØA 1DA5 26 E2     1D89       BNE    GOERR
ØØ981A 1DA7 CD 1916      A GOON  JSR    LOCSTK    YES PUT IT
ØØ982A 1DAA B6 52        A       LDA    ADDRH     IN STACK
ØØ983A 1DAC A1 1F        A       CMP    #PCMASK   TO BIG?
ØØ984A 1DAE 22 D9     1D89       BHI    GOERR     YES
ØØ985A 1DBØ E7 Ø7        A       STA    7,X
ØØ986A 1DB2 B6 53        A       LDA    ADDRL
ØØ987A 1DB4 E7 Ø8        A       STA    8,X
ØØ988A 1DB6 AD 1B     1DD3 CONT  BSR    SCNBKP    FIND B.P. TABLE
ØØ989A 1DB8 F6           GOINSB  LDA    Ø,X       INSERTPB.P.'S
ØØ99ØA 1DB9 2B 1Ø     1DCB       BMI    GONOB     VALID?
ØØ991A 1DBB B7 52        A       STA    ADDRH     YES
ØØ992A 1DBD E6 Ø1        A       LDA    1,X
ØØ993A 1DBF B7 53        A       STA    ADDRL
ØØ994A 1DC1 CD 1F15      A       JSR    LOAD      SAVE OPCODE
ØØ995A 1DC4 E7 Ø2        A       STA    2,X
ØØ996A 1DC6 A6 83        A       LDA    #SWIOP
ØØ997A 1DC8 CD 1F24      A       JSR    STORE
ØØ998A 1DCB 5C           GONOB   INCX             GET NEXT B.P.
ØØ999A 1DCC 5C                   INCX
Ø1ØØØA 1DCD 5C                   INCX
Ø1ØØ1A 1DCE 3A 5A        A       DEC    PNCNT
Ø1ØØ2A 1DDØ 26 E6     1DB8       BNE    GOINSB    DONE?
Ø1ØØ3A 1DD2 8Ø                   RTI              YES
Ø1ØØ4                      *
Ø1ØØ5                 1DD3   A SCNBKP EQU   *
Ø1ØØ6A 1DD3 A6 Ø3        A       LDA    #NUMBKP
Ø1ØØ7A 1DD5 B7 5A        A       STA    PNCNT
Ø1ØØ8A 1DD7 AE 37        A       LDX    #BKPTBL
Ø1ØØ9A 1DD9 81                   RTS
Ø1Ø1Ø                      *
Ø1Ø11                      ***************************************
Ø1Ø12                      *                                     *
Ø1Ø13                      *     DISPLAY STACK POINTER           *
Ø1Ø14                      *                                     *
Ø1Ø15                      ***************************************
Ø1Ø16                      *
Ø1Ø17                 1DDA   A STACK EQU    *
Ø1Ø18A 1DDA A6 B5        A       LDA    #$B5      PRINT
Ø1Ø19A 1DDC B7 4D        A       STA    DTABL+4   'SP'
Ø1Ø2ØA 1DDE A6 73        A       LDA    #$73
Ø1Ø21A 1DEØ B7 4E        A       STA    DTABL+5
Ø1Ø22A 1DE2 4F                   CLRA
Ø1Ø23A 1DE3 5F                   CLRX
Ø1Ø24A 1DE4 CD 1F8E      A       JSR    PRTBYT
Ø1Ø25A 1DE7 CD 1916      A       JSR    LOCSTK    FIND USER
Ø1Ø26A 1DEA 9F                   TXA              STACK POINTER
Ø1Ø27A 1DEB AB Ø3        A       ADD    #3
Ø1Ø28A 1DED AE Ø2        A       LDX    #2
Ø1Ø29A 1DEF CD 1F8E      A       JSR    PRTBYT    PRINT IT
Ø1Ø3ØA 1DF2 CC 18B5      A       JMP    CMDSCN
Ø1Ø31                      *
```

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Ø1Ø33                     *
Ø1Ø34                     ****************************************
Ø1Ø35                     *                                      *
Ø1Ø36                     *      CLEAR DISPLAY TABLE             *
Ø1Ø37                     *                                      *
Ø1Ø38                     *      X REG DESTROYED                 *
Ø1Ø39                     *                                      *
