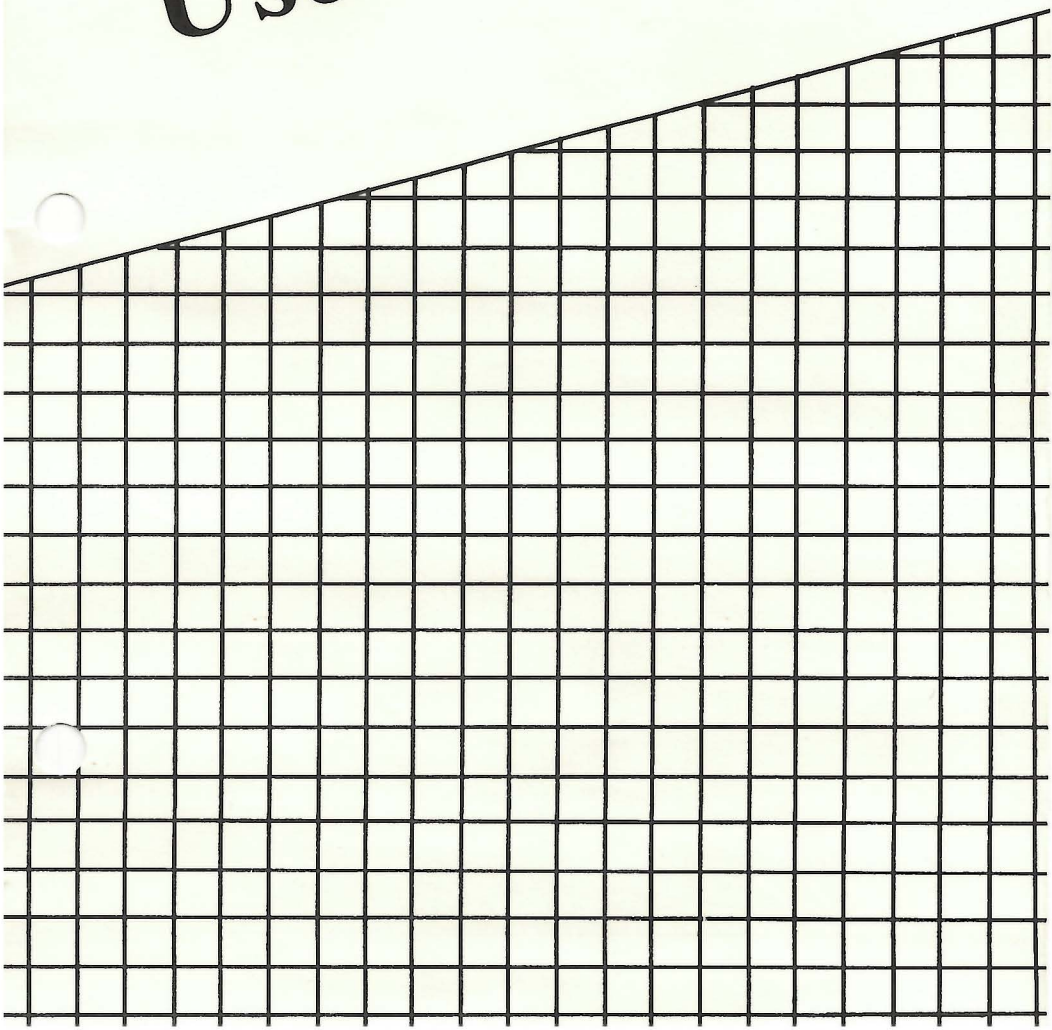
dClock
User's Manual



dCLOCK

USER'S MANUAL

Revision G

Microsync, Inc.
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Carrollton, TX 75011
214-492-5265

Please note our
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Chapter 1
INTRODUCING dCLOCK

dClock is a real-time clock-calendar that automatically enters the system date and time every time you turn on your personal computer. The advantages to you are that you do not have to stop to figure out what the date is and what the time is in 24-hour notation before you can start computing. And, the dates and times recorded on your files are always accurate. dClock has a battery backup. Battery power is used only when your personal computer is turned off.

