Assembly Instructions MP-T Interrupt Timer

Introduction

The MP-T Interrupt Timer is a 5 1/4" x 3 1/2" double sided, plated thru hole circuit board implemented with the 5009 programmable counter/ divider and 6820 peripheral interface adapter integrated circuits. The board provides software selectable interrupts of 1 usec, 10 usec, 100 usec, 1 msec, 10 msec, 20 msec, 100 msec, 1 sec, 10 sec, 100 sec, 1 min, 10 min or 1 hour. Since only half of the 6820 peripheral interface adapter is used for the interrupt timer the other half has been fully buffered to provide a general purpose eight bit input port along with one buffered "data read" input line and one buffered "data accepted" output line for complete handshake control. The interface is completely software programmable by the user with interrupt control as well as polarity control of the input port handshake lines. Power for the board is supplied by a +5 volt regulator with a current consumption of approximately 0.3 A. Approximately 15 ma. is drawn from the -12 VDC interface power buss to supply minus voltage to the 5009 integrated circuit.

Before using this board in your system, the control registers of the interface must be configured for proper operation of the board. Complete details for configuring the control registers for the interrupt timer portion of the board are contained later in this instruction set. Details for configuring the control registers on the input side of the interface are contained in the Hardware and Programming sections of the System Documentation Notebook.

When the SWTPC 6800 Computer System is being assembled, work on only one board at a time. Each of the system's boards and their associated parts must not be intermixed to avoid confusion during assembly. The MOS integrated circuits supplied with this kit are susceptible to static electricity damage and for this reason have been packed with their leads impressed onto a special conductive foam or possibly wrapped in a conductive foil. In either case, do not remove the protective material until specifically told to do so later in the instructions.

The MP-T Interrupt Timer is an option board and need not be assembled nor should be installed onto the mother board until the entire computer system has been checked out and is known to be working properly.

PC Board Assembly

NOTE: Since all of the holes on the PC board have been plated thru, it is only necessary to solder the components from the bottom side of the board. The plating provides the electrical connection from the "BOTTOM" to the "TOP" foil of each hole. Unless otherwise noted it is important that none of the connections be soldered until all of the components of each group have been installed on the board. This makes it much easier to interchange components if a mistake is made during assembly. Be sure to use a low wattage iron (not a gun) with a small tip. Do not use acid core solder or any type of paste

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flux. We will not guarantee or repair any kit on which either product has been used. Use only the solder supplied with the kit or a 60/40 alloy resin core equivalent. Remember all of the connections are soldered on the bottom side of the board only. The plated-thru holes provide the electrical connection to the top foil.

( ) Before installing any parts on the circuit board, check both sides of the board over carefully for incomplete etching and foil "bridges" or "breaks". It is unlikely that you will find any but should there be one especially on the "TOP" side of the board it will be very hard to locate and correct after all of the components have been installed on the board.

( ) Starting from one end of the circuit board install each of the three, 10 pin Molex female edge connectors along the lower edge of board. These connectors must be inserted from the "TOP" side of the board and must be pressed down firmly against the circuit board so that each pin extends completely into the holes on the circuit board. Not being careful here will cause the board to either wobble and/or be crooked when plugging it onto the mother board. It is suggested that you solder only the two end pins of each op the three connectors until all have been installed at which time if everything looks straight and rigid you should solder the as yet unsoldered pins.

( ) Following the procedure outlined above, attach the one remaining 12 pin Molex female edge connector along the upper edge of the board. Solder.

( ) Insert the small nylon indexing plugs into both the upper and lower edge connector pins indicated by the small triangular arrows on the "BOTTOM" side of the circuit board. This prevents the board and I/0 connector from being accidentally plugged on incorrectly.

( ) Attach capacitors C1 thru C3 to the board. As with all other components unless noted, use the parts list and component layout drawing to locate each part and install from the "TOP" side of the board bending the leads along the "BOTTOM" side of the board and trimming so that 1/16" to 1/8" of wire remains. Solder.

( ) Install all of the resistors on the circuit board. Solder.

( ) Install the transistor and diode. These components must be oriented to match the component layout drawing. Solder.

