

Order of Performing Operators

- FIRST
- SECOND
- NOT UNARY+ UNARY-
- THIRD
- FOURTH
- FIFTH
- SIXTH
- SEVENTH

Between any two operators, the one higher in the preceding table is performed first. If they are at the same level, they are performed from left to right. This rule is overridden by parentheses in that all calculations within parentheses are performed first.

Error Messages

TOPTS* AND TODS* ERRORS

Example (Paper tape and disc systems unless noted)

20 2 = X
ERROR 7 IN LINE 20

- | Error Code | Meaning |
|------------|---|
| 1. | Statement ends unexpectedly. |
| 2. | Exceeds 72 characters. |
| 3. | System command not recognized. |
| 5. | Bad exponent. |
| 7. | Assignment statement has no store. Operator must be left of sign. |
| 8. | Multiple COM statement. |
| 9. | Missing or incorrect function identifier in DEF. |
| 10. | Missing parameter in DEF statement. |
| 11. | Missing assignment operator. |
| 12. | Missing or incorrect statement type after IF. |
| 13. | Missing or incorrect FOR variable. |
| 14. | Missing TO. |
| 15. | Incorrect STEP in FOR statement. |
| 16. | Called routine does not exist. |
| 17. | Wrong number of parameters in instrument control statement. |
| 18. | Missing or incorrect constant in DATA statement. |
| 19. | Missing or incorrect variable in READ-INPUT or LOAD statement. |
| 20. | No closing quotation marks for PRINT message. |
| 21. | Missing PRINT delimiter or bad PRINT quantity. |
| 30. | Missing left parenthesis. |
| 31. | Missing right parenthesis. |
| 32. | Operand not recognized. |
| 33. | Defined array missing subscript part. |
| 34. | Missing array identifier. |
| 35. | Missing or bad integer. |
| 36. | Non-blank characters following statement's logical end. |
| 37. | Program is too large. |
| 39. | Doubly defined function. |
| 40. | FOR statement has no matching NEXT. |
| 41. | NEXT statement has no matching FOR. |
| 42. | Out of storage for symbol table. |
| 43. | Array appears with inconsistent dimensions. |
| 45. | Array double dimensioned. |
| 46. | Number of dimensions not obvious. |

*TOPTS: Test Oriented Paper Tape System.
TODS: Test Oriented Disc System.

TODS* DSAVE-DLOAD-REPLACE ERRORS

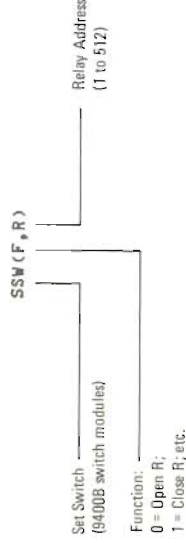
Example

- ```
1200 DSAVE 2000
ERROR TD-4 IN LINE 0
TD-1. READ error in cartridge directory.
TD-2. Requested catalog reference number not cataloged.
TD-3. Disc full.
TD-4. Duplicate program reference number.
TD-5. Program reference number nonexistent or not BASIC.
TD-6. Cartridge directory WRITE error.
TD-7. Program WRITE error.
TD-8. Catalog full.
TD-9. No program reference number in command.
TD-10. Illegal in operator mode.
TD-11. Delete protected file.
```

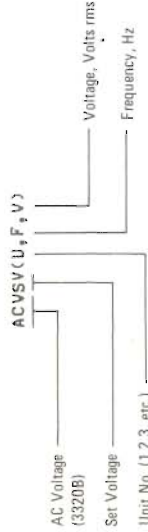
## Instrument Call Examples

(A complete listing of calls for each system will be found in the system documents).