1.1 Compatibility

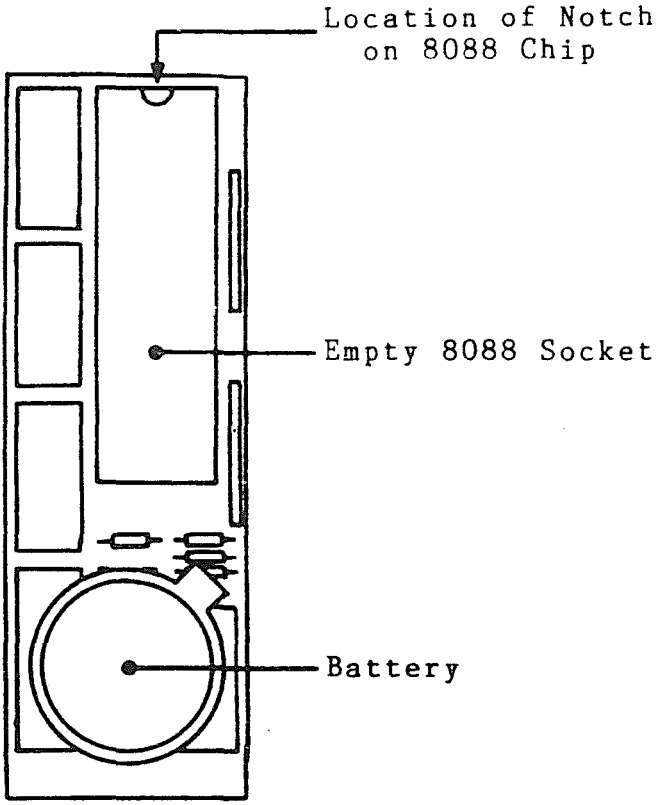
dClock is completely compatible with all IBM PC types including the 3270/PC. dClock can also be installed in the COMPAQ and many other PC compatibles.

1.2 PC-DOS Operation

The software provided with dClock works under the PC-DOS operating system. All operating system commands given herein are PC-DOS commands.

1.3 Board Layout

The following figure shows the dClock board layout. Parts that you'll need to access are labeled.



dClock Board Layout

1.4 Syntax Conventions

Commands that you type in exactly as shown are printed in **boldface** type.

DOS commands are shown herein in UPPERCASE letters.

Keys to be pressed are represented by surrounding the key name with angle brackets, < >. For example, <Enter> means press the Enter key.

Chapter 2
INSTALLING dCLOCK

2.1 Installing the Hardware

2.1.1 In the IBM PC

1. Have the following tools ready:

   - Medium-size, flat-blade screwdriver

   - Small-size, flat-blade screwdriver or similar object

   - 1/4-inch nutdriver (optional)

   - 3/16-inch nutdriver (optional)

2. Turn Off the system unit power switch and the power switches on any peripherals (monitor, printer, etc.).

3. Unplug the system unit's power cord from the wall outlet.

4. Remove the cover mounting screws from the rear of the system unit using the medium-size, flat-blade screwdriver or 1/4-inch nutdriver. Depending on the model of IBM PC that you have, there will be either two screws--in the lower corners, four screws--one in each corner, or five screws--one in each corner plus one in the center top.

5. Slide the system unit cover towards the front. When the cover will go no further tilt it upwards and lift up to remove it completely.

6. Looking down onto the system unit from above, locate the 8088 integrated circuit chip (see the figure on page 6).

   - First find the power supply in the corner closest to the power switch. The power supply is the silver metal box with the caution sticker on the top.

   - Next to the power supply on the bottom of the unit at the rear will be an empty 40-pin socket (this socket will contain an 8087 chip if your computer is so equipped).

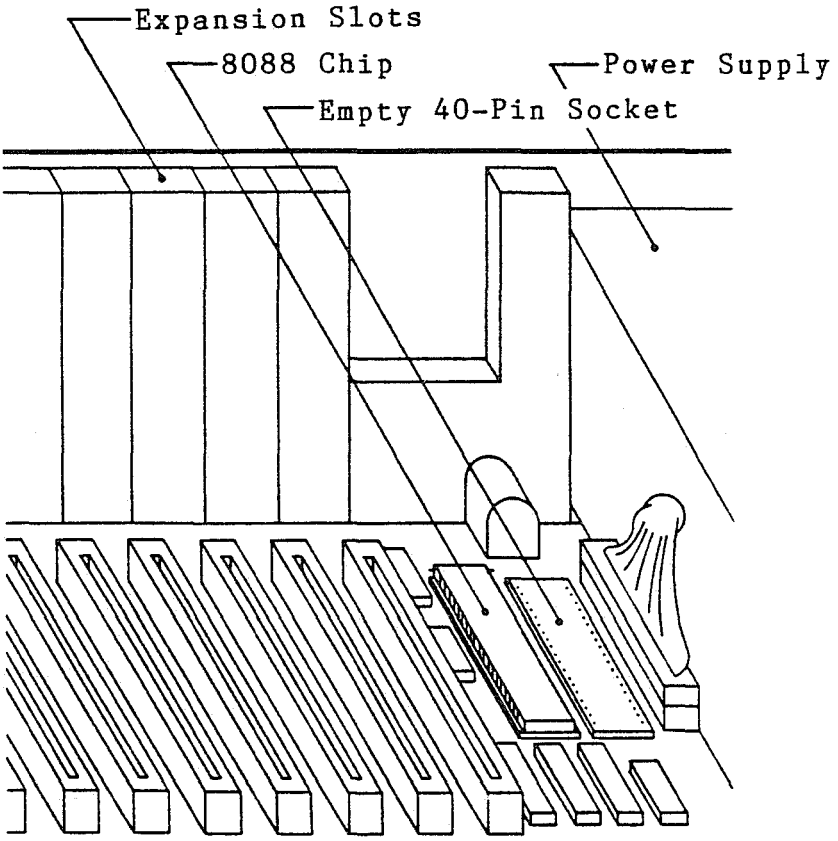
   - Right next to the empty socket will be another 40-pin socket containing the 8088 chip. The numbers "8088" will be printed on the top of the chip.