( ) Install integrated circuit IC2 on the circuit board. This component must be oriented so its metal face is facing the circuit board as is secured to the circuit board with a #4- 40 x 1/4" screw, lockwasher and nut. A heatsink is not used. The three leads of the integrated circuit must be bent down into each of their respective holds. Solder.

( ) Install integrated circuits IC4 and ICS on the circuit board. Do not bend the leads on the back side of the board. Doing so makes it very difficult to remove the integrated circuits should replacement ever be necessary. The semi-circle notch or dot on the end of the package is used for orientation purposes and must match with the outlines shown on the component layout drawing for each of the IC's.

( ) Attach crystal XTAL1 to the circuit board. It should be oriented so its length lies flat across the circuit board as shown in the outline on the component layout drawing. If the crystal has long thin wire leads, they may be bent down 90 degrees at the base of the crystal so they fit into the two holes provided for the crystal on the circuit board. If the crystal has short heavy wire leads, solder onto and at a 90 degree angle, the crystal's leads some heavy buss wire. The buss wire with the crystal attached may then be inserted into the board. Solder. You may solder a piece of wire to the opposite end of the crystal's can and run the other end of the wire thru the hole provided in the circuit board. This will keep the crystal from moving around after it is mounted.

( ) Attach trimmer capacitor C4 to the circuit board as shown in the component layout drawing. The capacitor hooks onto the top edge of the circuit board so that it may be adjusted with the circuit board in place. The fingers of the trimmer are soldered to the solder tabs along the top edge of the top side of the circuit board. Make sure the capacitor is firmly in place before soldering.

( ) Unless you plan to use the board in a special situation where you will be using the non-maskable interrupt (NMI), you will want to run a pair of jumpers between point TIM and IRQ and point INP and IRQ on the board. This allows you to use the conventional interrupt, request line (IRQ) when it is selected in your program. These jumpers are not shown in place on the component layout drawing.

NOTE: MOS integrated circuits are susceptible to damage by static electricity. Although some degree of protection is provided internally within the integrated circuits, their cost demands the utmost in care. Before opening and/or installing any MOS integrated circuits you should ground your body and all metallic tools coming into contact with the leads, thru a 1 M ohm 1/4 watt resistor (supplied with the kit). The ground must be an "earth" ground such as a water pipe, and not the circuit board ground. As for the connection to your body, attach a clip lead to your watch or metal ID bracelet. Make absolutely sure you have the 1 Meg ohm resistor connected between you and the "earth" ground, otherwise you will be creating a dangerous shock hazard. Avoid touching the leads of the integrated circuits any more than necessary when installing them, even if you are grounded. On those MOS IC's being soldered in place, the tip of the soldering iron should be grounded as well (separately from your body ground) either with or without a 1 Meg ohm resistor. Most soldering irons having a three prong line cord plug already have a grounded tip. Static electricity should be an important consideration in cold, dry environments. It is less of a problem when it is warm and humid.

( ) Install MOS integrated circuits IC1 and IC3 following the precautions given in the preceding section. As they are installed, make sure they are down firmly against the board before soldering all of their leads. Do not bend the leads on the back side of the board. Doing so makes it very difficult to remove the integrated circuit should replacement ever be necessary. The "dot" or "notch" on the end of the package is used for orientation purposes and must match with that shown on the component layout drawing for the IC. Solder.

( ) Working from the "TOP" side of the circuit board, fill in all of the feed-thru's with molten solder. The feed-thru's are those unused holes on the board whose internal plating connects the "TOP" and "BOTTOM" circuit connections. Filling these feed-thru's with molten solder guarantees the integrity of the connections and increases the current handling capability.

( ) Now that all of the components have been installed on the board, double check to make sure all have been installed correctly in their proper location.

( ) Check very carefully to make sure that all connections have been soldered. It is very easy to miss some connections when soldering which can really cause some hard to find problems later during checkout. Also look for solder "bridges" and "cold" solder joints which are another common problem.

Since the MP-T circuit board now contains MOS devices, it is susceptible to damage from severe static electrical sources. One should avoid handling the board any more than necessary and when you must, avoid touching or allowing anything to come into contact with any of the conductors on the board.

Input Connector Wiring

The input connection may be made to the board thru a 12 pin connector along the top edge of the board. The function of each of the input pins is as follows:

C1 is the "handshake" control input. It is electrically the same as the CA1 input on IC1, the PIA integrated circuit. The line is buffer protected and represents one TTL load.

