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CONTROL DATA
CORPORATION

CONTROL DATA®
1700 COMPUTER SYSTEMS

OLYMPUS 1700 DIAGNOSTIC PACKAGE SOFTWARE USERS GUIDE

APPLICATION SOFTWARE PRODUCT

THE SOFTWARE PRODUCT DESCRIBED HEREIN WAS DEVELOPED BY THE SMALL COMPUTER DEVELOPMENT DIVISION FOR SPECIFIC APPLICATIONS AND IS NOT SUPPORTED BY CONTROL DATA CORPORATION AS A STANDARD PRODUCT. IT IS AVAILABLE ONLY ON AN INDIVIDUAL SYSTEM QUOTATION BASIS.

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REVISION RECORD

REVISION	DESCRIPTION
A	Original
(6/69)	
B	The following pages in this manual have been replaced: vii/viii, 2.10, 2.11, 2.12, 2.16, 2.17, 2.18, 2.19,
(5/70)	2.20, 2.20a/2.20b, 2.35, 2.47/2.48, 2.49/2.50, 2.51, 2.52, 2.53, 2.54, 2.55, 2.56, 2.69, 2.70, 2.70a,
	2.70b, 2.73
C	Manual revised. The following pages in this manual have been replaced: 2.67 through 2.74 and 2.77/2.78.
(3/71)	The following pages have been revised: vi, vii, 1.2, 2.8, 2.15, 2.18, 2.20, 2.23, 2.24, 2.29, 2.30, 2.31,
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Address comments concerning this manual to:

Small Computer Development Division
4455 Eastgate Mall
La Jolla, California 92037

or use Comment Sheet in the back of this manual.

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MNEMONIC INSTRUCTIONS

Section One

GENERAL DESCRIPTION

1.1 GENERAL

OLYMPUS is a diagnostic utility software package for the CONTROL DATA® 1700 Computer. It is useful in the following applications:

1. General software debugging
2. Standard peripheral communications
3. Hardware unit testing

OLYMPUS is composed of an executive, a high-level language interpreter, and a variable set of processing routines which define the mnemonic instruction language.

OLYMPUS is operated in a conversational mode through the 1711, 1712, or 1713 Teletypewriter (TTY). Mnemonic statements which define some specific operation are input via the TTY and executed.

OLYMPUS is operated in one of two modes: Direct or Indirect. In the Direct mode a sub-processor is called with a TTY statement and executed immediately. The Indirect mode allows a sequence of sub-processors to be defined by the operator using the OLYMPUS language and then executed on command.

For general software debugging and standard peripheral communications, OLYMPUS includes processors which dump core, load core, read paper tape, punch paper tape, search core for pattern, read/write magnetic tape, etc.

For hardware testing, OLYMPUS includes basic instructions such as Read, Write, Type Message, and Define Variable, as well as higher order instructions for specific hardware such as Read Digital Input and Read Analog Input.

OLYMPUS makes available to the user a high-order FORTRAN-like language which easily facilitates the writing, debugging, and modification of simple hardware diagnostics. The language is self-documenting and can be input, edited, saved, reloaded, or executed via the Teletype.

Modules written for the UTOPIA 1700 Console Debugging Package may be operated under OLYMPUS with restriction. The systems utilize a different technique to pass parameters, and as a result dynamic changing of variables is not allowed with UTOPIA modules operated under OLYMPUS control.

1.2 HARDWARE REQUIRED

The minimum hardware configuration for OLYMPUS requires:

1700 Computer with 4096-word core and 1705 Interrupt/Data Channel

Teletypewriter: Model 1711, 1712, or 1713 to use as a comment medium

Input Device: 1712 or 1713 TTY Paper Tape Reader, 1721 Paper Tape Reader, or 1729 Card Reader

In expanded form, OLYMPUS may operate the following I/O equipment:

1705 Interrupt/Data Channel
1750 Data and Control Terminal (DCT)
1721 Paper Tape Reader
1723 Paper Tape Reader
1729 Card Reader
405 Card Reader
1731 Magnetic Tape Controller and 601 Tape Transport Units
8000 High-Speed Magnetic Tape Controller and 800 Tape Transport Units
1738 Disk Drive Controller and 853/4 Disk Drive Units
1751 Drum Interface and Storage Units
Units operating on a 1797 Buffered I/O Interface
1739 Disk
1752 Drum
1742 Line Printer
1728/430 Card Reader/Punch

1.3 SOFTWARE REQUIRED

The minimum software configuration for OLYMPUS requires the following six modules:

OLOPIA	84967900
OLYMPY	84968100
OL1711 or OL1713 or OL1712	84968000/39267000/39567600
OLYREJ	84968200
OLMANF	39266900
UTLAST	84961300

Any of the additional OLYMPUS modules may be added to the above required modules to produce the desired software package.