7. Remove the 8088 chip from its socket by wedging the small-size, flat-blade screwdriver or similar object between the chip and its socket and prying STRAIGHT upwards. CAUTION: While removing the chip and while the chip is out of your computer take care not to bend any of its metal legs. Make sure you do not remove the socket.

8. Place the 8088 chip into the empty socket on the dClock board (see the figure on page 2).

   - Place the notch that is on one of the short sides of the chip towards the top of the dClock board.

   - Carefully line up the legs on the chip with the holes in the socket. It helps to line up one side, then the other.



Location of the 8088 in the IBM PC

- Press STRAIGHT down on the top of the chip until the legs are fully inserted into the socket.

- Check the installation to make sure that all the legs are fully inserted in the proper holes and that none are bent.

9. Install the dClock board in your computer. In order to better see what you are doing while performing this step, you might want to remove one or two of the expansion slot covers on the rear of the unit using the medium-size, flat-blade screwdriver or a 3/16-inch nutdriver so that you can look through the slot. If you remove an expansion slot cover, reinstall it at the end of this step.

   - Line up the legs that protrude from the underside of the dClock board with the holes in the socket of your computer that you removed the 8088 chip from. It helps to line up one side, then the other.

   - Press STRAIGHT down on top of the 8088 chip until the board is fully inserted.

   - If you cannot fully insert the dClock board without hitting something on the motherboard, install the spare socket that is provided on the underside of the dClock board and reinstall the dClock board in your computer.

10. Replace the system unit cover reversing the actions in step 5 above.

11. Replace the screws that hold the cover to the system unit.

2.1.2 In Other Computers

Because dClock fits in many different computers, we cannot include detailed installation instructions for each one. If you have a computer other than the IBM PC, use the following generalized instructions to install dClock. Refer to your computer's operations guide if you need further details about how to open the cabinet, remove printed circuit boards, etc.

1. Have the following tools ready:

   - Medium-size, flat-blade screwdriver

   - Small-size, flat-blade screwdriver

   - 1/4-inch nutdriver (optional)

   - 3/16-inch nutdriver (optional)

2. Turn Off the system unit power switch and the power switches on any peripherals (printer, etc.).

3. Unplug the system unit's power cord from the wall outlet.

4. Locate the 8088 integrated circuit chip on the computer's motherboard. The 8088 is a 40-pin chip that has the numbers "8088" printed on the top. To do this you'll have to remove the outside cover. Also, you may have to remove all or some of the printed circuit boards (PCB's) from the inside compartment. This includes any expansion boards that you have installed as well as any standard PCB's that came with your computer.

5. Remove the 8088 chip from its socket by wedging the small-size, flat-blade

screwdriver or similar object between the chip and its socket and prying STRAIGHT upwards. CAUTION: While removing the chip and while the chip is out of your computer take care not to bend any of its metal legs. Be careful not to remove the socket.

6. Place the 8088 chip into the empty socket on the dClock board (see the figure on page 2).

   - Place the notch that is on one of the short sides of the chip towards the top of the dClock board.

   - Carefully line up the legs on the chip with the holes in the socket. It helps to line up one side, then the other.

   - Press STRAIGHT down on the top of the chip until the legs are fully inserted into the socket.

   - Check the installation to make sure that all the legs are fully inserted in the proper holes and that none are bent.

