## INTRODUCTION

The Electronic Acorn provides the user with all of the required components for a beginning home computer system, and has the capability for later expansion. The package contains an 8080A micro-computer made by Byte Industries and a basic computer instruction course prepared by Bell & Howell School. Features include: a power supply with primary power isolated from the motherboard; a control panel and board for relaying external information to and from the MPU, which controls and processes all instructional data within the computer; and a 1/2k memory board for information storage. The computer can be assembled with only a screwdriver since all boards are pre-soldered and have been tested at the factory.

## ASSEMBLY INSTRUCTIONS

Refer to Electronic Acorn parts list and check all parts before starting assembly.

1. Attach the motherboard to the narrow side panels with four 6-32 x 3/8 binder head machine screws (BHMS), washers and nuts. Install the large capacitor on the board, observing polarity as marked on the solder side of the board. That is, the plus (+) side of the capacitor is attached to the plus side of the board.

2. Attach the back panel to the side panels, using four 6-32 x 3/8 flat head machine screws (FHMS); insert the numbered wires from the transformer into the corresponding marked sockets on the motherboard.

3. To mount the front panel to the control board, first connect one end of the ribbon cable to the empty socket (J1), then adjust the back nut on the switch to the third thread from the bottom and install the washer. Align all toggle switches in the same direction, then insert the switches through the holes in the front panel. Snap the LEDs into the collars. Install all nuts on the front panel.

4. Insert the front panel PC board into the first connector on the motherboard and attach the front panel to the side panels with the four remaining 6-32 x 3/8 FHMS.

5. Install the bottom cover using four 6-32 x 1/4 BHMS. Insert the MPU and Memory boards into the second and third connectors on the motherboard. Then attach the ribbon cable from the front panel to the socket labeled J1 on the MPU. The system is now ready for operation — proceed to the checkout instructions.

## CHECKOUT INSTRUCTIONS

Refer to the Front Panel photo and state and status description (pg. 4 and 5).

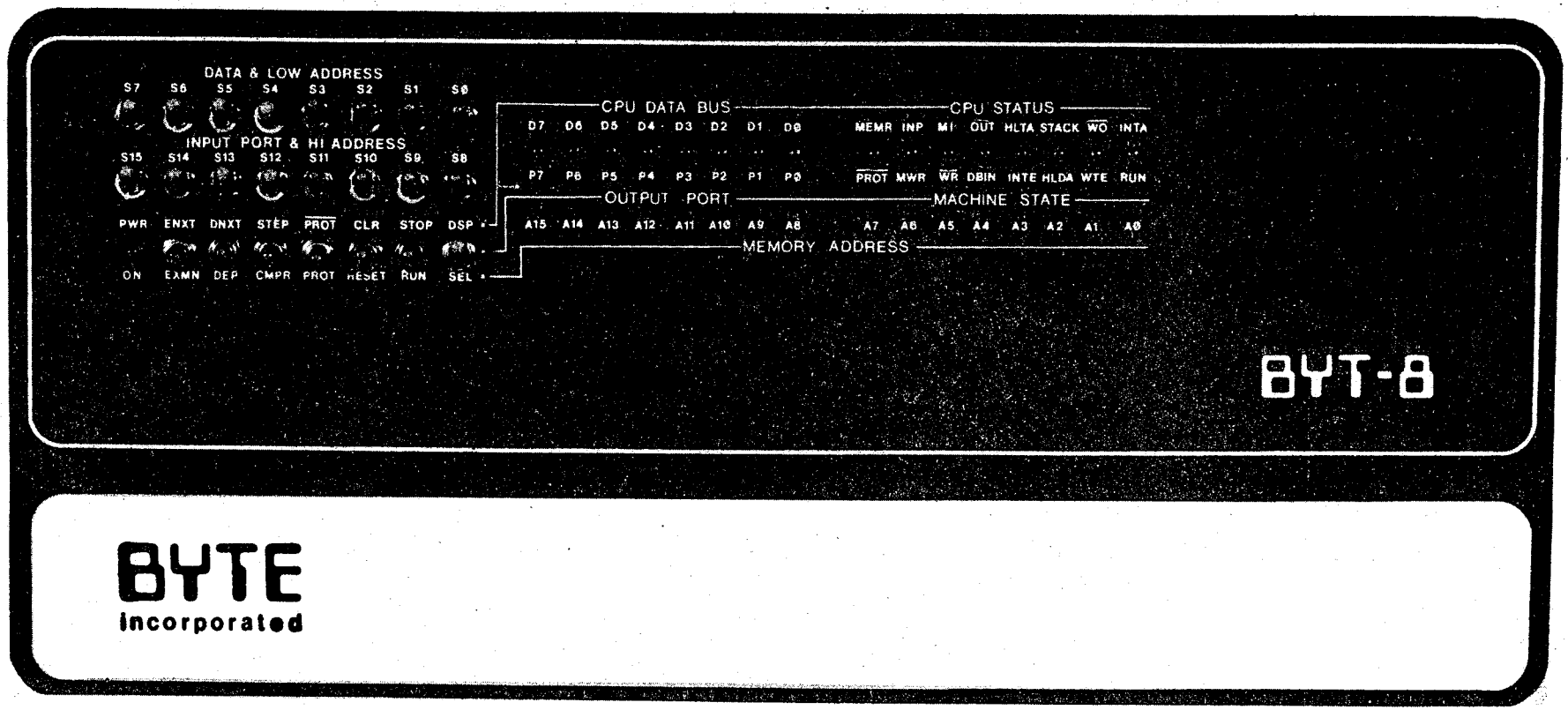
Reset — Set Reset/Clear switch to RESET position. Set Display Selector switch to down position. Address indication should be all indicators off.