Section Two

OPERATION

2.1 GENERAL

OLYMPUS is supplied to the user as a modular package. It is loaded into the computer at a location of convenience by a bootstrap operation. This section describes:

1. Loading OLYMPUS
2. Direct mode of operation
3. Indirect mode of operation
4. OLYMPUS statement set
5. Generating new OLYMPUS routines

2.2 LOADING THE OLYMPUS PROGRAM

OLYMPUS paper tapes are available in either absolute or relocatable binary formats. (See paragraph 2.2.6.) The absolute form is a run-anywhere, binary format record and may be loaded into core by a bootstrap operation at cell location $200 or above. The relocatable binary format tapes must be read into the computer and absolutized by a loader operation (refer to paragraphs 2.2.4 and 2.2.5). After these operations, an absolute tape can be produced. The following routines load the OLYMPUS PROGRAM:

OPERATION	PROCEDURE
2.2.1 START THE 1700 COMPUTER AND NECESSARY PERIPHERALS	Follow the normal starting procedures for the computer and selected peripherals.
2.2.2 LOAD THE BOOTSTRAP INSTRUCTION SEQUENCE MANUALLY The loading addresses run sequentially and are determined by the initial setting	1. Select the P-register. 2. Set the P-register to hhhh. This is the arbitrary starting address of the bootstrap. It must be selected so the tape being input is not read over the bootstrap. 3. Select the X-register.

OPERATION	PROCEDURE
2.2.2 (Continued) of the P-register. Instructions are loaded into core via the X-register.	4. Set the ENTER/SWEEP switch to ENTER. 5. For each of the following instructions: a. Set the X-register display to the instruction.(1) b. Momentarily set the STEP/RUN switch to STEP. c. Clear the display register with the CLEAR switch and repeat the sequence until all instructions are loaded.

No.	Instruction	Symbolic Code
0	680F	STA* N1
1	0A20	ENA 32_{10}
2	E000	LDQ = N$A1
3	00A1	
4	03FE	OUT -1
5	0DFE	INQ -1
6	02FE	S1 INP -1
7	0112	SAN S3-*-1
8	18FD	JMP* S1
9	02FE	S2 INP -1
A	0FC8	S3 ALS 8
B	02FE	INP -1
C	6C03	STA* (N1)
D	D802	RAO* N1
E	18FA	JMP* S2
F	0000	N1 N0P 0

	6. Return the ENTER/SWEEP switch to the neutral position.
OPTIONAL CHECK	7. Select the P-register. The display should read $hhhh + $F indicating that $F instructions have been entered. 8. MASTER CLEAR.

(1) All computer instructions in the manual are given in hexadecimal form except where otherwise noted.

OPERATION	PROCEDURE
2.2.3 LOAD THE OLYMPUS ABSOLUTIZED PAPER TAPE The P-register is set to the start of the bootstrap and the A-register set to the first word address minus one in core where OLYMPUS is to be loaded.	1. Insert the absolute OLYMPUS paper tape in the paper tape reader (PTR). 2. Verify that the reader is on. 3. Press the PTR CLEAR switch. 4. Set P = hhhh (Start of bootstrap). 5. Set A = first word address -1. 6. Momentarily step the STEP/RUN switch to RUN. The paper tape will completely load. If the tape should stop before completely loading, some mistake has occurred during the operation. In this event, rewind the tape, clear the computer, and begin again at the start of the bootstrap. 7. To use the loaded OLYMPUS program see Section 2.3.
2.2.4 LOADING AND ABSOLUTIZING OLYMPUS IN RELOCATABLE TAPE FORMAT This method loads an absolutized OLYMPUS package in upper core and then uses it to load and link new relocatable modules of OLYMPUS. The modules will be loaded consecutively starting at the selected address and absolutized at their relative loading location.	1. Enter the bootstrap of paragraph 2.2.2 at $ [End core - (length of loading package) - 10]. 2. Load an absolutized OLYMPUS tape, which contains an OLSILY module, into the Paper Tape Reader. Press the PTR CLEAR switch. 3. Set the P-register to the bootstrap starting address, i.e., $ [End core - (length of loading package) - 10]. 4. Set the A-register to the address minus one of the location at which the tape is to be loaded, i.e., $ [End core - (length of loading package) - 1]. 5. Momentarily set the STEP/RUN switch to RUN. The tape will load at the address specified in step 4. 6. Set the P-register to the beginning address of OLYMPUS (i.e., next cell above the address specified in step 4 above). Step the STEP/RUN switch to RUN. The program now enters OLYMPUS which will be used to load and link the relocatable OLYMPUS modules.