7. Install the dClock board in your computer.

   - Line up the legs that protrude from the underside of the dClock board with the holes in the socket of your computer that you removed the 8088 chip from. Line up one side, then the other.

   - Press STRAIGHT down on top of the 8088 chip until the board is fully inserted.

   - If you cannot fully insert the dClock board without hitting something

on the motherboard, install the spare socket that is provided on the underside of the dClock board and reinstall the dClock board in your computer.

8. Replace any PCB's that you removed in step 4.

9. Replace the outside cover.

2.2 Installing the Software

1. Plug in the system unit's power cord.

2. Turn On the system unit power switch and the power switches on any peripherals. If your computer does not come on, check that the unit is plugged in. Then check to see that the 8088 chip is fully inserted into the dClock board, that all the legs on the chip line up with the holes in the socket, and that none of the legs are bent. If any of the legs are bent, use needle-nose pliers to straighten them. Be VERY careful not to bend them so much that they break. Check these same things for the insertion of the dClock board into the computer.

3. Boot DOS using a DOS diskette that contains BASIC.

4. Enter the current date when DOS prompts you:

```
Current date is Tue 1-01-1980
Enter new date:
```

For example, to set the date to July 4, 1984, enter:

```
7-4-84 <Enter>
```

5. Enter the current time when DOS prompts you:

```
Current time is 0:01:43.53
Enter new time:
```

For example, to set the time to 11:15 a.m., enter:

```
11:15 <Enter>
```

The DOS prompt is returned.

6. Create the file SETDCLK.COM by entering and running a BASIC program as follows. SETDCLK.COM will contain a program that sets the time remembered by dClock.

- Enter the command:

BASIC <Enter>

or:

BASICA <Enter>

depending on which version of BASIC you have. The BASIC prompt, "Ok," will be returned.

- Enter the following program line for line where Ø is a zero and O is an "Oh":

```
1Ø FOR I%=1 TO 12 <Enter>
2Ø X=Ø <Enter>
3Ø FOR K%=1 TO 1Ø <Enter>
4Ø READ J$ <Enter>
5Ø X=X+VAL("&H"+J$) <Enter>
6Ø NEXT K% <Enter>
7Ø PRINT X <Enter>
8Ø NEXT I% <Enter>
9Ø INPUT "IS DATA OK (Y/N)";ANS$ <Enter>
1ØØ IF ANS$="Y" OR ANS$="y" THEN RESTORE:GOTO 11Ø <Enter
1Ø5 END <Enter>
11Ø OPEN "SETDCLK.COM" AS #1 LEN=1 <Enter>
12Ø FIELD #1,1 AS C$ <Enter>
13Ø FOR I%=1 TO 12Ø <Enter>
14Ø READ J$ <Enter>
15Ø LSET C$=CHR$(VAL("&H"+J$)) <Enter>
16Ø PUT #1,I% <Enter>
17Ø NEXT I% <Enter>
18Ø CLOSE #1 <Enter>
19Ø SYSTEM <Enter>
2ØØ DATA EB,Ø3,9Ø,ØA,64,BC,FØ,ØØ,B4,2A <Enter>
21Ø DATA CD,21,91,2E,F6,36,Ø4,Ø1,86,EØ <Enter>
22Ø DATA E8,4A,ØØ,8A,C6,E8,45,ØØ,8A,C2 <Enter>
23Ø DATA E8,4Ø,ØØ,32,CØ,5Ø,B4,2C,CD,21 <Enter>
24Ø DATA 8A,C5,E8,34,ØØ,5B,58,ØC,Ø8,5Ø <Enter>
25Ø DATA 53,8A,C1,E8,29,ØØ,8A,C6,E8,24 <Enter>
26Ø DATA ØØ,32,DB,B9,ØD,ØØ,8A,C3,BA,CØ <Enter>
27Ø DATA Ø6,ØC,CØ,EE,EB,Ø1,9Ø,24,4F,EE <Enter>
28Ø DATA 9Ø,58,ØC,5Ø,EE,EB,Ø1,9Ø,FE,C3 <Enter>
29Ø DATA E2,E6,32,CØ,EE,CD,2Ø,5B,32,E4 <Enter>
3ØØ DATA 2E,F6,36,Ø3,Ø1,5Ø,86,C4,5Ø,53 <Enter>
31Ø DATA C3,ØØ,ØØ,ØØ,ØØ,ØØ,ØØ,ØØ,ØØ,ØØ <Enter>
```

- Check every line in your program for typing errors. If any errors exist, dClock will not work.

