ABSOLUTE BINARY PROGRAM NO. 24316-16001
DATE CODE 1431

ALTER-SKIP INSTRUCTIONS DIAGNOSTIC

reference manual

for HP-2100 Series Computers

The absolute binary code for this diagnostic is contained on one or more media (e.g., paper tape, cartridge tape, disc, and magnetic tape). The binaries also exist on single as well as multiple files. For the current date code(s) associated with these media, refer to appendix A in the *Diagnostic Configurator Reference Manual,* part no. 02100-90157, dated August 1976 or later.

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Alter-Skip Instruction Diagnostic

Introduction

The purpose of the HP 2100 Series Alter-Skip Instruction Diagnostic is to check all instruction code combinations of the Alter-Skip Instruction Group. The diagnostic is divided into two sections (Basic Tests and Extended Tests) and operates on any 2100 series computer in 4K of memory. This diagnostic should be preceded by the Memory Reference Instruction Diagnostic as the instructions in instruction execution are communicated to the operator by means of coded HALTS through the computer memory data register (referred to as the MDR or T-register).

GENERAL ENVIRONMENT

Hardware Requirement

This diagnostic can be run on any 2100 series computer; it does not require a teletype or other peripheral devices.

Tape reading device required to load diagnostic only.

Software Requirement

The required software consists of the Alter-Skip Instruction Diagnostic binary object tape, part no. 24316-16001, and the Binary Loader. See the appropriate *Front Panel Procedures* for the 2100-series computer being used for use of the Binary Loader. The Basic Binary Loader and the Basic Binary Disc Loader are described in the HP manual *Basic Binary Loader-Basic Binary Disc Loader* (HP Part No. 5951-1376).

This program does *not* use the Diagnostic Configurator. However, locations 100_8 - 127_8 are reserved for the Diagnostic Configurator so that when the diagnostic is loaded, the Configurator (if present) will not be destroyed.

Operating Procedures

Operating procedures are divided into three parts — Preparation For Diagnostic Run, Running The Diagnostic, and Diagnostic Halts.

PREPARATION FOR DIAGNOSTIC RUN

Before the test can be initiated, the user must load the diagnostic. Since no special configuration procedures are necessary, the user directly loads the Alter-Skip Instruction Diagnostic using the Binary Loader. If the user wishes to insure that the proper diagnostic is loaded, he can check Memory Location 126_8 for the Diagnostic Serial Number = 101001_8.

RUNNING THE DIAGNOSTIC

No operator inputs are needed to execute the Alter-Skip Instruction Diagnostic unless an error is found. Memory Data Register (MDR) coded HALTS indicate the type of error. Switch options allow the operator to repeat a particular error by single stepping.

Switch Options

Only switch register bits 12 and 0 have significance in this test. With both clear, the program will execute one pass and halt or halt if an error is detected in Alter-Skip instruction execution. An instruction failure causes execution of a HALT with MDR = 102000_8.

SWITCH 0. When set, this switch causes the program to repeat a failing Alter-Skip instruction. A HALT is executed with MDR = 102076_8 just before repeating the instruction. Pressing RUN then executes the failing instruction.

SWITCH 12. When clear, this switch causes the program to execute a HALT with MDR = 102077_8 at the end of each complete pass through the diagnostic. When set, the program will cycle continuously until an error is detected, i.e., the diagnostic will loop.

Starting Up

Perform the following procedure to initiate diagnostic execution.

1. Set program register to 100_8.
2. Select program options.
3. Press PRESET (EXTERNAL and INTERNAL).
4. Press RUN.

Diagnostic Execution

Diagnostic execution proceeds automatically except where procedure has been modified by a switch register setting.

DIAGNOSTIC HALTS

Table 1 lists the octal HALT codes and their significance.