OPERATION	PROCEDURE
2.2.4 (Continued)	7. Place the relocatable OLYMPUS tapes in the Paper Tape Reader and use the mnemonics of the OLSILY module (described in Table 2.1t) to load and link the modules. OLOPIA must be the first module loaded; UTLAST must be the last. The remainder of the modules may be in any order. First module — OLOPIA . . . } Any Order Last module — UTLAST NOTE OLYMPUS makes reference to the I-register (location $FF in core); because some routines require use of the interrupt trap region (locations $100-$140), the OLYMPUS should be loaded at cell location $200 or above. 9. After the modules are loaded and linked, the operator may punch an absolutized binary tape by using the Punch Paper Tape (PPP) command on the newly loaded OLYMPUS program.
2.2.5 LOADING AND ABSOLUTIZING RELOCATABLE OLYMPUS TAPES WITH AN OPERATING SYSTEM OR UTILITY SYSTEM LOADER	If other relocating loaders have been previously entered in the computer, it may be preferable to use them. Methods of loading and absolutizing tapes with these loaders will be found in the following references: OPERATING SYSTEM REFERENCE MANUAL Publication No. 60174600 UTILITY SYSTEM REFERENCE MANUAL Publication No. 60172300

OPERATION	PROCEDURE
2.2.6 ORDERING INSTRUCTIONS	OLYMPUS resides in the software library at SCDD (Small Computer Development Division). OLYMPUS is composed of a series of programs which can be linked as specified by the user to produce a wide range of capability. To order a copy of OLYMPUS from SCDD library, it is necessary to furnish the information shown on the example Job Request Form.

COMPUTER SERVICES JOB REQUEST

NAME	CHARGE NO.	EXT.	ATTEND	EST. TIME	SEQ. NO.
JOHN DOE	99999	222			

UTILITY ASSEMBLER	MACRO ASSEMBLER	3200	1700	636	160A	RECEIVED	RELEASED	OPERATOR	KEYPUNCH	VERIFY
		COBOL	COMPASS	FORTRAN	NON-STD.					

SPECIAL INSTRUCTIONS		EXPECTED OUTPUT		INPUT	
LOAD & LINK ALL MODULES SHOWN		PRINTED LISTING		BINARY CARDS	
BELOW AND PRODUCE ABSOLUTIZED		MAGNETIC TAPE		HOLLERITH CARDS	
OUTPUT.		CARDS		MAGNETIC TAPE	
		REL. BIN. PAPER TAPE		PAPER TAPE	
	1	ABS. PAPER TAPE	X		

PROGRAM LIBRARY REQUEST (SPECIFY NAME/ID NUMBER)				
84967900/OLOPIA				
84968000/OL1711				
84968100/OLYMPY				KEYPUNCH
84968200/OLREJ				MACH. VERIFY
39267100/OL601M				SIGHT VERIFY
etc.				LIST

For requests generated outside SCDD, a memo or TWX containing the above information directed to Computer Services, will suffice. A charge number must be included. The user can order either an absolute tape as shown, or individual relocatable binary tapes to be loaded by the user as specified in paragraph 2.2.4.