Deposit — Set Display Selector to up position. Data indication (DØ-D7) will be whatever instruction happens to be in address location zero. Set data switches (SØ-S7) for the hexadecimal value (21) in the test program of Table 1. Set the DEP/DNXT switch to the DEP position. Data indicators (DØ-D7) will now display the same information as the data switches. Set the data switches (SØ-D7) for the next hexadecimal value (FF) and set the DEP/DNXT switch to the DNXT position. Place the Display Selector switch down and check the address indicators (AØ-A15). For AØ on condition (this indicates you stepped from location zero to location one, and you have deposited instructions sequentially), place the Display Selector in the up position and continue putting the hexadecimal values of the test program in the data switches (SØ-S7) followed by a DNXT. (CAUTION: If the data indicators DØ-D7 are not changing to the same value as the data switches, your Memory Board may be misaddressed or protected. To unprotect the board, place the PROT/$\overline{\text{PROT}}$

switch in the $\overline{\text{PROT}}$ position.) When the entire test program has been deposited into memory, place the Display Selector down and the Address indicators should have the value 002E Hexidecimal. If this is not so, you have erred when depositing the program into memory.

Examine — Place the Display Selector to the up position and put the Reset/Clear switch to the RESET position. The data indicators (DØ-D7) should display the contents of location zero (21 in test program). Put the EXMN/ENXT switch to the ENXT position and the data indicators should display the contents of location one (FF in test program). Continue depressing the ENXT switch and checking the display indicators for the proper value in the test program. If the contents of memory agree with the program listing in Table 1, you may proceed.

Run — Place all switches SØ-S15 down. Depress RESET switch, then depress RUN switch. If the Display Selector is in the up position, all the data indicators will appear on, as well as the appropriate CPU status. Put the Display Selector in the center position and the Output Port indicator (PØ-P7) will be turning on and off $P_7P_6P_1P_0$ then $P_2P_3P_4P_5$. The appropriate Machine State indicators will be on. Put the Display Selector down and the Address indicators will be flashing in an incremental fashion. You may now test STEP on Compare by putting an address value in SØ-S15 and depress CMPR. The AØ-A15 indicator should be the same value as SØ-S15. Depressing STEP will single step you through locations in memory. If you encounter problems with this test program, contact your BYTE SHOP.




BYTE
incorporated

Assembled front panel and board.