- Save this program under the name SETDCLK:

  SAVE"SETDCLK <Enter>

  "Ok" is returned.

- Run the program:

  RUN <Enter>

  A list of numbers and the prompt "IS DATA OK (Y/N)?" is returned.

- Compare the list of numbers to the following list to double check whether you made any typing errors in the data lines of the program. If one of the numbers is wrong, check the corresponding line as indicated on the right for a mistake.

1142	line 200
1092	line 210
1275	line 220
1080	line 230
898	line 240
1291	line 250
1178	line 260
1181	line 270
1391	line 280
1542	line 290
923	line 300
195	line 310

If you find any errors, answer no:

N <Enter>

The BASIC prompt "Ok" is returned. Check your program for errors. Especially check to make sure that all your Øs are zeros and all your Os are "Ohs". Edit the BASIC program, save it, and run it again.

If you do not find any errors, answer yes:

Y <Enter>

The DOS prompt will be returned.

7. Set dClock to the correct date and time by executing the program SETDCLK.COM. Type:

SETDCLK <Enter>

8. Create the file READDCLK.COM by entering and running a BASIC program as follows. READDCLK.COM will contain a program that reads the time remembered by dClock and uses that time to set your computer's system clock. You will need to run READDCLK.COM every time you start your computer.

   - Enter the command:

     BASIC <Enter>

     or:

     BASICA <Enter>

     depending on the version of BASIC you have. The BASIC prompt, "Ok," will be returned.

   - Enter the following program line for line where Ø is a zero and O is an "Oh":

```
1Ø FOR I%=1 TO 13 <Enter>
2Ø X=Ø <Enter>
3Ø FOR K%=1 TO 1Ø <Enter>
4Ø READ J$ <Enter>
5Ø X=X+VAL("&H"+J$) <Enter>
6Ø NEXT K% <Enter>
7Ø PRINT X <Enter>
8Ø NEXT I% <Enter>
9Ø INPUT "IS DATA OK (Y/N)";ANS$ <Enter>
1ØØ IF ANS$="Y" OR ANS$="y" THEN RESTORE:GOTO 11Ø <Enter>
1Ø5 END <Enter>
11Ø OPEN "READDCLK.COM" AS #1 LEN=1 <Enter>
12Ø FIELD #1,1 AS C$ <Enter>
13Ø FOR I%=1 TO 13Ø <Enter>
14Ø READ J$ <Enter>
15Ø LSET C$=CHR$(VAL("&H"+J$)) <Enter>
16Ø PUT #1,I% <Enter>
17Ø NEXT I% <Enter>
18Ø CLOSE #1 <Enter>
19Ø SYSTEM <Enter>
2ØØ DATA EB,Ø2,9Ø,ØA,BC,FØ,ØØ,B7,ØC,E8 <Enter>
21Ø DATA 3C,ØØ,32,ED,8Ø,F9,5Ø,7D,Ø3,8Ø <Enter>
22Ø DATA C1,64,81,C1,6C,Ø7,51,E8,2A,ØØ <Enter>
23Ø DATA 51,E8,26,ØØ,58,8A,D1,8A,FØ,59 <Enter>
24Ø DATA B4,2B,CD,21,FE,CF,E8,17,ØØ,8Ø <Enter>
25Ø DATA E9,5Ø,8A,E9,E8,ØF,ØØ,51,E8,ØB <Enter>
26Ø DATA ØØ,8A,F1,32,D2,59,B4,2D,CD,21 <Enter>
27Ø DATA CD,2Ø,B3,Ø2,BA,CØ,Ø6,8A,EØ,8A <Enter>
28Ø DATA C7,ØC,CØ,EE,EB,Ø1,9Ø,24,4F,EE <Enter>
29Ø DATA 9Ø,BØ,6Ø,EE,32,CØ,8A,C8,EC,24 <Enter>
3ØØ DATA ØF,3A,C1,75,F7,FE,CF,FE,CB,75 <Enter>
31Ø DATA DB,32,CØ,EE,8A,C4,32,E4,2E,F6 <Enter>
32Ø DATA 26,Ø3,Ø1,Ø2,C8,C3,ØØ,ØØ,ØØ,ØØ <Enter>
```

- Check every line in your program for typing errors. If any errors exist, dClock will not work.

- Save this program under the name READDCLK:

  SAVE"READDCLK <Enter>

  The "Ok" prompt will be returned.

- Run the program:

  RUN <Enter>

  A list of numbers and the prompt "IS DATA OK (Y/N)?" will be returned.