C2 is the "handshake" control output. It is the line buffered output of the CA2 pin on IC1, the PIA integrated circuit. It is TTL compatible and is capable of sourcing 5.2 Ma. and sinking 32 Ma. of current.

GND is the common line for all input connections and is electrically connected to the computer system's ground buss.

I0-17 are the eight non-inverting data input lines. Each is buffered and represents one standard TTL load. The buffered lines feed pins PAO thru PA7 respectively on IC1, the PIA integrated circuit.

Attaching the Input Connector to the Interface

The male input connector which attaches to the interface is simply a row of twelve pins supported by a nylon base. The longer side of the male connector plugs onto the interface board edge connector while the cable wires going to the peripheral device are soldered onto the shorter side of the connector. The cable which goes back to the peripheral should, if at all possible, be a multi-conductor cable (not supplied with the kit) with a minimum of twelve separate conductors.

When preparing to attach the cable to the connector, first strip back 2" of the cable's outer insulation. While positioning the cable in line with the male connector's nylon support strip allowing the wires to extend just beyond the last pin on the strip, attach and solder each of the appropriate wires oriented so the C1 pin is connected to the shortest wire on the cable. It is very easy to melt the body of the nylon connectors which will loosen the pins, so be very careful and use a heatsink on each pin between the solder point and connector body where possible. After attaching all of the cable wires bend the connector around the cable a full 180 degrees and secure with two wire ties (supplied with the kit). Now cut off the indexing pin on the male connector. To minimize noise and ringing, keep the cable length between the interface and peripheral as short as possible.

Using the Interrupt Timer

The Oscillator/Divider integrated circuit is connected to the B side of the peripheral interface adapter. The divider's output is connected to the CB1 control line while it's programmable inputs are connected to the PIA's B side outputs. Before using the interrupt timer you will have to configure B side of the PIA for the desired interrupt timing interval. Use the table below to select the desired value:

PIA A data word	Timing-Interval
00	1 usec
01	10 usec
02	100 usec
03	1 msec
04	10 msec
05	100 msec
06	1 sec
08	100 sec
09	1 min
0A	1 hour
0B	10 min
0C	no output
0D	no output
0E	20 msec
0F	no output

Outputting an 80 will reset the oscillator/divider so the count will stop, and everything will be prepared for an interval measurement. This will allow the computer to be used as a programmable stopwatch if desired.

When you are configuring the data direction registers for the board, the A side of the PIA should be set for all inputs while the B side should be set for all outputs.

You also have to configure the control register of the PIA so the CB1 line will respond to the negative going edge of the oscillator/divider circuit. Of course if you do not wish to use interrupt timer portion of the board, then you do not need to configure the B control register unless it has been configured for interrupts since the RESET button last was depressed.

Address Assignments

Four address assignments have been allocated for each interface port; they are as follows:

PORT0	8000 to 8003
PORT1	8004 to 8007 (Serial control interface only)
PORT2	8008 to 800B
PORT3	800C to 800E
PORT4	8010 to 8013
PORT5	8014 to 8017
PORT6	8018 to 801B
PORT7	801C to 801E

The actual addresses to be used in your programs for the interface(s) is determined by the interface position (port #) onto which the board is plugged.

Within each block of four addresses the lowest is used for Peripheral Register A and Data Direction Register A. The second sequential address is used for Control Register A. The third sequential address is used for Peripheral Register B and Data Direction Register B. The last sequential address is used for Control Register B. Complete details on these registers and their functions are contained in the Hardware section of the System Documentation Notebook and will not be repeated here.

Important Note

If the interrupt timer portion of the board does not appear to work, try adjusting trimmer capacitor C4. These capacitors are often shipped with the adjusting screw loose which makes their capacity too low for the oscillator to function.

Calibration

Although the interrupt timer is extremely accurate, the actual oscillator frequency can be changed several cycles per second by adjusting trimmer capacitor C4. You will of course need an accurate timebase to make this adjustment and in almost all cases, it is not necessary anyway. The oscillator's actual count output may be seen on pin 10 of IC3.