Ø1Ø4Ø                     ****************************************
Ø1Ø41                     *
Ø1Ø42A 1DF5 AE Ø5       A CLRTAB LDX    #5
Ø1Ø43A 1DF7 6F 49       A CLRLOC CLR    DTABL,X  CLEAR SIX
Ø1Ø44A 1DF9 5A                   DECX            LOCATIONS IN
Ø1Ø45A 1DFA 2A FB    1DF7        BPL    CLRLOC   DISPLAY TABLE
Ø1Ø46A 1DFC 81                   RTS
Ø1Ø47                     *
Ø1Ø48                     ****************************************
Ø1Ø49                     *                                      *
Ø1Ø5Ø                     *      DISPLAY TABLE CONTENTS          *
Ø1Ø51                     *                                      *
Ø1Ø52                     *      A,X REGISTERS DESTROYED         *
Ø1Ø53                     *                                      *
Ø1Ø54                     ****************************************
Ø1Ø55                     *
Ø1Ø56A 1DFD AE Ø5       A DISTAB LDX    #5
Ø1Ø57A 1DFF E6 49       A DISCHR LDA    DTABL,X  LOAD DISPLAY
Ø1Ø58A 1EØ1 AD Ø9    1EØC        BSR    DISPLY   TABLE INTO
Ø1Ø59A 1EØ3 5A                   DECX            145ØØØ
Ø1Ø6ØA 1EØ4 2A F9    1DFF        BPL    DISCHR
Ø1Ø61A 1EØ6 81                   RTS
Ø1Ø62                     *
Ø1Ø63                     ****************************************
Ø1Ø64                     *                                      *
Ø1Ø65                     *      BLANK DISPLAY                   *
Ø1Ø66                     *                                      *
Ø1Ø67                     *      A,X REGISTERS DESTROYED         *
Ø1Ø68                     *                                      *
Ø1Ø69                     ****************************************
Ø1Ø7Ø                     *
Ø1Ø71A 1EØ7 AD EC    1DF5 CLRDIS BSR    CLRTAB   BLANK
Ø1Ø72A 1EØ9 AD F2    1DFD        BSR    DISTAB   DISPLAY
Ø1Ø73A 1EØB 81                   RTS
Ø1Ø74                     *
Ø1Ø75                     ****************************************
Ø1Ø76                     *                                      *
Ø1Ø77                     *      SHIFT ONE CHARACTER INTO        *
Ø1Ø78                     *             DISPLAY                  *
Ø1Ø79                     *                                      *
Ø1Ø8Ø                     *      A REGISTER DESTROYED            *
Ø1Ø81                     *                                      *
Ø1Ø82                     ****************************************
Ø1Ø83                     *
Ø1Ø84A 1EØC BF 5Ø       A DISPLY STX    WORK1    SAVE INDEX
Ø1Ø85A 1EØE 1D ØØ       A        BCLR   6,PORTA  CLEAR DATA
Ø1Ø86A 1E1Ø AE Ø8       A        LDX    #8
Ø1Ø87A 1E12 48            DIS1   LSLA            SET UP
Ø1Ø88A 1E13 24 Ø2    1E17        BCC    DIS2     BIT OF
Ø1Ø89A 1E15 1C ØØ       A        BSET   6,PORTA  ACCUMULATOR
Ø1Ø9ØA 1E17 1E ØØ       A DIS2   BSET   7,PORTA  CLOCK
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Ø1091A 1E19 1F ØØ        A        BCLR   7,PORTA   IT
Ø1092A 1E1B 1D ØØ        A        BCLR   6,PORTA   CLEAR DATA
Ø1093A 1E1D 5A                    DECX             COMPLETE?