OPERATION	PROCEDURE
2.3 DIRECT MODE OF OPERATION	
2.3.1 EXECUTING OLYMPUS IN DIRECT MODE WITH TTY KEYBOARD CONTROL In direct mode, each statement is executed immediately upon entry from the TTY.	1. With OLYMPUS loaded, step the RUN/STEP switch and MASTER CLEAR. 2. Set the P-register to the beginning address of OLYMPUS and momentarily set the RUN/STEP switch to RUN. The TTY replies with a Line Feed, Carriage Return, Bell (LF, CR, B). The OVERFLOW light on the computer console will be flashing on and off indicating OLYMPUS is in the idle loop waiting for input instructions via the TTY. 3. To execute an OLYMPUS operation, a valid OLYMPUS statement (see Section 2.5) of the following format must be entered via the TTY: MNE, field 1, field 2, . . . , field 8 (cr) Where MNE is a mnemonic with up to four letters followed by the field quantities for the particular statement entered. A statement may have a maximum of eight fields, except for the continuation fields of the LHX statement. The statement is terminated by a Line Feed, Carriage Return ((cr)).
Execution is initiated by the Carriage Return.	Execution of the statement is begun when the Carriage Return has been received from the TTY. The completion of the operation will be signaled by a (LF, CR, B) output to the TTY, and the OVERFLOW LIGHT on the computer console flashing. OLYMPUS is in an idle loop waiting for further instructions. If the Processor Error Exit is taken, the following message will be typed out before returning to the idle loop: PROCESSOR ERROR EXIT
ERROR MESSAGE INTERPRETATION	The following messages will be output on the TTY if an error is made in the input statement: NOT MNEMONIC

OPERATION	PROCEDURE
ERROR MESSAGE INTERPRETATION (Continued)	and indicates the mnemonic input by the operator is either invalid or the module that contains the mnemonic is not linked in the OLYMPUS package; TOO MANY FIELDS More than the eight permitted fields have been input; IMPROPER FIELD TERMINATOR A statement field was terminated by something other than a comma or Carriage Return; INPUT FORMATTING ERROR OLYMPUS has picked up a statement field it cannot interpret caused by misused parenthesis or inclusion of a labeled storage location in a hexadecimal value.
DELETE STATEMENTS CONTAINING AN ERROR BY USE OF A QUESTION MARK	If an error is made while entering a statement, the operator can type a question mark which causes the partial statement entered to be deleted. OLYMPUS replies with a question mark and a (LF, CR, B). The operator may then input the correct statement.
STATEMENT FIELDS	The statement fields OLYMPUS will recognize and accept are the following types: 1. Hexadecimal Numbers All values are entered as hexadecimal numbers. A field is normally four or less digits in length without sign. If more digits are entered, only the last four will be used. This feature can be used to correct field errors without deleting the whole statement, as long as only hexadecimal values are involved in the error. 2. Labeled Storage A table of 20 cells located within OLYMPUS are provided for storage and are addressable with the alphabetic characters G thru Z. I denotes a labeled storage location.

OPERATION	PROCEDURE
STATEMENT FIELDS (Continued)	3. Parentheses Parentheses, in conjunction with hexadecimal values or labeled storage, are used as a means of indirectly addressing cells. Two levels of indirect addressing are available for hexadecimal values. One level is available for labeled storage locations (because labeled storage itself already implies one level of indirect addressing). Examples: The following table defines the five possible combinations that are provided for specifying quantities. hhhh is a hexadecimal number and ln is one of the labeled storage locations. Field — Operand hhhh — hhhh (hexadecimal number) (hhhh) — Contents of hhhh ((hhhh)) — Contents of the cell whose address is specified in hhhh In — Contents of the cell associated with In (In) — Contents of the cell whose address is specified in the cell associated with In. CAUTION In OLYMPUS statements with field parameter designated by h_i, specifying the parameters as hhhh has no meaning when that field defines a location into which data is to be stored. hhhh is interpreted as a hexadecimal number and not a core location. Any of the other four formats are meaningful.