How It Works

The Interrupt Timer board interfaces a crystal controlled programmable oscillator/divider chip, IC3, to the computer system thru 6820 peripheral interface adapter integrated circuit, IC2. Since the oscillator chip uses only one half of the PIA, the other half has been set up as a buffered eight bit input with handshake just like half of a standard MP-L parallel interface board. IC4 and IC5 are the buffers for the input lines. +5 volt power for the board is provided by voltage regulator integrated circuit IC2.

Using Maskable Interrupts (IRQ) on the SWTPC 6800 Computer System

Throughout the 6800 documentation you will find information telling you that the starting address of the maskable interrupt service routine must be stored in memory locations FFF8 and FFF9 which do not even exist in the SWTPC Computer System. The SWTPC 6800 vectors to memory locations EIF8 and ElF9

in the Mikbug ROM which in turn loads the program counter with the data stored in addresses AOOO and A001 of the scratchpad RAM on the MP-A board. This means that you must load the starting address of your interrupt service routine into these addresses before you service an interrupt.

Don't forget to always put a NOP instruction before every Clear Interrupt Mask (CLI) instruction in your program.

Precautions When Using Maskable Interrupts (IRQ) on the SWTPC 6800 Computer System

When using the 6800 Computer System with an interrupt generating device fed to the computer thru one of the programmable interface IC's on the interface card buss, care must be exercised in programming such that the interrupt mask bit is set (I=1) when interrupts are not desired. When either a power up RESET or manual RESET is generated, the I bit within the 6800 chip itself is set and the processor jumps into the Mikbug control program where it awaits single character commands from the operator. If an interrupt is generated by one of the interface boards during this time, the interrupt is remembered but not serviced until the I bit is cleared (I=0). When the operator finally types in a G for "Go to User Program", the 6800 executes a Return from Interrupt instruction (RTI) where it picks up the contents of the 1) condition code register, 2) B accumulator, 3) A accumulator, 4) index register and 5) program counter. This data is stored sequentially in memory locations A043 thru A049. The fact that the processor uses a RTI instruction at the beginning of each program has nothing to do with interrupts. It is just the most convenient way of getting accumulator, index register and program counter data into the internal registers of the 6800 chip itself. Since most programs initialize the values of the accumulators and index register within the program, the only data that generally must be entered is the value of the program counter. When the 6800 picks up the contents of the condition code register, it replaces the set interrupt mask bit with the new value contained in bit 4 of memory location A043. If this new bit happens to be a zero, and as mentioned earlier; an interrupt was generated by an interface board while the interrupt mask bit was set, then the 6800 will try to execute an interrupt service routine before it makes it to the first instruction of your program.

Fortunately 6820 PIA integrated circuits like those used on the MP-L and MP-T boards are internally reset when a 6800 buss RESET is generated and will not generate interrupts. This means that 6820 type interfaces should not cause this type of problem. Serial type 6850's however are internally reset on power up only. Once they are configured for interrupt operation, they will remain so until reconfigured or until they are powered down. This potential problem can best be eliminated by using Mikbug's memory change feature to write a 10 in memory location A043 before the program is started. This guarantees that the interrupt mask bit will be set until it is cleared by the user in his program or until the system is again RESET with the front panel button. Once into the user program, the 6800's stack is decremented from A049

any time there is an interrupt, push or subroutine execution. If the stack is decremented down to the A043 address or if any data is ever stored in A043 then you can no longer count on bit 4 of the address being set. This means that if you exit your program with the RESET button, you will probably want to rewrite a 10 in memory location A043.

