Examining Memory and Storing Data

CONCEPT

This experiment uses three keys to examine and modify the contents of the memory in the μLab. The FETCH ADRS key allows you to examine the data stored at any address, and the STORE/INCR key is used for storing data or examining successive memory locations. These two keys were used in Lesson 3, and in this experiment, their operation is examined in greater detail. The DECR (Decrement) key, which allows you to step backwards through memory, is also introduced.

PROCEDURE

I. Examining the Contents of the Memory

A) The display should show υ L A b   U P   indicating that the system is in its normal "waiting for command" mode. If it does not show this display, press [RESET] .

B) Press [FETCH ADRS] [0] [0] [0] [0] . The display now shows the address (which you have just entered) in the left four digits of the display and the data (26) stored at that address in the right two digits of the display. Remember that addresses and data are displayed in hexadecimal.

C) Press [STORE /INCR] . This directs the μLab to store the data shown in the display at the address shown in the display, and then to increment the address. Since you just fetched the data from location 0000 and then stored the same data in the same location, you did not change the contents of the memory in any way. In this situation, the [STORE /INCR] key functions as an "increment address" key for examining successive locations in memory. By repeatedly pressing [STORE /INCR] , you can examine a section of memory. You used this feature previously in Experiment 3-2.

II. Storing Data in the Memory

A) Press [FETCH ADRS] [0] [8] [0] [0] . This specifies address 0800, which is the beginning of the RAM. The power-up program fills the RAM with zeros, so this location (and all others up through 0AEE) contains the data 00.

B) Press [STORE /INCR] . This advances the address to 0801 and leaves 00 stored in 0800.

C) Press [C] [3] . Notice that this appears in the data section of the display, and the right-most decimal point is lighted. The decimal point indicates that you are in a "data-entering" mode.

EXPERIMENT 4-1

(Continued)

D) Press [STORE/INCR]. You have now stored the data C3 at address 0801, and the address has been incremented to 0802.

Note that the decimal point goes off, indicating that the data just entered has been stored and the μLab is no longer in a data-entering mode.

E) Press [STORE/INCR]. This leaves 00 in 0802 and goes on to 0803.

F) Press [8] [STORE/INCR]. Note that you do not need to press 0 first. If you only enter one digit, the μLab automatically inserts a leading zero. You have now stored the following data:

| Address	Contents
0800	00
0801	C3
0802	00
0803	08

G) Press [DECR]. This decrements the address shown in the display and is useful for checking the data that you have just entered.

H) Repeat step G until you have verified that the above listing is contained in the memory. Note that [DECR] does not affect the contents of the memory in any way.

You could also have checked the data by pressing [FETCH ADRS] [0] [8] [0] [0] and then using [STORE/INCR] to examine successive locations.

III. Correcting Mistakes

A) Press [FETCH ADRS] [0] [0] [0] [0]. This selects the first address in ROM.

B) Press [0] [STORE/INCR]. This attempts to store 00 in this location.

C) What happened? You tried to store data in the ROM, which is impossible. The monitor detects this error, issues a warning beep, does *not* increment the address, and shows you the data that is stored there.

D) This procedure pointed out a mistake that the monitor detected. But what about mistakes such as entering the wrong address or data? When entering an address, you can always press [FETCH ADRS] again to start over.

To illustrate this, press [FETCH ADRS] [0] [7] . Suppose that at this point you realize that the address you want is 0900. Even though you are in the middle of entering the address, you can recover by pressing [FETCH ADRS] [0] [9] [0] [0] .

E) Now that you have entered the correct address, you can enter some data. Press [7] [9] . This data now appears in the right two digits of the display.

F) Suppose this is not the data you intended to enter: what you wanted was 69. Simply enter the correct data, and the incorrect data will be shifted out. When you are entering data, you can keep entering digits indefinitely, and the μLab keeps only the last two. The decimal point indicates that it is still accepting data. Once you press [STORE /INCR] , however, the data is stored in memory, and the decimal point goes off.

G) Press [STORE /INCR] . You just stored 69 at address 0900. Suppose you now want to change that to 68.

H) Press [DECR] . The address 0900 and the data 69 appear in the display. Key in the correct data, 68, and press [STORE /INCR] . You have now changed the data.

SUMMARY

In this experiment you produced a listing of part of the ROM and then stored some data in RAM. The following keys were used:

[FETCH ADRS] allows you to specify an address and view the data stored there.

[STORE /INCR] stores the data shown in the display at the address shown, and then displays the next location.

[DECR] decrements the address shown in the display without affecting the data and shows you the previous location.

These three keys enable you to easily store and examine data in the μLab's memory.