CHECKOUT WITH THE 65A PROM MONITOR

On serial-based systems, once you are confident that you have interfaced the computer correctly, plug in both the terminal and the computer to a common grounded three-wire outlet. It is also recommended that you do not operate the system in areas which produce high static discharges.

First turn on the terminal and allow it to warm up. Then turn on the computer. On Model 500-1, Challenger II and Challenger III, reset lights should glow rather brightly. If the light is very dim or does not come on, turn the unit off and proceed to Section E. On Challenger III systems with the manual processor select switch, be sure that the 6502 is selected by rotating the switch at the rear of the unit counter-clockwise. On systems where you are utilizing your own power supply, monitor the -9V and +5V together with a voltmeter. If the voltage is not 14V, turn the power off and proceed to Section E.

Next, quickly depress the reset switch. On all Challenger systems equipped with ROM BASIC, the message "C/W/M?" should be printed out. On systems configured for use with the floppy disk, "D/M?" should be printed out. On older Challenger configurations, a simple carriage return-line feed will be put out. Occasionally, on the first reset operation under power-up, one or more of the characters may be mistyped due to warm-up. In any case, repeat the reset procedure three or four times and observe the output on the screen. If you are not getting the proper message, but are getting a somewhat garbled message of approximately the same length and characters, your baud rate is probably misadjusted. On systems using the 500 Board or on Challenger IIIs (110 baud), it is necessary to fine-adjust the baud rate. A rough adjustment of the baud rate can be made by rocking the pot back and forth over its range and resetting the computer until you get the desired output. If you are not qualified or experienced in electronic servicing, you should not attempt this procedure with power applied. Simply turn the computer off, remove the cover, adjust the potentiometer, place the cover back on, and turn the computer back on (reset) until you get the proper message. If it is not possible to get the proper output with this procedure, refer to Section E.

Once you have obtained the proper output message, type M. This will place you in the 65A Monitor. Then type PØØØØ. The computer should now start listing memory incolumns of eight hex bytes, or 16 hex characters with spaces between characters, i.e., 0-9 and A-F, with even spacing between characters. If there are any illegal characters or uneven spaces, then your baud rate requires fine tuning. This can be accomplished by moving the potentiometer baud rate pot adjustment clockwise until it provides a large number of errors, and then rocking the back to the right until it provides a large number of errors, and then setting the pot in the middle of its range, thus fine-tuning the baud rate.

Next proceed to the 65A PROM Monitor instructions and execute the sample program. You may or may not desire to become familiar with the machine language operation of the computer. If you do, refer to the MOS Technology Programming Manual which provides an excellent discussion of machine language programming of the computer and, also, to the Ohio Scientific Small Systems Journal which occasionally provides short routines which can be entered directly in machine code. Another excellent introductory source for machine language programming is Ohio Scientific's Model 300 Computer Trainer Manual. This manual provides twenty experiments on the 6502-based Model 300 Computer Trainer, but, these experiments can also be executed on any Challenger system. The manual can be ordered directly from Ohio Scientific for ten dollars postpaid. Once you are satisfied with your familiarity with the 65A Monitor, proceed to Section C.

65A PROM MONITOR
INSTRUCTIONS

The 65A PROM Monitor is used with 6502 serial systems by the programmer who wishes to write at the machine language level. When the reset button is pressed, the letters D/M? or C/W/M? may appear on the screen. To get into the monitor, type an M on the keyboard (D is used only in conjunction with the diskette, which contains BASIC). While using the Monitor program, you can directly manipulate the computer's memory, and write programs using the computer's own language.

First of all, to examine memory locations before changing them, type a P, then the initial location in the block of addresses you wish to inspect. When you do this, the contents of that block will scroll up the screen. You may halt this scrolling by typing any key on the keyboard.

To change memory contents, type an R to return to the Command Mode. Then type an L, together with the location whose contents you wish to change, then an optional space for clarity, followed by the "new" contents which you select. If you are altering the contents of consecutive addresses, simply type the new contents one after the other. You may type spaces, carriage returns, and line feeds between these contents if you wish to make it more legible, but this is not necessary. In any case, the next successive address in memory is opened with each set of contents you type. If the next location you wish is not immediately consecutive, type R to get back into the Command Mode, then type L and the new address, plus the contents you wish to place there. Continue typing new contents if you are changing those of consecutive addresses, otherwise type R, then L, and so on.

To verify any changes you have made, use the P command to examine memory blocks as explained above.

While you are using the L command, the Monitor ignores all non-hexadecimal characters except R. When you use the P command, the monitor inserts spaces, carriage returns, line feeds and nulls.

The fourth command available when using the 65A Monitor is the G command which is used to run programs. This will be illustrated in the sample program below. Some of the following subroutines are used in the course of the program.

Subroutines

FE00	INCH (input character and echo)
FE0B	OUTCH (output character)
FE35	CONTROL (Note: FE40 will bypass ACIA initialization)
FE77	LOAD
FE8D	PRINT
FEC7	BUILD ADDRESS (constructs an address from input at 00FC [low] and 00FD [high])

Go and Breakpoint Locations

0129	Index Register Y
012A	Index Register X
012B	Accumulator
012C	Status Register
012D	Stack Pointer
012E	Program Counter High
012F	Program Counter Low

Vectors:

NMI	0130
RESET	FE35
IRQ	01C0

Sample program to illustrate OSI 65A Monitor

This program prints in double any character you type on the keyboard. Beginning at location 0200, the program would look as follows in user source code:

```
10*=$200
20 JSR INCH
30 JSR OUTCH
40 JMP $200
```

The assembled version of this short program would look as follows:

```
10 0200          *=$200
20 0200 2000FE   JSR INCH
30 0203 200BFE   JSR OUTCH
40 0206 4C0002   JMP $200
```

These lines are interpreted as follows:

Line 10: initialization of program counter

Line 20: actual program begins at given initialization point (0200); 20 is the ASCII code representation for JSR; 00 is the low address byte of INCH; FE is its high address byte.

Line 30: since three bytes have been used since program initialization, we are now at location 0203; 20 is ASCII for JSR; 0B is low address byte for OUTCH; FE is its high address byte.

Line 40: as this is the sixth byte since program initialization, we are at location 0206; 4C is the ASCII code for JMP; 00 is the low address byte for location 0200; and 02 is its high byte.

The bytes in this program are all to occupy consecutive memory locations. Therefore, only one L command will be necessary while we are in the Monitor, until we are ready to run the program. To enter it, engage in the following dialogue with the computer: press reset (your responses are underlined).

```
D/M? M
L0200 2000FE 200BFE 4C0002 R
```

To verify that these contents truly are loaded into memory, type: P0200
The contents of all the addresses beginning with location 0200 will immediately scroll up the screen. To stop the scrolling, type any key and examine the contents displayed on the screen. Then type R to get back into Command Mode.

To run the program, you need to set the stack pointer (located at address 012D) to 28, and the program counter high (012E) at 02 and low (012F) at 00, because the starting address is 0200. Since these locations are consecutive, you need only type : L012D280200R
To execute the program, type G
Then any character you type will appear in duplicate on the screen.