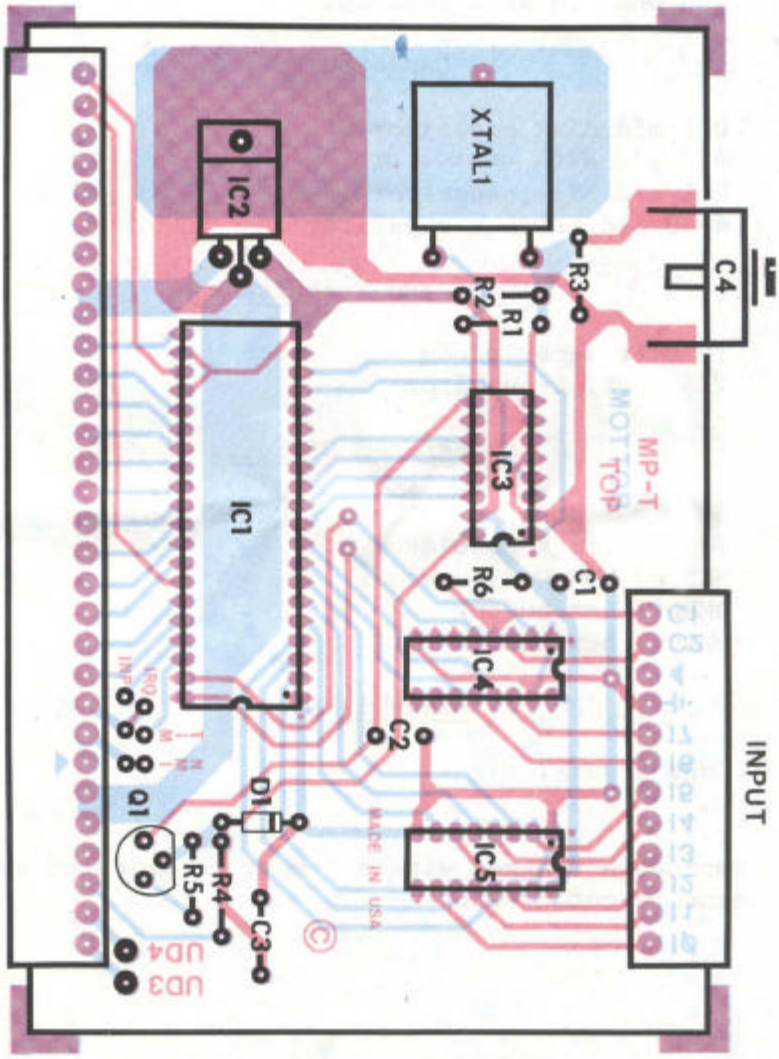
Another programming convenience is to put a Load Stack Pointer (LDS) with A042 instruction at the beginning of your program so that decrementing the stack will not change the contents of address A043. This same instruction will also protect the program counter address data in locations A048 and A049.

If you are not using any 6850 (MP-S) interfaces with enabled interrupts, on your system, then you shouldn't have to worry about getting an interrupt while you are in the Mikbug control program. There still is the opportunity for the interrupt bit to be cleared (I=0) when the 6800's register data is picked up from memory location A043 after typing in the G for "Go to User Program". If this may cause a program in your program, then make the first instruction in your program a Set Interrupt Mask (SEI).

Another condition to be aware of is that when the processor services an interrupt, the I bit, which must be a zero for the processor to respond to the interrupt in the first place, is pushed onto the stack. The I bit within the 6800 however is set to a one to prevent further interrupts from restarting the service routine. At the end of the interrupt service routine, the Return from Interrupt (RTI) instruction pulls the cleared interrupt mask bit from the stack. If an interrupt occurred during the interrupt service routine, the processor will immediately jump back to the beginning of the service routine since the mask bit has now been cleared, and the 6800 responds to prior interrupt requests. If this creates a problem in your program, append the following code to the end of your interrupt service routine:

```
PUL A -    pulls condition codes from stack
ORA A #10-sets bit 4
PSH A -    push condition codes back on the stack
RTI   -    return from interrupt
```

The computer will not respond to interrupts until the Clear Interrupt Mask (CLI) instruction is seen.


XTAL1
IC2
IC1
IC3
IC4
IC5
C4
C1
C2
C3
R1
R2
R3
R4
R5
R6
D1
Q1
INPUT
MP-T
MADE IN USA

Parts List - MP-T Interrupt Timer Board

Resistors

___ R1 10M ohm 1/4 watt resistor
___ R2 6.8M ohm 1/4 watt resistor
___ R3 3.3M ohm 1/4 watt resistor
___ R4 220 ohm 1/2 watt resistor
___ R5 2.2K ohm 1/4 watt resistor
___ R6 10K ohm 1/4 watt resistor

Capacitors

___ Cl 0.1 mfd disk capacitor
___ C2 4.7 pfd disk capacitor
___ C3 0.1 mfd-film capacitor
___ C4 4-40 pfd trimmer capacitor