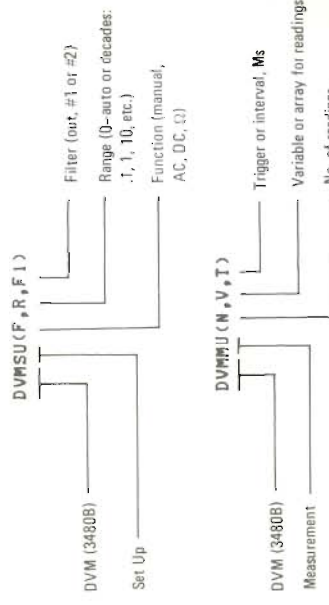
### SWITCHING



### STIMULUS



### MEASUREMENT



### TODS\* SYSTEM ERRORS

- | Error Code | Meaning                                                                                               |
|------------|-------------------------------------------------------------------------------------------------------|
| 84.        | > PROG ABORTED                                                                                        |
| 85.        | > NOT FOUND (PRN)                                                                                     |
| 86.        | > RPT PRDT (Repeat Protected)                                                                         |
| 87.        | > JOB STACK FULL--PRESS RUN                                                                           |
| 88.        | > MOUNT CARTRIDGE NO XXX ON DRIVE 1.                                                                  |
| 89.        | > RESTART (indicates system being restarted).                                                         |
| 90.        | > PRN NG (requested program illegal in op. mode).                                                     |
| 91.        | > LDRPM--PRN NOT FOUND (program segment requested from running program cannot be located on disc).    |
| 92.        | > EP. entry protected; only executable thru CHAIN/INVOKE).                                            |
| 93.        | > EDT (end of tape).                                                                                  |
| 94.        | > EXEC CALL ERR (executive call contains an illegal request code).                                    |
| 95.        | > DIO ERR (program called from job stack or CHAIN/INVOKE cannot be loaded due to input/output error). |
| 96.        | > DISC I/O ERR (program requested by exec. call cannot be loaded due to input/output error).          |
| 97.        | > DIO ERR--SYSTEM SUBR. (subroutine on disc cannot be loaded).                                        |
| 98.        | > ILLEGAL RESET (attempt to reset pointer with illegal LUN or reset code).                            |
| 99.        | > RETRY (try again to do last step).                                                                  |

# HP Basic for Automatic Test Systems

## Quick Reference Guide

- ```
70 DISPLAY "CON
80 DISPLAY
90 DISPLAY "SER
100 PRINT "AMPL
115 PRINT
120 PRINT "FREQ
125 SSW (5,0)
130 SSW (1,97)
135 SSW (1,1)
140 SSW (1,33)
150 DCVSL (1,12,
160 FOR F=1000
170 ACVSV (1,F,
180 WAIT 500
190 DVMSU (2,100
195 DVMU (1,V1,
200 SSW (0,1)
210 SSW (1,7)
220 DVMU (1,V2,
230 LET E=(V2.
240 PRINT F,V2/
250 IF ABS(E)>=
250 IF ABS(I)>=
250 IF ABS(E)>=
260 PRINT
270 NEXT F
280 END
```

Introduction

Programs for 9500 automatic test systems are usually most successful when written by technicians who understand the units to be tested. Hewlett-Packard has developed the HP ATS BASIC language specifically with this in mind. It facilitates the understanding and learning of programming by test personnel so that they may write electronic test programs with the minimum of training. This language is similar to the familiar time-share BASIC employing everyday "English" terms for instructions to the computer. But it also includes abbreviations which represent test instrument names used to call for voltages, signals, and measurements in the test.

This reference guide provides you with a convenient listing of all statements and commands needed to program 9500 systems, except for the instrument calls. The instrument calls for your system are supplied with the system documentation. Sample calls are included in the listing here as an illustration of their simplicity.

Operator's control panel inputs are listed separately from the programmer's keyboard inputs. Unless otherwise noted, all symbols may be used for both punched-tape systems and disc systems. The two operating systems are called TOPTS (Test Oriented Paper Tape System) and TODS (Test Oriented Disc System).

BASIC is an interpretive language that checks the validity of each statement as it is entered. If entered in error or incorrectly, the system replies with a coded error message. The "Error Message" listing is included to help you interpret these coded messages.

Control Panel

For both TOPTS and TODS unless noted as being for one or the other.*

INDICATORS

- ERROR**
Lights when error occurs during test; e.g., turned-off subsystem or program error.
- TEST NUMBER**
Displays number of loaded or running program.
- OPERATION (OP)**
Displays coded number from OPNUM statement for what data is to be entered when INPUT button lights, or other information.
- VALUE/LINE NUMBER**
Shows data as it is entered on keyboard and VLUM statement variables. Shows line numbers of running program in supervisor mode.

COMMANDS (Actuated by pushing indicator switches)

- FAIL/NO**
Lights when program FAIL statement is satisfied. Pushing button for NO sets YES function to 0.
- INPUT**
Loads test number or data entered on keyboard. Lights for INPUT request.
- LOADS (TOPTS only)**
Reads in program in ASCII form using paper tape photoreader.
- LOAD (TODS only)**
Sets up controller to accept program number (PRN) entered on keyboard.
- PASS/YES**
Lights when PASS statement in program is satisfied. Pushing button for YES sets this function to 1.
- PAUSE**
Pushing button lights it and temporarily halts program in supervisor mode only. Button lights during programmed PAUSE (OPERATION coded display may indicate action to be taken).