Ø1094A 1E1E 26 F2    1E12         BNE    DIS1      NO
Ø1095A 1E2Ø BE 5Ø        A        LDX    WORK1     RESTORE INDEX
Ø1096A 1E22 81                    RTS
Ø1097                      *
Ø1098                      ***************************************
Ø1099                      *                                     *
Ø11ØØ                      *      KEYPAD SCAN                    *
Ø11Ø1                      *                                     *
Ø11Ø2                      *      X REGISTER DESTROYED           *
Ø11Ø3                      *                                     *
Ø11Ø4                      *      A REGISTER CONTAINS VALUE      *
Ø11Ø5                      *                                     *
Ø11Ø6                      *      CARRY SET IF VALID OUTPUT      *
Ø11Ø7                      *                                     *
Ø11Ø8                      ***************************************
Ø11Ø9                      *
Ø111ØA 1E23 98             KEYSCN CLC
Ø1111A 1E24 4F                    CLRA
Ø1112A 1E25 AE Ø6        A        LDX    #6        SETUP
Ø1113A 1E27 AB 1Ø        A KEY1   ADD    #$1Ø      ROW
Ø1114A 1E29 B7 ØØ        A        STA    PORTA
Ø1115A 1E2B AD Ø6    1E33         BSR    COLUMN    CHECK COLUMNS
Ø1116A 1E2D 25 Ø3    1E32         BCS    KEY2      IF VALID GET OUT
Ø1117A 1E2F 5A                    DECX             ELSE TRY
Ø1118A 1E3Ø 26 F5    1E27         BNE    KEY1      NEXT ROW
Ø1119A 1E32 81             KEY2   RTS
Ø112Ø                      *
Ø1121                      ***************************************
Ø1122                      *                                     *
Ø1123                      *      CHECK FOR KEY CLOSURE          *
Ø1124                      *      WITHIN COLUMN AND DEBOUNCE     *
Ø1125                      *                                     *
Ø1126                      *      A REGISTER CONTAINS VALUE      *
Ø1127                      *                                     *
Ø1128                      *      CARRY SET IF VALID OUTPUT      *
Ø1129                      *                                     *
Ø113Ø                      ***************************************
Ø1131                      *
Ø1132A 1E33 B6 ØØ        A COLUMN LDA    PORTA     READ KEYPAD
Ø1133A 1E35 B7 5Ø        A        STA    WORK1     STORE IT
Ø1134A 1E37 A5 ØF        A        BIT    #$ØF      KEY CLOSED?
Ø1135A 1E39 27 19    1E54         BEQ    COLRET    NO GET OUT
Ø1136A 1E3B AD 18    1E55         BSR    DBOUNC    ELSE DEBOUNCE
Ø1137A 1E3D B6 ØØ        A        LDA    PORTA     RE-READ KEYPAD
Ø1138A 1E3F B1 5Ø        A        CMP    WORK1     SAME KEY CLOSED?
Ø1139A 1E41 26 11    1E54         BNE    COLRET    NO GET OUT
Ø114ØA 1E43 99                    SEC              SET FLAG FOR VALID
Ø1141A 1E44 B6 ØØ        A COL1   LDA    PORTA     KEY
Ø1142A 1E46 A5 ØF        A        BIT    #$ØF      RELEASED?
Ø1143A 1E48 26 FA    1E44         BNE    COL1      NO TRY AGAIN
Ø1144A 1E4A AD Ø9    1E55         BSR    DBOUNC    YES DEBOUNCE
Ø1145A 1E4C B6 ØØ        A        LDA    PORTA     STILL
Ø1146A 1E4E A5 ØF        A        BIT    #$ØF      RELEASED?
Ø1147A 1E5Ø 26 F2    1E44         BNE    COL1      NO TRY AGAIN
Ø1148A 1E52 B6 5Ø        A        LDA    WORK1     RETURN CHAR IN A-REG
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Ø1149A 1E54 81            COLRET RTS              YES GO HOME
Ø115Ø                     *
Ø1151                     *****************************************
Ø1152                     *                                       *
Ø1153                     *      PAUSE FOR 3Ø75 CYCLES            *
Ø1154                     *                                       *
Ø1155                     *      A REGISTER DESTROYED             *
Ø1156                     *                                       *