Diodes and Transistors

___ Dl* 10 volt zener diode
___ Ql* TIS58 FET transistor

Integrated Circuits

___ IC1* 6820 MOS peripheral Interface Adapter
___ IC2* 7805 Voltage Regulator
___ IC3* MK5009 MOS Osc./Divider
___ IC4* DM8097 hex buffer
___ IC5* DM8097 hex buffer

Miscellaneous

___ XTAL1 1.0MHz crystal

Note: All components flagged with a * must be oriented as shown in the component layout drawing

Clock Program for the SWTPC 6800 Computer System with the MP-T Interrupt Timer Option INTCLK-1

This program accepts and displays hours, minutes and seconds in a 12 hour format on the computer system's control terminal. The program works by first allowing the operator to enter the correct time. The MP-T interrupt Timer board is configured for a one second maskable interrupt, and each time an interrupt is generated the program updates and displays the new time. The program uses the lower 256 words of memory and is meant to be loaded in three parts from tape or instruction by instruction using Mikbug.

The interface address to which the MP-T Interrupt Timer is attached must be loaded into addresses A002 and A003 using MikbugR before the program is initiated. The most significant byte goes into A002. The starting addresses of the various interface ports are given below:

Port	Address in Hex
I/0 #0	8000
I/0 #1	8004 (reserved for control interface)
I/0 #2	8008
I/0 #3	800C
I/0 #4	8010
I/0 #5	8014
I/0 #6	8018
I/0 #7	801C

In addition addresses A000 and A001 must be loaded with the starting address of the interrupt service routine which is 013D.

The program counter addresses, A048 and A049, must also be set to 0100 before the program is initiated. The program may then be started as described in the "Go to User's Program" section of the Engineering Note 100 in the Operating System secion of your yellow notebook. Once initiated, the program may be stopped only by depressing the "RESET" button. The time may be re-entered and restarted by retyping a G for "Go to User Program".

When the program is initiated, it will print the following on the control terminal:

```
SWTPC 6800 COMPUTER SYSTEM TIME:

HH:MM.SS
```

It will then wait for you to enter the appropriate data. You must be very careful when entering the time because the program makes no checks on the entry to see that correct ASCII data is being entered. Type in the data exactly as it is formatted on the screen. If there is only one hour digit, enter a space for the first character. The colon and period must be entered just as shown on the screen. The program will start as soon as the last digit is entered. Example:

```
12:17.07

 1:35.00
```

If you ever wish to reset the time, simply hit the RESET button and type in a G for "Go the User Program". The control terminal will display the time at which the RESET button was pressed. Simply overstrike the old time with the correct time. The program will resume as soon as the last digit is entered.

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```
                        NAM    INTCLK

                    * CLOCK PROGRAM FOR MP-T INTERRUPT TIMER
                    * DISPLAYS TIME IN 12 HOUR FORMAT 12:24.56
                    *
                    * MEMORY ADDRESS $A002 AND $A003 HOLD ADDRESS
                    * OF THE MP-T PORT, DEFAULT IS #5 OR $8010
                    *
                    * ADDRESS $A000 AND $A001 MUST BE LOADED WITH
                    * INTERUPT SREVICE ROUTINE WHICH IS $013D
                    *
0100                        ORG    $0100
0100 0F                     SEI
0101 8E A0 42               LDS    #$A042
0104 CE 00 20               LDX    #$0020
0107 BD E0 7E               JSR    PDATA1
010A CE 00 60               LDX    #$0060
010D BD E0 7E               JSR    PDATA1
0110 CE 00 61               LDX    #$0061
0113 86 0D                  LDA A  #$0D
0115 BD E1 D1               JSR    OUTEEE
0118 BD E1 AC  LOOP1        JSR    INEEE
011B A7 00                  STA A  0,X
011D 8C 00 68               CPX    #$0068
0120 27 03                  BEQ    CONFIG
0122 08                     INX
0123 20 F3                  BRA    LOOP1
0125 FE A0 02  CONFIG       LDX    $A002
0128 86 FF                  LDA A  #$FF
012A A7 02                  STA A  2,X
012C 86 3D                  LDA A  #$3D
012E A7 03                  STA A  3,X
0130 86 80                  LDA A  #$80
0132 A7 02                  STA A  2,X
0134 86 06                  LDA A  #$06
0136 A7 02                  STA A  2,X
0138 01                     NOP
0139 0E                     CLI
013A 01             LOOP2   NOP
013B 20 FD                  BRA    LOOP2

