Performing Operators Order of

LINS	
SECOND	NOT UNARY+ UNARY
THIRD	
FOURTH	1
FIFTH	Relational
SIXTH	AND
SEVENTH	OR

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 overriden 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)

202 = X ERROR 7 IN LINE 20

- Statement ends unexpectedly. Meaning
- Exceeds 72 characters.
- System command not recognized.
- Bad exponent,
- Assignment statement has no store. Operator must be left of sign,
 - Multiple COM statement.
- Missing or incorrect function identifier in DEF
- Missing parameter in DEF statement.
- Missing or incorrect statement type after 1F. Missing assignment operator.
- Missing or incorrect FOR variable.
- incorrect STEP in FOR statement.
- Wrong number of parameters in instrument control statement, Called routine does not exist
 - Missing or incorrect constant in DATA statement
- Missing or incorrect variable in READ-INPUT or LOAD statement.
- Missing PRINT delimiter or bad PRINT quantity No closing quotation marks for PRINT message.
- Missing left parenthesis.
- Missing right parenthesis.
- Operand not recognized.
- Defined array missing subscript part.
 - Missing array identifier.
- Non-blank characters following statement's logical end Missing or bad integer.
- Program is too large.

Doubly defined function.

- FOR statement has no matching NEXT.
 - NEXT statement has no matching FOR Out of storage for symbol table.
- Array appears with inconsistent dimensions
 - Array double dimensioned.
- Number of dimensions not obvious
- *TOPTS: Test Oriented Paper Tape System. TODS : Test Oriented Disc System.

Meaning

Array too large.

- Out of storage during array allocation.
 - Subscript exceeds bound.
- Accessed operand has undefined value.
 - Non-integer power of negative number
- Zero-to-zero power. Missing statement.
- GOSUBs nested more than 20 deep.

- - RETURN finds no address.
- - Out of data.
- Trigonometric function argument is too large.

Out of storage during execution.

- Attempted square root of negative value.
 - Attempted log of negative value.

PROGRAM CONTINUES EXECUTING) **NARNING ONLY ERRORS**

- Numerical overflow, result taken to be + or infinity
 - Numerical underflow, result taken to be zero.
 - Log of zero taken to be infinity.
- EXP overflows; result taken to be + infinity.
- Division by zero; result taken to be + or infinity.
- Zero raised to negative power; result taken to be + infinity

TODS* SYSTEM ERRORS

- > PROG ABORTED
- > NOT FOUND (PRN)
- > RPT PRDT (Repeat Protected)
- > JOB STACK FULL-PRESS RUN

- > MOUNT CARTRIDGE NO XXX ON DRIVE 1.
- > RESTART (indicates system being restarted).
- > LDPGM-PRN NOT FOUND (program segment requested > PRN NG (requested program illigal in op. mode).
- > E.P. (entry protected; only executable thru CHAIN/INVOKE). from running program cannot be located on disc).
 - > EDT (end of tape).
- > EXEC CALL ERR (executive call contains an illegal request
- DIO ERR (program called from job stack or CHAIN/INVDKE cannot be loaded due to input/output error). DISC I/O ERR (program requested by exec. call cannot be
- DIO ERR-SYSTEM SUBR (subroutine on disc cannot be
- > ILLEGAL RESET (attempt to reset pointer with illegal LUN
 - - 99. > RETRY (try again to do last step).

TODS* DSAVE-DLOAD-REPLACE ERRORS

70 DSPLAY "CON

90 DSPLAY "SER

80 DSPLAY

SRROR TD-4 IN LINE 0 200 DSAVE 2000

- Requested catalog reference number not cataloged. READ error in cartridge directory.
- Duplicate program reference number.

 Program reference number nonexistent or not BASIC.
 Cartridge directory WRITE error.
 - Program WRITE error.
- Catalog full.
- No program reference number in command. Illegal in operator mode.
 - Delete protected file,

Instrument Call Examples

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

SWITCHING



0 = Open R; 1 = Close R; etc. Function:

STIMULUS

Voitage, Voits rms Frequency, Hz ACVSV(U,F,V) AC Voltage Set Voltage

MEASUPEMENT

Unit No. (1,2,3, etc.)