*TOPTS: Test Oriented Paper Tape System.
TODS: Test Oriented Disc System

RUN/CONTINUE (TOPTS only)

Executes program initially or as a continuation after a PAUSE. Button lights while program is running.

RUN/CONTINUE (TODS only)

Same as for TOPTS (above) except that when button is pushed, following INPUT while in program request state, program is loaded into core from disc and then executed.

STOP/READY (TOPTS only)

Lights when program in core is ready for execution. Stops program execution if pushed when program is running.

STOP/READY (TODS only)

Same as for TOPTS (above) except that when button is pushed, following INPUT while in program request state, program is loaded into core from disc to set up ready state.

TRAP 1

Pushing executes subroutine defined by TRAP 1 statement.

TRAP 2

Pushing executes subroutine defined by TRAP 2 statement.

Keyboard

For both TOPTS and TODS unless noted as being for one or the other.*

COMMANDS

- CTRL-A (TODS only)**
Program request state; allows entry of test no. by operator.
- CTRL-L (TOPTS only)**
Same as control panel LOAD button.
- CTRL-P**
Temporarily halts program.
- CTRL-R (TOPTS only)**
Execute program; also continue from PAUSE.
- CTRL-R (TODS only)**
Same as for TOPTS (above) except at beginning the requested program loads from disc and then executes.
- CTRL-S**
Stops execution of current program.
- CTRL-Q**
Executes TRAP 1 subroutine.
- CTRL-W**
Executes TRAP 2 subroutine.
- CATALOG (TODS only)**
Lists all BASIC programs stored on disc.
- DELETE**
Deletes program or segment in core.[†]
- DISPLAY**
Displays statements of current program on display device.[†]
- DLOAD (TODS only)**
Loads BASIC program from disc into core.^{††}
- DSAVE (TODS only)**
Stores BASIC program from core onto disc.^{††}
- LIST**
Lists program or segment.[†]
- LOAD**
Reads in program in ASCII form from paper tape.
- LOAD SRN (TODS only)**
Loads the designated source program SRN = Source Reference Number.
- N**
NO in answer to question YES or NO.
- REMOVE (TODS only)**
Deletes program on disc cartridge.^{††}
- REPLACE (TODS only)**
Replaces program on disc with program in core.^{††}
- RUN (BASIC only)**
Executes BASIC program.
- SAVE**
Punches program on paper tape in ASCII code.^{††}
- Y**
YES in answer to question YES or NO.

[†]Will begin and end with specified statements by typing statement numbers M, N after command name.

^{††}Command followed by PRN (Program Reference Number); may also include CRN (Cartridge Reference Number) and Alphanumeric Name of Program.

STATEMENTS (TOPTS and TODS Systems)

- Symbol** **Example** **Purpose**
- VARIABLE ASSIGNMENT STATEMENTS**
- ASSIGN VALUE OR COMPUTE**
30 X = A + B
35 X = Y - Z = 0
Assigns value of expression on right of = sign to variable on left of = sign (Optional LET).
- DATA**
15 DATA 95, 47, 5.2
Specifies data which is read from left to right in READ statement.
- READ**
80 READ A, B, C
Reads data in DATA statement from left to right.
- RESTORE**
85 RESTORE
Resets to beginning the pointer which indexes reading of DATA statement.
- INPUT AND OUTPUT STATEMENTS**
- DISPLAY**
10 DISPLAY "MESSAGE"
20 DISPLAY X, Y, Z
Tells computer to display information on display device; e.g., CRT terminal.
- INPUT**
75 INPUT X, Y, Z
Requests data to be entered from keyboard in assigned order.
- LOAD**
80 LOAD X, Y, Z
Reads ASCII coded input information from photoreader. Similar to INPUT except for input method.
- PRINT**
40 PRINT "MESSAGE"
45 PRINT A, B, C
Tells computer to output information on print device; e.g., line printer.
- PRINT TAB (X)**
50 PRINT TAB (16) "X = "
; X, "A + B = ", A + B
Teletypewriter line has 72 columns; TAB (X) prints first character in column X. (.) inhibits normal 5 column spacing.
- SAVE**
90 SAVE X, Y, Z
Stores ASCII format data on record device; e.g., punched tape. Same as PRINT except for device used.