Ø1157                     *****************************************
Ø1158                     *
Ø1159A 1E55 A6 FF       A DBOUNC LDA     #$FF     PAUSE
Ø116ØA 1E57 21 FE    1E57 DLOOP  BRN     *        256X12
Ø1161A 1E59 21 FE    1E59        BRN     *        CYCLES
Ø1162A 1E5B 4A                   DECA             OR AT
Ø1163A 1E5C 26 F9    1E57        BNE     DLOOP    LEAST
Ø1164A 1E5E 81                   RTS              3.7 MS
Ø1165                     *
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Ø1167                     *
Ø1168                     *****************************************
Ø1169                     *
Ø117Ø                     *      INPUT ONE CHARACTER              *
Ø1171                     *                                       *
Ø1172                     *      A REGISTER CONTAINS HEX VALUE    *
Ø1173                     *                                       *
Ø1174                     *      X REGISTER CONTAINS HEX VALUE    *
Ø1175                     *                                       *
Ø1176                     *****************************************
Ø1177                     *
Ø1178          1E5F     A CHRIN  EQU    *
Ø1179A 1E5F CD 1E23     A        JSR    KEYSCN   GET KEY
Ø118ØA 1E62 24 FB    1E5F        BCC    CHRIN    IF NOT VALID RETRY
Ø1181A 1E64 5F                   CLRX
Ø1182A 1E65 D1 1E6F     A CHRIN1 CMP    STABL,X  CONVERT
Ø1183A 1E68 27 Ø3    1E6D        BEQ    CHRIN2   TO HEX
Ø1184A 1E6A 5C                   INCX
Ø1185A 1E6B 2Ø F8    1E65        BRA    CHRIN1
Ø1186A 1E6D 9F            CHRIN2 TXA             IF CANCEL
Ø1187A 1E6E 81                   RTS
Ø1188                     *
Ø1189                     *****************************************
Ø119Ø                     *                                       *
Ø1191                     *      CONVERSION TABLE FOR KEYPAD      *
Ø1192                     *      TO HEX NUMBER                    *
Ø1193                     *                                       *
Ø1194                     *****************************************
Ø1195                     *
Ø1196A 1E6F     11      A STABL  FCB    $11      Ø
Ø1197A 1E7Ø     21      A        FCB    $21      1
Ø1198A 1E71     22      A        FCB    $22      2
Ø1199A 1E72     24      A        FCB    $24      3
Ø12ØØA 1E73     31      A        FCB    $31      4
Ø12Ø1A 1E74     32      A        FCB    $32      5
Ø12Ø2A 1E75     34      A        FCB    $34      6
Ø12Ø3A 1E76     41      A        FCB    $41      7
Ø12Ø4A 1E77     42      A        FCB    $42      8
Ø12Ø5A 1E78     44      A        FCB    $44      9
Ø12Ø6A 1E79     48      A        FCB    $48      A
Ø12Ø7A 1E7A     38      A        FCB    $38      B
Ø12Ø8A 1E7B     28      A        FCB    $28      C
Ø12Ø9A 1E7C     18      A        FCB    $18      D
Ø121ØA 1E7D     14      A        FCB    $14      E
Ø1211A 1E7E     12      A        FCB    $12      F
Ø1212A 1E7F     61      A        FCB    $61      CANCEL COMMAND
Ø1213A 1E8Ø     58      A        FCB    $58      ENTER COMMAND
Ø1214A 1E81     68      A        FCB    $68      STACK POINTER
Ø1215A 1E82     64      A        FCB    $64      MEMORY
Ø1216A 1E83     62      A        FCB    $62      GO
Ø1217A 1E84     54      A        FCB    $54      VERIFY TAPE
Ø1218A 1E85     52      A        FCB    $52      LOAD TAPE
Ø1219A 1E86     51      A        FCB    $51      PUNCH TAPE
Ø122Ø                     *
Ø1221                     *****************************************
Ø1222                     *                                       *
Ø1223                     *      HEX TO MUX DISPLAY               *
Ø1224                     *      CONVERSION TABLE                 *
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Ø1225                         *                                            *
Ø1226                         ********************************************