OPERATION	PROCEDURE
STATEMENT FIELDS (Continued)	Examples: ADD, h_1, h_2, h_3 (cr) h_3 may not be a hexadecimal number unless parentheses are used. RPT, Core location (cr) Core location may be a hexadecimal number.
2.4 INDIRECT MODE OF OPERATION	To use OLYMPUS in the Indirect mode of operation the user must utilize Direct mode to set up the OLYMPUS language program sequence. The program sequence may be listed and modified if desired. Indirect mode is initiated with a command to begin execution. OLYMPUS then executes the statements in the program sequence until it is instructed to exit from the program or until an error is encountered.
2.4.1 INPUTTING OLYMPUS PROGRAM SEQUENCE	1. Start with OLYMPUS in the Direct mode idle loop, waiting for TTY input. Type in the following mnemonic to enter the input statement processor. INPT (cr) OLYMPUS will now accept statements tagged with a proper statement number and store them in a buffer starting at the end of OLYMPUS. Each program statement must be assigned a statement number with the following format: m•n where $1 \leq m \leq 320$ and $0 \leq n \leq 99$. m and n are decimal numbers. The decimal point must be specified, but n may be omitted. The statements may be input in any order, but priority of execution follows ascending order of value of the statement number, unless the statement specifies otherwise. Examples in order of ascending value are as follows.

OPERATION	PROCEDURE
STATEMENT FIELDS (Continued)	1. Note that the decimal point is a separator rather than a true decimal point, i.e., 1.1 .1 = 1 1.10 .2 = 2 1.11 .10 = 10 1.90 .01 = 1 1.99 2.0 A space is required to terminate the statement number before the mnemonic and field portion are begun. The format of the statement is therefore: m.n MNE, field 1, field 2, . . . , field 8 (cr) 2. The user continues to enter the program statements in a sequential order while in the Input mode. 3. At the point in the program sequence where the operation is completed, the EXIT statement must be included in the program to cause a normal return to OLYMPUS. It has the following format: m.n EXIT (cr)
Terminating input.	4. When all program statements have been entered, the Input routine is terminated by typing: END (cr) The input operation is terminated and the buffer size is output on the TTY in the following format: INPUT BUFFER FROM XXXX TO YYYY XXXX is the first buffer address YYYY is the last buffer address The user may save the program sequence by outputting it on some storage medium. It can be reloaded and run by any OLYMPUS package with the proper modules to handle the mnemonics in the program sequence.
Loading a previous saved program is done in direct mode.	If the user has a program sequence saved on some storage medium, it may be read in using the OLYMPUS routines. The beginning of the input buffer area can be located by typing in the statements that follow.

OPERATION	PROCEDURE
STATEMENT FIELDS (Continued)	INPT (cr) END (cr) The input termination message will be output on the TTY with the first buffer address equal to the last buffer address. If an error is made while inputting a statement, a question mark followed by a line feed and carriage return deletes the statement. If an error causes an exit from the input processor routine, the user may continue inputting the program by using the EDIT statement. Failing to terminate the statement number with a space is one error that causes an exit. The error exit causes an "INPUT FORMATTING ERROR" message and an exit from the input processor.
2.4.2 EXECUTING PROGRAM SEQUENCE	To begin execution of the program in the input buffer, the user types: EXEC, NUM (cr) OLYMPUS begins processing the program sequence and begins execution at statement number NUM. If NUM is omitted, execution will begin at the lowest statement number in the program. One of the following mnemonics will be output if an error causes an exit during the processing of the statements: NOT MNEMONIC One of the mnemonics is invalid or not linked to the OLYMPUS package being used; MODE ERROR An invalid indirect mode mnemonic is in the program sequence. (See NOTE.); STATEMENT NO UNPATCHED

OPERATION	PROCEDURE
	One of the instructions that transfer control to other statement number locations was given a statement number that is not in the program sequence. NOTE Any of the following statements are illegal if requested in the Direct mode of operation: IFGT, IFEQ, IFLT, IFNE, IFSK GOTO, EXIT, END, MSG, INT Any of the following statements are illegal if requested in the Indirect mode of operation: INPT, EXEC, EDIT, LIST
2.4.3 CHANGING PROGRAM SEQUENCE	To modify statements in the program or to add statements to the program, the EDIT statement is used: EDIT (cr) This mnemonic puts OLYMPUS in the input mode. It is used in the same manner as the INPT statement, except that it saves the statements that are already in the input buffer. It is terminated with the END statement and gives the same termination message. SAMPLE PROGRAM The following example shows how the various statements may be used. A line feed and carriage return terminate each line. Under line indicates computer printout. INPT 1. MSG, CONTACT CLOSURE INPUT SCAN TEST 2. MSG, DEFINE THE FOLLOWING INPUTS 3. DEFN, X, Y, J, M