013D FE A0 02  INTSER       LDX    $A002
0140 A6 02                  LDA A  2,X
0142 CE 00 60               LDX    #$0060
0145 86 39                  LDA A  #$39
0147 C6 30                  LDA B  #$30
0149 A1 08                  CMP A  8,X
014B 27 04                  BEQ    SKIP2
014D 6C 08                  INC    8,X
014F 20 50                  BRA    DISPLY
0151 E7 08          SKIP2   STA B  8,X
0153 86 35                  LDA A  #$35
0155 A1 07                  CMP A  7,X
0157 27 04                  BEQ    SKIP3
0159 6C 07                  INC    7,X
015B 20 44                  BRA    DISPLY
015D E7 07          SKIP3   STA B  7,X
015F 86 39                  LDA A  #$39
0161 A1 05                  CMP A  5,X
```

```
0163 27 04             BEQ    SKIP4
0165 6C 05             INC    5,X
0167 20 38             BRA    DISPLY
0169 E7 05     SKIP4   STA B  5,X
016B 86 35             LDA A  #$35
016D A1 04             CMP A  4,X
016F 27 04             BEQ    SKIP5
0171 6C 04             INC    4,X
0173 20 2C             BRA    DISPLY
0175 E7 04     SKIP5   STA B  4,X
0177 86 32             LDA A  #$32
0179 C6 39             LDA B  #$39
017B A1 02             CMP A  2,X
017D 27 08             BEQ    SKIP6
017F E1 02             CMP B  2,X
0181 27 16             BEQ    SKIP8
0183 6C 02             INC    2,X
0185 20 1A             BRA    DISPLY
0187 86 31     SKIP6   LDA A  #$31
0189 A1 01             CMP A  1,X
018B 27 04             BEQ    SKIP7
018D 6C 02             INC    2,X
018F 20 10             BRA    DISPLY
0191 A7 02     SKIP7   STA A  2,X
0193 C6 20             LDA B  #$20
0195 E7 01             STA B  1,X
0197 20 08             BRA    DISPLY
0199 86 30     SKIP8   LDA A  #$30
019B C6 31             LDA B  #$31
019D A7 02             STA A  2,X
019F E7 01             STA B  1,X
01A1 CE 00 60  DISPLY  LDX    #$0060
01A4 BD E0 7E          JSR    PDATA1
01A7 3B                RTI

0020                   ORG    $0020
0020 10                FCB    $10,$16,$0D,$00,$00,$00
0021 16 0D
0023 00 00
0025 00
0026 53                FCC    /SWTPC 6800 COMPUTER SYSTEM TIME:/
0027 57 54
0029 50 43
002B 20 36
002D 38 30
002F 30 20
0031 43 4F
0033 4D 50
0035 55 54
0037 45 52
0039 20 53
003B 59 53
003D 54 45
003F 4D 20
0041 54 49
0043 4D 45
0045 3A
0046 0D                FCB    $0D,$0A,$00,$00,$00,$04
0047 0A 00
0049 00 00
```

```
 004B 04

 0060                    ORG    $0060
 0060 0D                 FCB    $0D
 0061 48                 FCC    /HH:MM.SS /
 0062 48 3A
 0064 4D 4D
 0066 2E 53
 0068 53 20
 006A 04                 FCB    $04

 A048                    ORG    $A048
 A048 01 00              FDB    $0100

 A000                    ORG    $A000
 A000 80 10              FDB    $8010

 A002                    ORG    $A002
 A002 01 3D              FDB    $013D

 E1AC            INEEE   EQU    $E1AC
 E07E            PDATA1  EQU    $E07E
 E1D1            OUTEEE  EQU    $E1D1

                         END

NO ERROR(S) DETECTED

   SYMBOL TABLE:

CONFIG 0125   DISPLY 01A1   INEEE  E1AC   INTSER 013D   LOOP1  0118
LOOP2  013A   OUTEEE E1D1   PDATA1 E07E   SKIP2  0151   SKIP3  015D
SKIP4  0169   SKIP5  0175   SKIP6  0187   SKIP7  0191   SKIP8  0199
```