Ø1227                         *
Ø1228A 1E87    D7          A CTABL   FCB     $D7          Ø
Ø1229A 1E88    Ø6          A         FCB     6            1
Ø123ØA 1E89    E3          A         FCB     $E3          2
Ø1231A 1E8A    A7          A         FCB     $A7          3
Ø1232A 1E8B    36          A         FCB     $36          4
Ø1233A 1E8C    B5          A         FCB     $B5          5
Ø1234A 1E8D    F5          A         FCB     $F5          6
Ø1235A 1E8E    Ø7          A         FCB     7            7
Ø1236A 1E8F    F7          A         FCB     $F7          8
Ø1237A 1E9Ø    B7          A         FCB     $B7          9
Ø1238A 1E91    77          A         FCB     $77          A
Ø1239A 1E92    F4          A         FCB     $F4          B
Ø124ØA 1E93    D1          A         FCB     $D1          C
Ø1241A 1E94    E6          A         FCB     $E6          D
Ø1242A 1E95    F1          A         FCB     $F1          E
Ø1243A 1E96    71          A         FCB     $71          F
Ø1244                         *
Ø1245          1E97        A ERROR   EQU     *
Ø1246A 1E97 CD 1DF5        A         JSR     CLRTAB
Ø1247A 1E9A A6 F1          A         LDA     #$F1
Ø1248A 1E9C B7 4A          A         STA     DTABL+1
Ø1249A 1E9E A6 6Ø          A         LDA     #$6Ø
Ø125ØA 1EAØ B7 4B          A         STA     DTABL+2
Ø1251A 1EA2 B7 4C          A         STA     DTABL+3
Ø1252A 1EA4 CD 1DFD        A         JSR     DISTAB
Ø1253A 1EA7 CC 18B5        A         JMP     CMDSCN
```

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Ø1255                      *
Ø1256                      ****************************************
Ø1257                      *                                      *
Ø1258                      *    MEMORY EXAMINE/CHANGE             *
Ø1259                      *                                      *
Ø1260                      ****************************************
Ø1261                      *
Ø1262A 1EAA CD 1F53      A MEMEX   JSR    GETADR   BUILD ADDRESS
Ø1263A 1EAD A1 1Ø        A         CMP    #$1Ø
Ø1264A 1EAF 27 5F     1F1Ø         BEQ    MEMEX4
Ø1265A 1EB1 B7 5Ø        A MEMEX3  STA    WORK1
Ø1266A 1EB3 B6 52        A         LDA    ADDRH
Ø1267A 1EB5 A1 1F        A         CMP    #PCMASK
Ø1268A 1EB7 23 Ø3     1EBC         BLS    MEMOK
Ø1269A 1EB9 CC 1E97      A         JMP    ERROR
Ø127ØA 1EBC B6 5Ø        A MEMOK   LDA    WORK1
Ø1271A 1EBE CD 1F15      A         JSR    LOAD     LOAD DATA
Ø1272A 1EC1 CD 1F8C      A         JSR    PRTDAT   PRINT IT
Ø1273A 1EC4 CD 1F49      A         JSR    GETNYB   GET NEW NIBBLE
Ø1274A 1EC7 A1 1Ø        A         CMP    #$1Ø
Ø1275A 1EC9 27 45     1F1Ø         BEQ    MEMEX4
Ø1276A 1ECB A1 11        A         CMP    #$11
Ø1277A 1ECD 27 19     1EE8         BEQ    ADRINC
Ø1278A 1ECF A1 13        A         CMP    #$13
Ø1279A 1ED1 27 2D     1FØØ         BEQ    ADRDEC
Ø128ØA 1ED3 24 Ø8     1EDD         BCC    CMDMDL   IF VALID
Ø1281A 1ED5 CD 1F8C      A MEMEX1  JSR    PRTDAT   PRINT IT
Ø1282A 1ED8 CD 1F37      A         JSR    GETBY2   SHIFT IN NEXT
Ø1283A 1EDB 25 F8     1ED5         BCS    MEMEX1   IF VALID TRY AGAIN
Ø1284                      *
Ø1285A 1EDD A1 11        A CMDMDL  CMP    #$11     ENTER?
Ø1286A 1EDF 26 15     1EF6         BNE    MEMEX2   NO
Ø1287A 1EE1 B6 51        A         LDA    WORK2    RESTORE ACCA
Ø1288A 1EE3 CD 1F24      A         JSR    STORE    YES STORE IT
Ø1289A 1EE6 25 C9     1EB1         BCS    MEMEX3   STORE VALID?
Ø129ØA 1EE8 ØC 4F 25 1F1Ø ADRINC BRSET  6,SWIFLG,MEMEX4
Ø1291A 1EEB 3C 53        A         INC    ADDRL    YES GOTTO
Ø1292A 1EED 26 Ø2     1EF1         BNE    MEMEX5   NEXT
Ø1293A 1EEF 3C 52        A         INC    ADDRH
Ø1294A 1EF1 CD 1FBØ      A MEMEX5  JSR    PRTADR   PRINT IT
Ø1295A 1EF4 2Ø BB     1EB1         BRA    MEMEX3   REPEAT
Ø1296A 1EF6 A1 13        A MEMEX2  CMP    #$13     MEMORY?