OPERATION	PROCEDURE
2. 4. 3 (Continued)	4. STOR, O, H 4. 1 STOR, X, G 4. 2 STOR, Y, H 5. RDGI, G, H 6. TYPE, G, H 7. STOR, H, (J) 8. IFEQ, G, K, 12. 9. ADD, G, 1, G 10. ADD, J, 1, J 11. GOTO, 5. 12. STOR, X, G 13. STOR, Y, H 14. RDGI, G, H 15. IFEQ, H, (J), 18. 16. TYPE, G, H 17. STOR, H, (J) 18. IFEQ, G, K, 22. 19. ADD, G, 1, G 20. ADD, J, 1, J 21. GOTO, 14. 22. IFSK, 12. 23. EXIT END INPUT BUFFER FROM 1C58 TO 2276
2. 5 OLYMPUS STATEMENT SET	The statement set of any particular OLYMPUS program depends on the particular modules used to build the program. The basic statement set consists of those mnemonics in the required modules. This section gives a description of the mnemonics available in OLYMPUS. They are arranged according to the modules in which they are contained.

Table 2.1a. OLOPIA Module (1 Subroutine)

PROGRAM NO. 849679XX
EQUIPMENT: Mainframe, TTY

CORE SIZE: $260

MNEMONIC AND CALL	OPERATION
LST (cr)	LIST ALL LINKED MNEMONICS IN PACKAGE Each linked mnemonic in the program is output on the TTY followed by two hexadecimal values. The first value is the starting address of the module in which the mnemonic is located. The second value gives the address of the mnemonic relative to the starting address of the module.

Table 2.1b. OLYMPY Module (28 Subroutines)

PROGRAM NO. 849681XX CORE SIZE: $66F
EQUIPMENT: Mainframe, TTY

MNEMONIC AND CALL	OPERATION
ADD, h_1, h_2, h_3 (cr)	ADDITION The value specified by h_1 is added to the value specified by h_2. The sum is stored at the address specified by h_3. NOTE In this and the following tables, h_i may refer to a hexadecimal number, a labeled storage location, or an indirect address. If h_i is used to specify a cell into which a value is to be stored, it may not be a hexadecimal number. (See Statements Fields, page 2.7.)
SUB, h_1, h_2, h_3 (cr)	SUBTRACTION h_1 minus h_2 is stored at h_3.
MUI, h_1, h_2, h_3 (cr)	MULTIPLY h_1 multiplied by h_2 is stored at h_3.
DVI, h_1, h_2, h_3 (cr)	DIVIDE h_1 divided by h_2 is stored at h_3.
EOR, h_1, h_2, h_3 (cr)	EXCLUSIVE OR COMPARISON The "Exclusive Or" comparison of h_1 and h_2 is stored at h_3. This is a bit-by-bit comparison of h_1 and h_2. The corresponding bit in h_3 is set only if the bit in h_1, or the bit in h_2 is set. The bit in h_3 will not be set if both h_1 and h_2 are set.

Table 2.1b. OLYMPY Module (28 Subroutines) (Continued)

EQUIPMENT: Mainframe, TTY

MNEMONIC AND CALL	OPERATION
AND, h_1, h_2, h_3 (cr)	AND COMPARISON The "And" comparison of h_1 and h_2 is stored at h_3. This is a bit-by-bit comparison of h_1 and h_2. The corresponding bit in h_3 will be set only if the bit in h_1 and the bit in h_2 are set.
OR, h_1, h_2, h_3 (cr)	INCLUSIVE OR COMPARISON The "Inclusive Or" comparison of h_1 and h_2 is stored at h_3. This is a bit-by-bit comparison of h_1 and h_2. The corresponding bit in h_3 will be set if the bit in h_1 is set, or the bit in h_2 is set, or both are set.
STOR, h_1, h_2 (cr)	STORE VALUE The value specified by h_1 is stored at h_2.
RTJ, Core location, Q, A, I, M (cr)	RETURN JUMP Return jump to the core location specified with the parameters set. If M is dropped from the input list, the M-register will remain at its present value. NOTE In all IF statements +0 (0000) is equal to -0 (FFFF).
IFGT, h_1, h_2, NUM (cr) (Indirect mode only)	LOGICAL "IF GREATER THAN" If h_1 is greater in value than h_2, go to statement number specified by NUM; if not, go to next highest statement number.