- Compare the list of numbers to the following list to double check whether you made any typing errors in the data lines of the program. If one of the numbers is wrong, check the corresponding line as indicated on the right for a mistake.

1246	line 200
1060	line 210
1085	line 220
1253	line 230
1305	line 240
1255	line 250
1191	line 260
1302	line 270
1374	line 280
1506	line 290
1665	line 300
1603	line 310
439	line 320

If you find any errors, answer no:

N <Enter>

Check your program for errors. Especially check to make sure that all your Øs are zeros and all your Os are "Ohs". Edit the BASIC program, save it, and run it again.

If you do not find any errors, answer yes:

Y <Enter>

The DOS prompt will be returned.

9. Create or modify your AUTOEXEC.BAT file to include the command line READDCLK.COM. This action causes READDCLK.COM to be run automatically

every time you boot DOS.

- If you are unsure as to whether you already have an AUTOEXEC.BAT file, issue the command:

  DIR AUTOEXEC.BAT <Enter>

  If you are using DOS version 2.0 or higher, you'll want to be located in the root directory when you issue this command.

- If DOS responds "File not found," create the file by entering the following:

  COPY CON: AUTOEXEC.BAT <Enter>
  READDCLK.COM <Enter>
  <Function key F6> <Enter>

- If DOS responds with a listing for the file, first find out what the current contents of the file are by entering the command:

  TYPE AUTOEXEC.BAT <Enter>

  The contents of the file will be listed on your screen. Modify the file so that the command READDCLK.COM precedes the other commands in the file:

  COPY CON: AUTOEXEC.BAT <Enter>
  READDCLK.COM <Enter>
  .
  .
  .
  <Function key F6> <Enter>

10. Make sure that all DOS diskettes, DOS applications diskettes, and fixed disks (if your system is so equipped) that you will be booting from contain

the file READDCLK.COM and the AUTOEXEC.BAT file containing the line "READDCLK.COM." If necessary, use the COPY command to copy these two files to other diskettes.

2.3 Checking Out dClock

Verify that dClock is working properly by performing the following three steps:

1. Do a system reset by pressing the keys <Ctrl> + <Alt> + <Del> simultaneously. In approximately 10 seconds when DOS comes up again, notice that you are not prompted for the date and time as you were before you installed dClock. The DOS prompt is returned immediately.

2. Enter the command:

   TIME <Enter>

   When DOS responds with the system time, verify that it is correct.

3. Enter the command:

   DATE <Enter>

   When DOS responds with the system date, verify that it is correct. If the date and time are not correct, reset the date and time using the DOS DATE and TIME commands, then execute SETDCLK.COM, then repeat steps 1, 2, and 3 in this section. Verify that your BASIC programs were typed in correctly and that they created the files SETDCLK.COM and READDCLK.COM when run using the DIR command. Also, verify that your AUTOEXEC.BAT file contains the READDCLK.COM line. Check to see that the 8088 chip is fully inserted into the dClock board, that all the legs on the chip line up with

the holes in the socket, and that none of the legs are bent. Check these same things for the insertion of the dClock board into the computer.

Chapter 3
USING dCLOCK

Using dClock requires no learning on your part. You'll only notice that when you start up your computer the prompts:

```
Current date is Tue 1-01-1980
Enter new date:

Current time is 0:01:43.53
Enter new time:
```

do not appear. You can begin computing immediately.

3.1 Changing the Time

If you should need to change the time remembered by dClock (for example, during daylight savings time), use the following procedure:

1. Use the DOS DATE command to set the desired date. For example, to set the date to August 18, 1984, enter:

   DATE 8-18-84 <Enter>

2. Use the DOS TIME command to set the desired time. For example, to set the time to 7:05 p.m., enter:

   TIME 19:5 <Enter>

3. Enter the command:

   SETDCLK <Enter>

to read the new system date and time into dClock.

3.2 Replacing the Battery

Check the date and time every once in a while with the DOS DATE and TIME commands to make sure that dClock is still keeping accurate time. If it is not, check whether the metal clip of the battery holder is touching the battery. If the clip is not touching the battery, bend the clip so that the two make contact. If the clip is touching the battery, your battery may need replacing.

3 volt, lithium batteries (part number BR2325, CR2325, CR2320 or equivalent) can be purchased at an electronic supply store or can be ordered from Microsync, Inc., P.O. Box 116302, Carrollton, TX 75011.

To replace the battery:

1. Remove the battery from the battery holder (see the figure on page 2) by sliding the battery out from under the metal clip.

2. Place a new 3 volt, lithium battery under the metal clip in the battery holder. Place the + (positive) side up and the - (negative) side towards the dClock board.