Ø1297A 1EF8 26 16     1F1Ø         BNE    MEMEX4   NO
Ø1298A 1EFA B6 51        A         LDA    WORK2
Ø1299A 1EFC AD 26     1F24         BSR    STORE
Ø13ØØA 1EFE 25 B1     1EB1         BCS    MEMEX3
Ø13Ø1A 1FØØ ØC 4F ØD 1F1Ø ADRDEC BRSET  6,SWIFLG,MEMEX4
Ø13Ø2A 1FØ3 3D 53        A         TST    ADDRL    YES THEN
Ø13Ø3A 1FØ5 26 Ø2     1FØ9         BNE    CMDMB2   GET PREVIOUS
Ø13Ø4A 1FØ7 3A 52        A         DEC    ADDRH    ADDRESS
Ø13Ø5A 1FØ9 3A 53        A CMDMB2  DEC    ADDRL
Ø13Ø6A 1FØB CD 1FBØ      A         JSR    PRTADR   PRINT IT
Ø13Ø7A 1FØE 2Ø A1     1EB1         BRA    MEMEX3   REPEAT
Ø13Ø8A 1F1Ø 1D 4F        A MEMEX4  BCLR   6,SWIFLG INVALID CHAR
Ø13Ø9A 1F12 CC 18AB      A         JMP    GETCMD
Ø131Ø                      *
Ø1311                      ****************************************
Ø1312                      *                                      *
```

```
Ø1313                     *      LOAD BYTE AT ADDRH,ADDRL         *
Ø1314                     *      INTO ACCUMULATOR                 *
Ø1315                     *                                       *
Ø1316                     *****************************************
Ø1317                     *
Ø1318A 1F15 BF 5Ø       A LOAD   STX    WORK1    SETUP
Ø1319A 1F17 AE C6       A        LDX    #$C6     ROUTINE
Ø1320A 1F19 BF 51       A LDSTCM STX    WORK2    TO DO
Ø1321A 1F1B AE 81       A        LDX    #$81     TWO BYTE
Ø1322A 1F1D BF 54       A        STX    WORK3    LOAD
Ø1323A 1F1F BD 51       A        JSR    WORK2
Ø1324A 1F21 BE 5Ø       A        LDX    WORK1
Ø1325A 1F23 81                   RTS
Ø1326                     *
Ø1327                     *****************************************
Ø1328                     *                                       *
Ø1329                     *      STORE ACCUMULATOR INTO           *
Ø1330                     *      BYTE AT ADDRH,ADDRL              *
Ø1331                     *                                       *
Ø1332                     *****************************************
Ø1333                     *
Ø1334A 1F24 BF 5Ø       A STORE  STX    WORK1
Ø1335A 1F26 AE C7       A        LDX    #$C7     SETUP
Ø1336A 1F28 AD EF    1F19        BSR    LDSTCM   ROUTINE
Ø1337A 1F2A B7 55       A        STA    WORK4    TO DO
Ø1338A 1F2C CD 1F15     A        JSR    LOAD     TWO BYTE
Ø1339A 1F2F B1 55       A        CMP    WORK4    STORE
Ø1340A 1F31 27 Ø1    1F34        BEQ    STRTS
Ø1341A 1F33 99                   SEC
Ø1342A 1F34 BE 5Ø       A STRTS  LDX    WORK1
Ø1343A 1F36 81                   RTS
Ø1344                     *
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Ø1346                      *
Ø1347                      ****************************************
Ø1348                      *                                      *
Ø1349                      *      BUILD A BYTE                    *
Ø135Ø                      *                                      *
Ø1351                      *      A REGISTER CONTAINS BYTE        *
Ø1352                      *                                      *
Ø1353                      ****************************************
Ø1354                      *
Ø1355A 1F37 B7 51        A GETBY2 STA    WORK2
Ø1356A 1F39 AD ØE     1F49        BSR    GETNYB
Ø1357A 1F3B 24 ØB     1F48        BCC    GETBRT
Ø1358A 1F3D 38 51        A        ASL    WORK2
Ø1359A 1F3F 38 51        A        ASL    WORK2
Ø136ØA 1F41 38 51        A        ASL    WORK2
Ø1361A 1F43 38 51        A        ASL    WORK2
Ø1362A 1F45 BA 51        A        ORA    WORK2
Ø1363A 1F47 99                    SEC
Ø1364A 1F48 81             GETBRT RTS
Ø1365                      *
Ø1366                      ****************************************
Ø1367                      *                                      *
Ø1368                      *      GET ONE CHARACTER AND           *
Ø1369                      *      CHECK FOR VALID HEX NUMBER      *
Ø137Ø                      *                                      *
Ø1371                      *      A REGISTER CONTAINS OUTPUT      *
Ø1372                      *                                      *
Ø1373                      *      X REGISTER DESTROYED            *
Ø1374                      *                                      *
Ø1375                      *      CARRY SET IF VALID HEX NUMBER   *
Ø1376                      *                                      *
Ø1377                      ****************************************
Ø1378                      *
Ø1379A 1F49 CD 1E5F      A GETNYB JSR    CHRIN    GET CHARACTER
Ø138ØA 1F4C 98                    CLC
Ø1381A 1F4D A1 ØF        A        CMP    #$ØF     VALID HEX?