Range (0-auto or decades: 1, 1, 10, etc.) Filter (out, #1 or #2) Function (manual, DVMSU(F,R,F1) DVM (3480B) Set Up -

 Variable or array for readings Trigger or interval, Ms No. of readings. DVMMUCN,V,T) DVM (3480B) Measurement

HEWLETT OF PACKARD

HP Basic

100 PRINT "AMPL 115 PRINT

120 PRINT "FREQ 125 SSW (5,0)

(130 SSW(1,97)

for

140 SSW(1,33) 135 SSW(1,1)

Automatic

150 DCVSL(1,12,

Test

Systems

170 ACVSVCI,F.

190 DVMSU(2, 100

Reference

Guide

Quick

195 DVMMU(1,VI,

210 SSW(1,7)

230 LET E=((V2.

AC, DC, O)

250 IF ABS(I)>=

260 PRINT

270 NEXT F

280 END

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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 ing 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. with this in mind. It facilitates the understanding and learning of programThis 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.

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

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

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

COMMANDS (Actuated by pushing indicator switches)

gram in supervisor mode.

Lights when program FAIL statement is satisfied. Pushing button for NO sets Loads test number or data, entered on gram is satisfied. Pushing button for Sets up controller to accept program keyboard. Lights for INPUT request Reads in program in ASCII form using number (PRN) entered on keyboard. Lights when PASS statement in pro-YES sets this function to 1. paper tape photoreader. YES function to 0. LOAD (TODS only) TOPTS only) PASS/YES OADS

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

tinuation after a PAUSE. Button light while program is running.	Same as for TOPTS (shove) except the when button is pushed, following IN PUT while in program request state program is foaded into core from dis and then executed.	Lights when program in core is read for execution. Stops program execution if pushed when program is running	Same as for TOPTS (above) except the when button is pushed, following IN PUT while in program request state program is loaded into core from dis to set up ready state.	Pushing executes subroutine defined by TRAP 1 statement.	Pushing executes subroutine defined b TRAP 2 statement.
(TOPTS anly)	RUN/CONTINUE (TODS only)	STOP/READY (TOPTS only)	STOP/READY (TODS only)	TRAP 1	TRAP 2

Keyboard

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

Ends access to the disc file made available by the most recently

STATEMENTS USED FOR TODS ONLY*

440 CLOSE (7,S)

Displays (55) as Operation Num

240 OPNUM (55)

Lights PASS indicator. Lights FAIL indicator.

220 PASS (1) 230 FAIL (0)

(Results in control panel display or message)

CONTROL PANEL STATEMENTS

Displays (M) as Value Number Displays (X) as Test Number.

250 VLNUM (M) 260 TSNUM (X) OPEN statement (7 = access no Reads data from disc file most recently opened (7 = access no.

S = status parameter).

430 DREAD (7,1, A(1)

1 = pointer, A(1) = first word, 25 = no. of variables, S = status

parameter).

Writes data into disc file made available by most recent OPEN statement; otherwise is same as DREAD. Transfers control to the specified OPENS disc file and assigns access