PROGRAM CONTROL STATEMENTS

- COM**
1 COM A(10), B(3,5)
1 COM C(5), D(5), C(5)
Sets up common memory for more than one program for storing data in contiguous locations. Stores by row and column in statement order.
- DIM**
1 DIM R(20)
1 DIM A(5,5), B(5), Z(83)
Reserves maximum memory for array. Variable is letter from A to Z, integer refers to rows and columns.
- FOR...NEXT**
25 FOR V = 50 TO +50
STEP 5
30 FOR I = 1 TO 5
Repeats statements starting with FOR and ending with NEXT. Loops increment variable by 1 or by specified step value.
- GO TO**
330 GO TO 900
Transfers control to specified statement.
- GOSUB**
335 GOSUB 900
Transfers control to subroutine starting at specified statement (see RETURN statement).
- IF...***
5 IF X = 5 GO TO 50
5 IF ABS (V - M) > .01
PRINT "FAIL"
Execute statement if condition is true. Use (=) signs cautiously, limit signs preferred in mathematical IF expressions.
- NEXT**
355 NEXT J
Lower boundary of FOR...NEXT.
- PAUSE**
100 PAUSE
Temporarily suspends program execution for entering data or adjustments.
- RETURN**
850 RETURN
Return from called subroutine.
- STOP**
90 STOP
Terminates the program.

- TRAP 1**
80 TRAP 1 GOSUB 9000
Trap 1
- TRAP 7**
85 TRAP 7 GOSUB 500

- WAIT**
95 WAIT 1000
Introduces millisecond delays in- at specified line number.

**Statements allowed after the IF: INPUT, PRINT, PAUSE, DISPLAY, LOAD, SAVE, READ, RESTORE, GO TO, GOSUB, LET, RETURN, WAIT, STOP, TRAP, and DEVICE MNEMONIC.

CONTROL PANEL STATEMENTS

- (Results in control panel display or message)
- PASS**
220 PASS (1)
Lights PASS indicator.
- FAIL**
230 FAIL (0)
Lights FAIL indicator.
- OPNUM**
240 OPNUM (55)
Displays (55) as Operation Number.
- VLNUM**
250 VLNUM (M)
Displays (M) as Value Number.
- TSNUM**
260 TSNUM (X)
Displays (X) as Test Number.

STATEMENTS USED FOR TODS ONLY*

- CLOSE**
440 CLOSE (7, S)
Ends access to the disc file made available by the most recent OPEN statement (7 = access no., S = status parameter).
- DREAD**
430 DREAD (7, 1, A(1), 25, S)
Reads data from disc file most recently opened (7 = access no., 1 = pointer, A(1) = first word, 25 = no. of variables, S = status parameter).
- DWRITE**
420 DWRITE (7, 1, A(1), 25, S)
Writes data into disc file made available by most recent OPEN statement; otherwise is same as DREAD.
- CHAIN**
300 CHAIN 5000
Transfers control to the specified program.
- OPEN**
400 OPEN (7, 5000, S)
OPENS disc file and assigns access no. (see CLOSE).
- RESET**
410 RESET (7, 2)
Resets disc file pointers (access no., read (1)/write (2) both (0)).
- INVOKE**
310 INVOKE 6020
Transfers control to specified program to be used as a subroutine.
- SCOM**
320 SCOM (1, V, S, S)
Read/write accesses to system common storage.

OPERATORS

- ARITHMETICAL OPERATORS**
- Symbol** **Example** **Purpose**
- ↑**
10 X = A / 2
Exponentiate.
- ***
10 X = A * B
Multiply.
- /**
10 X = A / B
Divide.
- +**
10 X = A + B
Add.
- 10 X = A - B
Subtract.
- RELATIONAL OPERATORS**
- =**
10 IF X = 35 GO TO 20
Is equal to.
- ≠**
10 IF X ≠ 15 GO TO 20
Does not equal.
- >**
10 IF X > B GO TO 15
Greater than.
- <**
10 IF X < B GO TO 15
Less than.
- >=**
10 IF X >= B GO TO 15
Greater than or equal to.
- <=**
10 IF X <= B GO TO 15
Less than or equal to.
- LOGICAL OPERATORS**
- AND**
10 IF X AND Y PAUSE
If both X and Y have a non-zero value, pause.
- OR**
10 IF X OR Y PAUSE
If either X or Y has a non-zero value, pause.
- NOT**
10 IF NOT (X = 1) PAUSE
If X ≠ 1, pause.