

## Supplementary Information on Program Control Instructions

Supplement to table 9-7, page 514 in Mano, Kime & Martin 5<sup>th</sup> edition.

| Name    | Mnemonic         | RTL description  | Example       | Comments on the example  |
|---------|------------------|--|---------------|--|
| Branch  | BR n             | $PC \leftarrow PC + n$   | BR 05h        | ; skips 5 addresses of instructions  |
|         |                  |  | BR FBh        | ; skips back 5 address of instructions (or<br>; skips -5 addresses. The FBh is 2C for<br>; -5 base 10)   |
| Jump    | JMP nn (or JP)   | $PC \leftarrow nn$   | JMP 1900h     | ; skips to address 1900h   |
| Call    | CALL nn          | $(SP) \leftarrow PC$<br>$SP \leftarrow SP - 1$<br>$PC \leftarrow nn$ | CALL 1900h    | ; saves return address on stack,<br>; decrements stack pointer, then<br>; skips to address 1900h   |
| Return  | RET              | $SP \leftarrow SP + 1$<br>$PC \leftarrow (SP)$                       | RET           | ; increment the stack pointer, then<br>; skip back to the return address that was<br>; previously saved on the stack.  |
| Compare | CMP r<br>(or CP) | $ACC - r$  | CP B          | ; subtract contents of register B from the<br>; accumulator and set flag bits according<br>; to the result. Does not save the result<br>; anywhere. (Only affects the flag bits).                    |
| Test    | TEST r r'        | $r \wedge r'$  | TEST 0900h, B | ; bitwise AND of the data word 0900h<br>; and data stored in register B. Sets the<br>; flag bits according to the result. Does<br>; not save the result anywhere. (Only<br>; affects the flag bits.) |
|         | or               | or   |               |  |
|         | TEST r           | $ACC \wedge r$   | TEST B        | ; uses implied addressing to do a bitwise<br>; AND of the accumulator and the data<br>; stored in register B. Otherwise the<br>; same as above.  |

Note: n denotes relative addressing mode (an 8-bit two's complement number in these examples).  
 nn denotes direct addressing mode (a 16-bit unsigned binary number in these examples.)  
 r denotes any operand, typically using register or immediate mode addressing  
 r' denotes the same as "r" only a different operand