420 BRITE (7,1, A(1),

S	
2	
A	
5	
5	
5	
Ξ	

only) aly) aly) aly) aly) aly) aly) aly) a	CTRL-A	Program request state; allows entry of
only) aly) aly) aly) aly) aly) aly) aly) a	(TODS only)	test no. by operator.
nly) OG (TODS only) nly) nly) E (TODS only) E (TODS only) SSIC only)	CTRL-L (TOPTS only)	Same as control panel LOAD button.
only) OG (TOOS only) INY) INY) RN INY) RN INY) SSIC only) SSIC only)	CTRL-P	Temporarily halts program.
nly) nly) nly) nly) e (TODS only) FE (TODS only) SiConly)	CTRL-R (TOPTS only)	Execute program; also continue from PAUSE,
Stops execution of current program Executes TRAP 1 subroutine. Executes TRAP 2 subroutine. Lists all BASIC programs stored on displays statements of current program on display statements of current program on display device. Loads BASIC program from disc intere. Loads BASIC program from core on display device. Loads BASIC program from core on disc. Lists program or segment. Reads in program or segment. Reads in program or segment. Loads BASIC program from core on disc. Loads the designated source program only Replaces program on disc cartridge. E (TODS only) Deletes program on disc with program in core. Replaces program on paper tape ASCII code. YES in answer to question YES or N YES in answer to question YES or N	CTRL-R (TODS only)	Same as for TOPTS (above) except at beginning the requested program loads from disc and then executes.
Executes TRAP 1 subroutine. Executes TRAP 2 subroutine. Lists all BASIC programs stored on displays statements of current program on display statements of current program on display statements of current program on display device. Loads BASIC program from disc intere. Loads BASIC program from core on display device. Loads BASIC program from core on disc. Loads BASIC program from core on disc. Loads the designated source program only. Reads in program or segment. Reads in program or segment. Loads the designated source program only. No in answer to question YES or Northers program on disc cartridge. E(TODS only.) Replaces program on disc with program in core. Replaces program on disc with program in core. Replaces program on paper tape ASCIC program. Punches program on paper tape ASCII code. YES in answer to question YES or Norther answer to question YES or Northers.	CTRL-S	
Lists all BASIC programs stored on displays statements of current program on displays statements of current program on displays statements of current program on display statements of current program on display device. Loads BASIC program from disc intere. The Stores BASIC program from core on display device. Loads BASIC program from core on disc. 11 Lists program or segment. Reads in program or disc cartridge. E (TODS only) Deletes program on disc cartridge. E (TODS only) Beletes program on disc with program in core. 11 Replaces program on disc with program in core. 11 Execute BASIC program. Punches program on paper tape ASCI code. 11 YES in answer to question YES or N	CTRL-Q	
Usiss all BASIC programs stored on displays statements of current program or segment in core Displays statements of current program of display device. Tools BASIC program from disc interest. Tools BASIC program from core on display device. Tools BASIC program from core on disc. 11 Lists program or segment. Tools paper tape. Loads the designated source program or ASCH form from paper tape. Loads the designated source program or SRN Son IN Replaces program on disc cartridge. Replaces program on disc cartridge. Replaces program on disc with program in core. 11 Execute BASIC program. Punches program on paper tape ASCH code. 11 YES in answer to question YES or IN YES in answer to question YES or IN	CRTLW	Executes TRAP 2 subroutine.
Deletex program or segment in correct program on display statements of current program on display device. † Loads BASIC program from core on disp. † Stores BASIC program from core on disp. † Lists program or segment. † Reads in program or segment. † Replect tape. Loads the designated source program or on a source program or dispersion or paper tape (Conty) Execute BASIC program. Or paper tape ASCII code. † YES in answer to question YES or N	CATALOG (TOOS only)	Lists all BASIC programs stored on disc.
Oisplays statements of current progra on display device. 1 Loads BASIC program from disc int core. 11 Stores BASIC program from core on disc. 14 Lists program or segment. 1 Reads in program in ASCII form from paper tape. Loads the designated source progra NR Source Reference Number. NO in answer to question YES or N Replaces program on disc cartridge. Replaces program on disc cartridge. Replaces program on disc with program in core. 17 Execute BASIC program. Punches program on paper tape ASCII code. 17 YES in answer to question YES or N YES in answer to question YES or N	DELETE	Deletes program or segment in core.1
Loads BASIC program from disc inn core.11 Stores BASIC program from core on disc.11 Lists program or segment.1 Reads in program in ASCH form from paper tape. Loads the designated source program or source program or as SRN = Source Reference Number. No in answer to question YES or N Replaces program on disc cartridge. E (TODS only) Deletes program on disc with program in core.11 Replaces program on disc with program in core.11 Execute BASIC program. Punches program on paper tape ASCH code.11 YES in answer to question YES or N	DSPLAY	Displays statements of current program on display device.*
Stores BASIC program from core on disc.,†† Lists program or segment.† Reads in program in ASCII form from paper tape. Loads the designated source program only) SRN SRN SRN SAN Source Reference Number, NO in answer to question YES or NO in answer to question on disc artiridge. Replaces program on disc with program only) Execute BASIC program. Punches program on paper tape ASCII code,†† YES in answer to question YES or N	DLOAD (TODS only)	Loads BASIC program from disc into core.11
Lists program or segment.† Reads in program in ASCII form fro paper tape. Loads the designated source program only) NO in answer to question YES or N Deletes program on disc cartridge. Replaces program on disc with program on the with program on paper tape ASCII code.†† YES in answer to question YES or N	DSAVE (TDDS only)	Stores BASIC program from core onto disc.11
SRN Loads the designated source program only) OR In answer to question YES or N OF In answer to question YES or N OF In answer to question YES or N OF In answer to question YES or N Replaces program on disc artridge. Replaces program on disc with program in core. T In core. T In Core. T Punches program on paper tape ASCII code. IT YES in answer to question YES or N	LIST	Lists program or segment.†
Loads the designated source progra SRN = Source Reference Number, NO in answer to question YES or N Deletes program on disc cartridge. Replaces program on disc with progra in core1T Execute BASIC program. Punches program on paper tape ASCII code1T YES in answer to question YES or N	LOAD	Reads in program in ASCII form from paper tape.
VE (TODS only) Deletes program on disc cartridge. Replaces program on disc with progra only) Execute BASIC program. Punches program on paper tape ASCII code.11 YES in answer to question YES or N	LOAD SRN (TODS only)	Loads the designated source program SRN = Source Reference Number.
VE (TODS only) Replaces program on disc cartridge. Replaces program on disc with progra ently) Execute BASIC program. Punches program on paper tape ASCII code.11 YES in answer to question YES or N		NO in answer to question YES or NO.
CE Replaces program on disc with progra enty) Execute BASIC program. Punches program on paper tape ASCII code, 11 YES in answer to question YES or N	REMOVE (TODS only)	Deletes program on disc cartridge, 11
AASIC only) Punches program on paper tape ASCII code, It YES in answer to question YES or N	REPLACE (TODS only)	Replaces program on disc with program in core. T
Punches program on paper tape ASCII code,11 YES in answer to question YES or N	RUN (BASIC only)	Execute BASIC program.
Y YES in answer to question YES or NO.	SAVE	program on paper tape de,tt
	^	YES in answer to question YES or NO.