Table 1. HALT Codes and Significance

MDR Code	Significance
10200*x*	Alter-Skip instruction error was detected. See EXTENDED TESTS section of Error Analysis for significance of value *x*.
102000	HALT before displaying additional error information.
102076	HALT before repeating failing Alter-Skip instruction.
102077	End of pass HALT (the A-register contains the pass count).
102040	RSS instruction failed
102041	CLE, SEZ sequence failed
102042	RSS, SEZ, CLE sequence failed
102043	CCE, SEZ, RSS sequence failed
102044	CCE, SEZ sequence failed
102045	CLE, CME, SEZ, RSS sequence failed

Table 1. HALT Codes and Significance (cont.)

MDR Code	Significance
102046	CCE, CME, SEZ sequence failed
103000	Unexpected change in A-register
103001	Unexpected change in B-register
	Note: See Section on Error Analysis for further explanation
106077	Unexpected trap cell HALT

Error Analysis

BASIC TESTS. A failure in a Basic Test results in a unique Memory Data Register (MDR) HALT value. This error should be corrected before proceeding further with testing. No provisions are available for repeating failing Basic Tests. See DIAGNOSTIC HALTS section for significance of the HALT Codes.

EXTENDED TESTS. A failure in an Extended Test results in an error HALT. If switch 0 is set, the RUN button may be pressed and the instruction repeated. If the diagnostic halts with an MDR code of 10200*x*, bits 0 through 2 of octal digit *x* indicate error conditions:

- bit 0=1, the A- or B-register is in error
- bit 1=1, the E-register is in error
- bit 2=1, the instruction skipped or did not skip as expected

Any or all of these combinations are possible in a given halt.

When any of the 10200*x* HALTS occur, the following is displayed:

- A-register — *actual* A- or B-register results
- B-register — the *expected* A- or B-register results
- E-register — the actual E-register result

Following this halt, more information about an error condition may be obtained by pressing the RUN button. A HALT with MDR=102000_8 occurs. The following will then be displayed:

- T-register — second display HALT identification (MDR = 102000_8)
- A-register — octal code of the failing Alter-Skip instruction (bit 11 of the instruction identifies the register:

  0 for A-register and 1 if B-register involved)
- B-register — original data in the A- or B-register
- E-register — original contents of the E-register

UNEXPECTED CHANGES IN A- OR B-REGISTERS. Before each Alter-Skip instruction is executed, a fixed nonsymmetrical data pattern of 043210_8 is placed in the register that is not expected to change during execution of the instruction.

If the *B*-register changes unexpectedly after execution of an Alter-Skip instruction involving the *A*-register, the diagnostic halts with MDR=103001_8 . If the reverse occurs and the A-register is altered, the diagnostic halts with MDR = 103000_8 . The unexpected change is left in the affected register. The other register contains the octal code of the Alter-Skip instruction. Other results normally checked are bypassed when the RUN button is pressed (unless switch 0 is set, in which case a HALT with MDR=102076_8 occurs).

These procedures do not apply to the Basic Tests.

Test Sections

The 2100 Series Alter-Skip Instruction Diagnostic is divided into two sections: Basic Tests and Extended Tests.

BASIC TESTS

This part of the diagnostic is a string of Basic Tests designed to check the ability to clear, set, and test the E-register.

EXTENDED TESTS

The Extended Tests check the full set of Alter-Skip Instruction code combinations by means of the E-register instructions (CLE, CCE, CME, SEZ, SEZ, RSS) tested in the Basic Tests and the Memory Reference Instructions.

All valid Alter-Skip instruction combinations are tested eighteen times. First, nine different data patterns are checked in the A- or B-register (depending on the instruction) with the E-register *clear*. Then, the same nine data patterns are checked in the A- or B-register (again depending on the instruction) with the E-register *set*.

After the execution of each instruction the following are checked:

- The contents of the A- or B-register
- The contents of the E-register
- Whether the instruction did or did not skip as expected

A detected failure results in the appropriate HALT and an information display.

After all instructions are tested, the diagnostic repeats the Basic and Extended Tests until an error is found. If switch 12 is clear, the diagnostic halts with MDR = 102077_8, and a 16 bit pass count is displayed in the A-register.

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