3. Use the DOS DATE command to set the desired date. For example, to set the date to August 18, 1984, enter:

   DATE 8-18-84 <Enter>

4. Use the DOS TIME command to set the desired time. For example, to set the time to 7:05 p.m., enter:

TIME 19:5 <Enter>

5. Enter the command:

SETDCLK <Enter>

to read the new system date and time into dClock.

Appendix A
INSTALLING 640K ON YOUR MOTHERBOARD

If you have an IBM XT or Portable, follow the procedure in section A.1. If you have a COMPAQ Portable, follow the procedure in section A.2.

A.1 In the IBM XT

You can make this modification to any IBM XT or Portable or to any PC with an XT motherboard. Your PC has an XT motherboard if it has eight expansion slots. If your PC has five expansion slots you will not be able to upgrade your PC.

1. Have the following materials ready:

   - Short piece of wire: 30-gauge wire-wrap wire recommended or whatever you have on hand
   - 1 74LS158 multiplexer integrated circuit chip
   - 18 256K RAM chips

2. Have the following tools ready:

   - Medium-size, flat-blade screwdriver
   - Small-size, flat-blade screwdriver or similar object
   - Needle-nose pliers
   - Soldering iron
   - 1/4-inch nutdriver (optional)

- 3/16-inch nutdriver (optional)

3. Turn Off the system unit power switch and the power switches on any peripherals (monitor, printer, etc.).

4. Unplug the system unit's power cord from the wall outlet.

5. Remove the cover mounting screws from the rear of the system unit using the medium-size, flat-blade screwdriver or 1/4-inch nutdriver.

6. Slide the system unit cover towards the front. When the cover will go no further tilt it upwards and lift up to remove it completely.

7. Remove all expansion boards from the system unit.

   - Before removing the expansion boards, make a note of their positions and where cables are connected to them so that you will be able to correctly reinstall them.

   - Unscrew any screws holding the expansion boards in using the small-size, flat-blade screwdriver or 3/16-inch nutdriver.

   - Unplug any cables connected to the boards.

   - Pull the boards straight up to remove them from their sockets and from the expansion board compartment.

8. Optional: This step is not entirely necessary, but will make the job easier. Remove the motherboard from the system unit.

- Unscrew the two screws holding the motherboard down.

- Locate the several plastic clips that hold the motherboard down. Squeeze the clips together while lifting up on the board.

- When all the clips have been unfastened, slide the motherboard out the side of the cabinet.

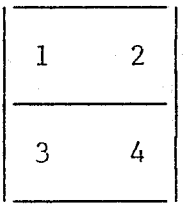
9. Install a jumper between pads 1 and 2 of the jumper block E2.

- Locate jumper block E2. It is on the motherboard, next to the power supply, 1/3 of the way from the rear of the drives to the rear of the cabinet.

- Locate pads 1 and 2. The block contains 4 pads. Pads 1 and 2 are the two towards the rear of the computer:

Rear of Cabinet

E2



Power Supply

Front of Cabinet

- Cut a short piece of wire-wrap wire (or other wire) and strip it if necessary.

- With needle-nose pliers, hold a short piece of stripped wire-wrap

wire so that it touches both pads 1 and 2.

- With the soldering iron, heat one pad so that the wire-wrap wire gets soldered onto the pad. Repeat with other pad.

- Remove excess wire-wrap wire by trimming with wire cutters or by repeatedly bending the wire.

10. Install the 74LS158 chip in the U84 socket on the motherboard.

- Locate the U84 socket on the motherboard. It is at the front of the cabinet, partly underneath drive A.

- Place the 74LS158 chip into the empty U84 socket. Place the notch that is on one of the short sides of the chip towards the rear of the computer.

- Carefully line up the legs on the chip with the holes in the socket. It helps to line up one side, then the other.

- Press STRAIGHT down on the top of the chip until the legs are fully inserted into the socket.

- Check the installation to make sure that all the legs are fully inserted in the proper holes and that none are bent.

11. Install the 256K RAM chips.

- Remove your 64K RAM chips from the rows labeled "BANK 0" and "BANK 1" (9 in each row) by wedging the small-size, flat-blade screwdriver

or similar object between the chip and its socket and prying STRAIGHT upwards. CAUTION: While removing the chip and while the chip is out of your computer take care not to bend any of its metal legs. Make sure you do not remove the socket.