## STATUS AND STATE DESCRIPTION

| | | |
|---|---|---|
| | MEMR | = MEMORY READ OP |
| S | INP | = I/O INPUT OP |
| T | M1 | = FETCH CYCLE OF FIRST BYTE OF INSTRUCTION |
| A | OUT | = I/O OUTPUT OP |
| T | HLTA | = CPU HALT CONDITION (REQUIRES INTERRUPT OR RESET TO START) |
| U | STACK | = STACK OPERATION |
| S | $\overline{WO}$ | = WRITE MEMORY OR I/O OUTPUT |
| | INTA | = INTERRUPT ACKNOWLEDGE |
| | PROT | = ADDRESSED MEMORY IS PROTECTED |
| S | MWR | = MEMORY WRITE SIGNAL |
| T | $\overline{WR}$ | = CPU WRITE SIGNAL TO I/O OR MEMORY |
| A | DBIN | = CPU DATA BUS GATED INBOUND (TO CPU) |
| T | INTE | = INTERRUPT IS ENABLED |
| E | HLDA | = CPU ACKNOWLEDGEMENT OF HOLD SIGNAL |
| | WTE | = CPU IS WAIT STATE |

MEMORY ADDRESS DESCRIPTION (All Address Bits On = 65,536)

| BIT: | A0 | A1 | A2 | A3 | A4 | A5 | A6 | A7 | A8 | A9 | A10 | A11 | A12 | A13 | A14 | A15 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| LOCATION: | 1 | 2 | 4 | 8 | 16 | 32 | 64 | 128 | 256 | 512 | 1024 | 2048 | 4096 | 8192 | 16384 | 32768 |

INPUT PORT

Senses switches S8-S15 on input instruction with FF address.

OUTPUT PORT

Displays output data in LED's PØ-P7 on output instruction with FF address.

CPU DATA BUS

Displays 8080 data bus in LED's DØ-D7 for each instruction.

TABLE 1. Test Program Listing

| LOCATION | DATA | INSTRUCTION |
|---|---|---|
| 00 | 21 | LXI H ← FF |
| 01 | FF | |
| 02 | FF | |
| 03 | 23 | INX H |
| 04 | 46 | MOV B ← M |
| 05 | 7D | MOV A ← L |
| 06 | EE | XRi FF |
| 07 | FF | |
| 08 | C2 | JNZ → 0003 |
| 09 | 03 | |
| 0A | 00 | |
| 0B | 7C | MOV A ← H |
| 0C | EE | XRi FF |
| 0D | 7F | |
| 0E | C2 | JNZ 0018 |
| 0F | 18 | |
| 10 | 00 | |
| 11 | 3E | MVi A ← C3 |
| 12 | C3 | |
| 13 | D3 | OUT → IOFF |
| 14 | FF | |
| 15 | 00 | NOP |
| 16 | 00 | |
| 17 | 00 | |
| 18 | 7C | MOV A ← H |
| 19 | EE | XRi FF |
| 1A | FF | |
| 1B | C2 | JNZ → 0003 |
| 1C | 03 | |
| 1D | 00 | |
| 1E | 3E | MVi A → 3C |
| 1F | 3C | |
| 20 | D3 | OUT → IOFF |
| 21 | FF | |
| 22 | 00 | NOP |
| 23 | 00 | |
| 24 | 00 | |
| 25 | DB | IN ← IOFF |
| 26 | FF | |
| 27 | E6 | ANi 01 |
| 28 | 01 | |
| 29 | C2 | JNZ → 0025 |
| 2A | 25 | |
| 2B | 00 | |
| 2C | C3 | JMP → 0003 |
| 2D | 03 | |
| 2E | 00 | |

HEXADECIMAL EXAMPLE

| Data Switches | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Data | $S_7$ | $S_6$ | $S_5$ | $S_4$ | $S_3$ | $S_2$ | $S_1$ | $S_0$ |
| 00 = | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 01 = | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| 02 = | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |
| 03 = | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 |
| 04 = | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| 05 = | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 |
| 06 = | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 |
| 07 = | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 |
| 08 = | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| 09 = | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 |
| 0A = | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 |
| 0B = | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 1 |
| 0C = | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 |
| 0D = | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 1 |
| 0E = | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 0 |
| 0F = | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 |
| 10 = | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 |
| ...etc.... | | | | | | | | |

NOTE: Color caps have been included in the kit to color code the switches either in an octal or hexadecimal format.

| | | | |
|---|---|---|---|
| OCTAL = | $S_9S_6$ | $S_5S_4S_3$ | $S_2S_1S_0$ |
| | X X | 0 0 0 | X X X |
| HEX = | $S_7S_6S_5S_4$ | $S_3S_2S_1S_0$ | |
| | X X X X | 0 0 0 0 | |