Ø1382A 1F4F 22 Ø1     1F52        BHI    GETRET   NO
Ø1383A 1F51 99                    SEC             YES
Ø1384A 1F52 81             GETRET RTS
Ø1385                      *
Ø1386                      ****************************************
Ø1387                      *                                      *
Ø1388                      *      BUILD ADDRESS                   *
Ø1389                      *                                      *
Ø139Ø                      *      A,X REGISTERS DESTROYED         *
Ø1391                      *                                      *
Ø1392                      *      ADDRH,ADDRL CONTAIN ADDRESS     *
Ø1393                      *                                      *
Ø1394                      *      CARRY SET IF NEW ADDRESS        *
Ø1395                      *                                      *
Ø1396                      ****************************************
Ø1397                      *
Ø1398A 1F53 CD 1DF5      A GETADR JSR    CLRTAB   BLANK DISPLAY
Ø1399A 1F56 AD 58     1FBØ        BSR    PRTADR
Ø14ØØA 1F58 AD EF     1F49 BLDADR BSR    GETNYB   GET CHARACTER
Ø14Ø1A 1F5A 25 ØA     1F66        BCS    GETAD1   VALID HEX
Ø14Ø2A 1F5C A1 1Ø        A        CMP    #$1Ø
Ø14Ø3A 1F5E 27 2B     1F8B        BEQ    GETRTS
```

NOTE

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Ø1487                           *
Ø1488A 1FC4 8Ø                  TIRQWV RTI
Ø1489                           *
Ø149ØA 1FC5 8Ø                  IRQV   RTI
Ø1491A 1FC6 8Ø                         RTI
Ø1492                           *
Ø1493           1FC7          A TIRQV  EQU    *
Ø1494A 1FC7 A6 4Ø             A        LDA    #$4Ø
Ø1495A 1FC9 B7 Ø9             A        STA    TIMEC
Ø1496A 1FCB CD 1916           A        JSR    LOCSTK
Ø1497A 1FCE E6 Ø4             A        LDA    4,X
Ø1498A 1FDØ BA 57             A        ORA    WORK6
Ø1499A 1FD2 E7 Ø4             A        STA    4,X
Ø15ØØA 1FD4 CC 1928           A        JMP    PCOUNT
Ø15Ø1                           *
Ø15Ø2A 1FD7 CD 1EØ7           A PWRDWN JSR    CLRDIS
Ø15Ø3A 1FDA 8E                         STOP
Ø15Ø4                           *
Ø15Ø5A 1FF6                            ORG    $1FF6
Ø15Ø6                           *
Ø15Ø7A 1FF6       ØØ46        A        FDB    TIRQW
Ø15Ø8A 1FF8       ØØ43        A        FDB    TIRQ
Ø15Ø9A 1FFA       ØØ4Ø        A        FDB    IRQ
Ø151ØA 1FFC       1856        A        FDB    SWI
Ø1511A 1FFE       18ØØ        A        FDB    RESET
Ø1512                           *
Ø1513                                  END
TOTAL ERRORS ØØØØØ--ØØØØØ
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Ø14Ø4A 1F6Ø A1 11         A        CMP   #$11      NO ENTER?
Ø14Ø5A 1F62 27 27    1F8B          BEQ   GETRTS    NO TRY AGAIN
Ø14Ø6A 1F64 2Ø ED    1F53          BRA   GETADR
Ø14Ø7A 1F66 3F 52         A GETAD1 CLR   ADDRH     INIT HIGH ADDRESS
Ø14Ø8A 1F68 B7 53         A        STA   ADDRL     PUT CHAR AWAY
Ø14Ø9A 1F6A AD 44    1FBØ          BSR   PRTADR    PRINT NEW ADDRESS
Ø141ØA 1F6C AD DB    1F49 GETALP   BSR   GETNYB    GET ANOTHER CHAR
Ø1411A 1F6E 24 12    1F82          BCC   GETARG    VALID?