- If banks 2 and 3 are currently empty, you can install the RAM chips removed from banks 0 and 1 there. To install the RAM chips, place the notch that is on one of the short sides of the chip towards the rear of the cabinet. Carefully line up the legs on the chip with the holes in the socket. It helps to line up one side, then the other. Press STRAIGHT down on the top of the chip until the legs are fully inserted into the socket. Check the installation to make sure that all the legs are fully inserted in the proper holes and that none are bent.

- Insert the 256K chips in banks 0 and 1. Follow the cautions stated in the last step.

- You should now have two banks (banks 0 and 1) of 256K RAM chips and two banks (banks 2 and 3) of 64K RAM chips giving you a total of 640K.

12. Change switch setting to indicate that you have 640K.

- Locate the switch labeled "SW1" on the motherboard. It is 1/3 of the way from the rear of the drive to the rear of the cabinet.

- Set switches 3 and 4 to the Off position if they are not already there.

13. Replace all expansion boards in their original positions.

    - Insert the boards into their sockets.

    - Connect the cables.

    - Replace screws.

14. Replace the system unit cover reversing the actions in step 6 above.

15. Replace the screws that hold the cover to the system unit.

A.2 In the COMPAQ

1. Have the following materials ready:

    - Decoder PROM (COMPAQ part no. 10069-901)

    - 18 256K RAM chips

2. Have the following tools ready:

    - Medium-size, flat-blade screwdriver

    - Small-size, flat-blade screwdriver

    - 1/4-inch nutdriver (optional)

    - 3/16-inch nutdriver (optional)

3. Turn Off the system unit power switch and the power switches on any peripherals (printer, etc.).

4. Unplug the system unit's power cord from the wall outlet.

5. Remove the top cover. Insert the medium-size, flat-blade screwdriver underneath the cover by the computer's handle to unlatch the notches that hold the cover on.

6. Remove the metal plate that covers the expansion board compartment by loosening (not removing) the seven screws that hold it down using the small-size, flat-blade screwdriver or the 1/4-inch nutdriver and then pulling up on the metal plate.

7. Remove all expansion boards from the compartment. This includes all expansion boards that you have installed as well as the two expansion boards that came with your computer.

   - Before removing the expansion boards, make a note of their positions and where cables are connected to them so that you will be able to correctly reinstall them.

   - Unscrew any screws holding the expansion boards in. The screws holding the standard boards in slots 1 and 2 are on the outside of the expansion board compartment. Slide open the I/O compartment door and remove them with the small-size, flat-blade screwdriver or 3/16-inch nutdriver. For any expansion boards that you may have, the screws may be on the inside or the outside of the expansion board compartment depending on the design of the board.

   - Unplug any cables connected to the boards.

   - Pull the boards straight up to remove them from their sockets

and from the expansion board compartment.

8. Replace the address decoder PROM.

   - Locate the U35 socket. It is on the motherboard directly behind the drives.

   - Remove the IC that is currently in the U35 socket by wedging the small-size, flat-blade screwdriver or similar object between the chip and its socket and prying STRAIGHT upwards. Make sure you do not remove the socket.

   - Place the new decoder PROM into the empty U35 socket. Place the notch that is on one of the short sides of the chip towards the front of the computer.

   - Carefully line up the legs on the chip with the holes in the socket. It helps to line up one side, then the other.

   - Press STRAIGHT down on the top of the chip until the legs are fully inserted into the socket.

   - Check the installation to make sure that all the legs are fully inserted in the proper holes and that none are bent.

9. Install the 256K RAM chips.

   - Locate "BANK 2" and "BANK 3" of RAM on the motherboard.

   - If you currently have RAM chips in these sockets, remove them by wedging the small-size, flat-blade screwdriver or similar object between

the chip and its socket and prying straight upwards.

- Install the 256K chips in banks 2 and 3. To install the RAM chips, place the notch that is on one of the short sides of the chip away from the power supply side of the computer. Carefully line up the legs on the chip with the holes in the socket. It helps to line up one side, then the other. Press STRAIGHT down on the top of the chip until the legs are fully inserted into the socket. Check the installation to make sure that all the legs are fully inserted in the proper holes and that none are bent.

10. Replace all expansion boards in their original positions in the expansion board compartment.

    - Insert the boards into their sockets.

    - Connect the cables.

    - Replace screws.

11. Replace the metal expansion board compartment cover. Tighten the screws.

12. Replace the top cover.

13. Plug in the computer and power it up.

14. Run the CHKDSK program:

    CHKDSK <Enter>

    If you have revision B or earlier ROMs, (location U40), CHKDSK will reveal 544K of memory. If you have revision C or later, the system will find 640K.