ctude CRN (Carridge Reterence Number); may also in-Program. Program. TWIII begin and end with specified statements by typing statement numbers M, N after command name.

PAUSE (OPERATION coded display

may indicate action to be taken).

only. Button lights during programmed

Pushing button lights it and temporarily halts program in supervisor mode

PAUSE

If both X and Y have a non-If either X or Y has a non-

zero value, pause.

zero value, pause.

10 IF NOT (X = 1) PAUSE If X ≠ 1, pause.

NOT

Greater than or equal to.

Does not equal

Is equal to.

10 IF X = 35 GO TO 20

10 IF X #15 GO TO 20

10 IF X > B GO TO 15 10 IF X < B GO TO 15

RELATIONAL OPERATORS

Subtract.

10 X = A -B

10 X = A+B 10 X = A *B 10 X = A/B

Greater than,

Less than.

Less than or equal to.

LOGICAL OPERATORS

10 IF X <= B GO TO 15 10 IF X >= 8 GO TO 15

10 IF X AND Y PAUSE

AND

10 IF X OR Y PAUSE

TATEMENTS FORTS and TODS Systems)

Instrument interrupt (e.g., over-load, according to numbered trap table, control goes to subroutine

85 TRAP 7 GOSUB 9000 85 TRAP 7 GOSUB 500

Introduces millisecond delays in-

95 WAIT 1000

at specified line number.

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

(TOPTS and TODS Systems)	DDS Systems)	
Symbol	Example	Purpose
	VARIABLE ASSIGNMENT	ASSIGNMENT STATEMENTS
ASSIGN VALUE OR COMPUTE	$30 \times = A + B$ $35 \times = Y = Z = 0$	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	TEMENTS
DSPLAY	10 DSPLAY "MESSAGE" 20 DSPLAY X, Y, X	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	Teleprinter line has 72 columns TAB (X) prints first character in column X. (2) inhibits normal 5 column spacing.
SAVE		Stores ASCII format data on re- ord device; e.g., punched tape. Same as PRINT except for device used.
	PROGRAM CONTROL STA	STATEMENTS
COM	1 COM C(5), D(5), C(5)	Sets up common memory for more than one program for storing data in continguous locations. Stores by row and column in statement order.
DIM	1 DIM R(20) 1 DIM A(5,5), B(5), Z(33)	Reserves maximum memory for array, Variable is letter from A to Z, integer refers to rows and columns.
FOR	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.
GD T0	330 G0 T0 900	Transfers control to specified statement.
GOSUB	335 GOSUB 9000	Transfers control to subroutine starting at specified statement (see RETURN statement).
:	5 IF X = 5 G0 T0 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 adjustmenets.
RETURN	850 RETURN 90 STOP	Return from called subroutine. Terminates the program.

Resets disc file pointers (access

410 RESET (7,2)

no. (see CLOSE).

400 OPEN (7,5000,S)

300 CHAIN 5000

no. read (1)/write (2)/both (0)). Transfers control to specified program to be used as a sub-Read/write accesses to system

common storage.

320 SCOM (1,V,5,S)

310 INVOKE 6020

Exponentiate

10 X = A 12

Example

Symbol

ARITHMETICAL OPERATORS

OPERATORS

Multiply. Purpose

Divide.

Add.