Ø1412A 1F7Ø 48                     ASLA            YES
Ø1413A 1F71 48                     ASLA            SHIFT IT IN
Ø1414A 1F72 48                     ASLA
Ø1415A 1F73 48                     ASLA
Ø1416A 1F74 AE Ø4         A        LDX   #4
Ø1417A 1F76 48              GETASF ASLA
Ø1418A 1F77 39 53         A        ROL   ADDRL
Ø1419A 1F79 39 52         A        ROL   ADDRH
Ø142ØA 1F7B 5A                     DECX
Ø1421A 1F7C 26 F8    1F76          BNE   GETASF
Ø1422A 1F7E AD 3Ø    1FBØ          BSR   PRTADR    PRINT NEW ADDR
Ø1423A 1F8Ø 2Ø EA    1F6C          BRA   GETALP    GET ANOTHER CHAR
Ø1424A 1F82 A1 1Ø         A GETARG CMP   #$1Ø
Ø1425A 1F84 27 Ø5    1F8B          BEQ   GETRTS
Ø1426A 1F86 A1 11         A        CMP   #$11      IS ENTER?
Ø1427A 1F88 26 E2    1F6C          BNE   GETALP    NO TRY AGAIN
Ø1428A 1F8A 99                     SEC             YES SET FLAG
Ø1429A 1F8B 81              GETRTS RTS
Ø143Ø                       *
```

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Ø1432                         *
Ø1433                         ****************************************
Ø1434                         *                                      *
Ø1435                         *      PRINT ONE BYTE INTO PAIR        *
Ø1436                         *      OF DISPLAY DIGITS               *
Ø1437                         *                                      *
Ø1438                         *      A REGISTER CONTAINS BYTE        *
Ø1439                         *                                      *
Ø144Ø                         *      X REGISTER POINTS TO 1ST        *
Ø1441                         *      DIGIT OF PAIR                   *
Ø1442                         *                                      *
Ø1443                         ****************************************
Ø1444                         *
Ø1445A 1F8C AE Ø4           A PRTDAT LDX    #4          PRINT IN LAST TWO DIGIT
Ø1446A 1F8E BF 5Ø           A PRTBYT STX    WORK1
Ø1447A 1F9Ø B7 55           A        STA    WORK4
Ø1448A 1F92 44                       LSRA
Ø1449A 1F93 44                       LSRA
Ø145ØA 1F94 44                       LSRA
Ø1451A 1F95 44                       LSRA
Ø1452A 1F96 97                       TAX
Ø1453A 1F97 D6 1E87         A        LDA    CTABL,X
Ø1454A 1F9A BE 5Ø           A        LDX    WORK1
Ø1455A 1F9C E7 49           A        STA    DTABL,X
Ø1456A 1F9E B6 55           A        LDA    WORK4
Ø1457A 1FAØ A4 ØF           A        AND    #$ØF
Ø1458A 1FA2 97                       TAX
Ø1459A 1FA3 D6 1E87         A        LDA    CTABL,X
Ø146ØA 1FA6 BE 5Ø           A        LDX    WORK1
Ø1461A 1FA8 E7 4A           A        STA    DTABL+1,X
Ø1462A 1FAA CD 1DFD         A        JSR    DISTAB
Ø1463A 1FAD B6 55           A        LDA    WORK4
Ø1464A 1FAF 81                       RTS
Ø1465                         *
Ø1466                         ****************************************
Ø1467                         *                                      *
Ø1468                         *      PRINT ADDRESS ADDRH,ADDRL       *
Ø1469                         *                                      *
Ø147Ø                         *      X REGISTER DESTROYED            *
Ø1471                         *                                      *
Ø1472                         ****************************************
Ø1473                         *
Ø1474A 1FBØ B7 56           A PRTADR STA    WORK5
Ø1475A 1FB2 BF 54           A        STX    WORK3
Ø1476A 1FB4 B6 52           A        LDA    ADDRH
Ø1477A 1FB6 5F                       CLRX
Ø1478A 1FB7 AD D5      1F8E          BSR    PRTBYT
Ø1479A 1FB9 B6 53           A        LDA    ADDRL
Ø148ØA 1FBB AE Ø2           A        LDX    #2
Ø1481A 1FBD AD CF      1F8E          BSR    PRTBYT
Ø1482A 1FBF B6 56           A        LDA    WORK5
Ø1483A 1FC1 BE 54           A        LDX    WORK3
Ø1484A 1FC3 81                       RTS
Ø1485                         *
```