CMOS battery failure

By David Presnell

CMOS RAM (Complementary Metal-Oxide Semiconductor Random-Access Memory) (pronounced "see-moss") is a small area of memory that contains valuable information needed by the computer's BIOS ROM (Basic Input/Output System Read Only Memory) to start the computer. The CMOS RAM holds current date and time information, floppy drive information, hard drive types, memory configuration, and monitor and I/O card types.

Because this information will be different for different computer systems, and may need to be changed from time to time, it is in RAM, so that it may be altered. It would be tedious, however, if the user had to enter the date and time and the identification information for disk drives and other hardware every time he turned on the computer. For this reason, this area of RAM is powered by a battery, so that it maintains the information in it, even when the computer is turned off (Figure 1)

The Setup program

The software that allows the user to enter this system configuration information into the computer is called the Setup program (Figure 2) Some computers allow the user to invoke the setup program during initial powerup For example, one system puts the message "FOR SETUP, PRESS <DEL>." If the user presses the Delete key when this message appears, the setup screen appears.

In another type of computer, the user can invoke setup at any time by pressing the Ctrl-Alt-Delete keys simultaneously. Refer to the literature supplied with the computer if the method of invoking the setup program isn't obvious.

The setup program is generally manufactured or burned into the ROM BIOS chip, although some computers, (mostly IBM AT's), do not have the setup program on the ROM BIOS chip. With these systems the program is located on a floppy disk, usually bootable, called a setup disk, diagnostics disk, or an equivalent.

CMOS RAM requiring setup is present on AT, 286 and higher computers, how-

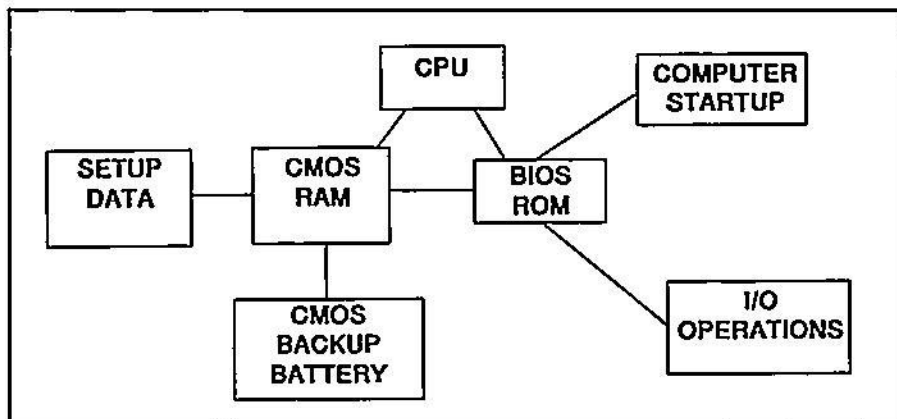Presnell is owner of an independent computer servicing business, and a freelance technical writer

Figure 1. CMOS RAM is a small area of memory that contains valuable information needed by the computer's BIOS ROM (Basic Input/output System Read Only Memory) to start the computer This area of RAM is powered by a battery, so that it maintains the information in it, even when the computer is turned off

ever, XT and PC machines may have a clock card installed with a ROM chip, CMOS RAM chip, and a lithium battery for maintaining the data in CMOS RAM.

Some advanced CMOS setup programs offer the ability to personalize a system with the drive to boot from, password setup, extended and expanded memory setup, enable shadow ROM functions, and other advanced setup options

The BIOS ROM

The BIOS ROM chip is the key that starts the computer's engine running. When you power on the computer, the supply powers up all the components of the mother board Immediately the BIOS takes over as commander of operations.

The BIOS is a ROM-based program (called firmware) that performs specific I/O (Input/Output) operations, initializes most of the computer hardware checks on the location of hardware, including I/O cards, ports and memory, runs basic diagnostics on the system (in most cases), and looks for and communicates with DOS (Disk Operating System) software.

BIOS ROM performs many other start-up procedures, but its final goal is to force the computer to recognize and use DOS All ROM chips are not created equal. You will find different levels of ROM programming depending on the ROM manufacturer; however, the goal still remains the same.

Once the BIOS ROM program has done its job and located the DOS program, which must be either on a floppy disk or on the boot sector of a hard drive, the BIOS turns the job of handling disk drives over to DOS. BIOS continues to handle computer hardware I/O operations. DOS takes over all disk drives and waits for the user to run application programs, the end use of the computer

Setup requires exact information

The computer has to be told every move to make, specifically. Thus, the burned in BIOS ROM program must know exactly what hardware is plugged into the computer. You cannot tell the BIOS that you simply have a hard drive, but you must tell it exactly what type of hard drive you have installed

If you tell BIOS that you have a 40MB hard drive installed, when in fact you have an 80MB, the computer will go right on thinking it only has 40MB available for use and that's exactly what you will get.

You can tell the BIOS what is onboard and customize the computer by using the CMOS setup program (or bios setup program) mentioned above Remember that a program supplies the necessary instructions (algorithm) that does something with the data supplied by the user. Thus, the BIOS ROM is an unchangeable set of instructions that looks for user entered data to respond to.

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┌─────────────────────────────────────────────────────────────┐
│              STANDARD CMOS SETUP PROGRAM                      │
├─────────────────────────────────────────────────────────────┤
│ Date (mm/date/year): Fri,  Mar 1, 1984   Base Memory : 640 KB│
│ Time (hour/min/sec): 12 : 10 : 20          Ext memory:  0 KB │
│ Daylight  Saving    : Disabled                               │
│ Hard Disk C: Type  : 17          Cyln  Head  WPCom LZone Sect Size│
│ Hard Disk D: Type   : Not Installed  977   5    300   977   17 41MB│
│ Floppy Drive A:     : 1 2 MB, 5 1/4                          │
│ Floppy Drive B:     : Not Installed                         │
│ Primary Display     : VGA/EGA                               │
│ Keyboard            : Installed                             │
│                                                             │
│  ESC: Exit   Arrow keys: Sel   F2/F3:Color   F10: save & exit│
└─────────────────────────────────────────────────────────────┘
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Figure 2. The software that allows the user to enter the system configuration information into the computer is called the Setup program (Figure 2).

The CMOS backup battery

The CMOS RAM backup battery that maintains CMOS RAM is usually the lithium type Because the CMOS uses little power to preserve its data, the battery backup works quite well until the battery goes dead In older XT and PC machines, setup was performed by changing motherboard mounted switches and jumpers.

These batteries occasionally outlast the motherboard they reside on. However, most will fail within three to five years depending on use and type. Most of the batteries are 3.6V installed directly on the motherboard close to the keyboard connector. Some are plugged in via a 2-pin connector and wire to an external battery pack, usually 6V. Many modern IBM compatible motherboards allow use of the board mounted battery or an external (to the motherboard) battery by changing a jumper setting on the motherboard.

Think battery

As technicians respond to day to day service calls, it's all too easy to look for the complex rather than the simple. Many computer technical manuals go into great depth on the seemingly complex hardware problems. However, when the CMOS backup battery is mentioned, (if at all), usually you're told to simply replace it. If life were only that simple.

Future installments of Computer Corner, will describe some of the many symptoms caused by a failing CMOS battery, share a case history with you, tell you how to replace the battery and get the system back up and running, and discuss how to avoid this problem in the future. ∎