Table 2.1b. OLYMPY Module (28 Subroutines) (Continued)

EQUIPMENT: Mainframe, TTY

MNEMONIC AND CALL	OPERATION
IFEQ, h_1, h_2, NUM (cr) (Indirect mode only)	LOGICAL "IF EQUAL" If h_1 is equal in value to h_2 , go to statement number specified by NUM; if not, go to next highest statement number.
IFLT, h_1, h_2, NUM (cr) (Indirect mode only)	LOGICAL "IF LESS THAN" If h_1 is less than h_2 in value, go to statement number specified by NUM; if not, go to next highest statement number.
IFNE, h_1, h_2, NUM (cr) (Indirect mode only)	LOGICAL "IF NOT EQUAL" If h_1 is unequal in value to h_2, go to statement number specified by NUM; if not, go to next highest statement number.
IFSK, NUM (cr) (Indirect mode only)	IF SKIP SWITCH SET, GO TO NUM If the Selective Skip switch on the computer console is set, control will transfer to the statement number NUM. If the switch is not set, control will continue with the next highest statement number.
GOTO, NUM (Indirect mode only)	TRANSFER CONTROL TO STATEMENT NUMBER NUM Direct transfer to statement number NUM.
PAUS, h (cr)	PAUSE AND TYPE h This statement causes the execution of the input buffer to pause and print the value of h. Execution will continue when the operator types in a carriage return.

Table 2.1b. OLYMPY Module (28 Subroutines) (Continued)

EQUIPMENT: Mainframe, TTY

MNEMONIC AND CALL	OPERATION
DELY, h (cr)	DELAY FOR h*100 μSEC. This statement causes a delay of h*100 μsec to occur while in this statement processor. The time required to access this statement processor (about 50 μsec) is not included.
EXIT (cr) (Indirect mode only)	EXIT FROM PROGRAM TO OLYMPUS IDLE LOOP This statement gives the normal exit from the program sequence.
DEFN, ln, ln, . . . (cr)	DEFINE LABELED STORAGE This statement permits the user to define labeled storage in a conservational mode. On execution of this statement, OLYMPUS types out ln = . It then waits in a Read mode for the operator to specify a value of ln. This operation continues until all labeled storage specified is defined. Example (underline indicates computer printout): Statement: DEFN, G, H (cr) Printout: G = 1234 (cr) H = 5678 (cr) Indirect addressing (parenthesis) is not permitted.
TYPE, ln, ln, . . . (cr)	TYPE OUT LABELED STORAGE VALUES This statement permits the contents of labeled storage to be output on the TTY as follows. $ln=h_1h_1h_1h_1$ $ln=h_2h_2h_2h_2$ Printing continues across the page until all parameters specified are output, or until a maximum of eight parameters are printed. Indirect addressing (parentheses) are not permitted.

Table 2.1b. OLYMPY Module (28 Subroutines) (Continued)

EQUIPMENT: Mainframe, TTY

MNEMONIC AND CALL	OPERATION
MSG, MESSAGE (cr)	OUTPUTS MESSAGE COMMENT This statement permits comments to be added. The comment begins immediately following the comma mnemonic terminator, and may be up to 60 characters in length. Execution of the statement causes the comment to be printed. The rubout character, ?, is still operative in the comment and therefore cannot be part of the message.
INPT (cr)	INITIATE INPUT MODE OLYMPUS is ready to receive program statements from the TTY and place them in the input buffer for later execution. Before each statement is requested, its block in the input buffer is zeroed out. Each acceptable statement becomes the last statement in the sequence. Statements are rejected if the statement number has an incorrect format. When an unacceptable statement is rejected, input is terminated, an error message output, and control returned to the idle loop. At this point, the EDIT statement may be used to continue input.
END (cr)	TERMINATE INPUT This statement terminates loading of the input buffer by the INPT module. It must be the last statement of the sequence, and it requires no statement number. The beginning and the end of the input buffer are printed out following this statement. The message format is: INPUT BUFFER FROM (FIRST) TO (LAST) With this information the input buffer may be saved on some storage medium using OLYMPUS output statements. By typing the following sequence, the terminate message will be printed with (first = last) INPT (cr) END (cr) This locates the buffer address for loading purposes. The END statement is handled special by OLYMPUS and does not list under the LST statement in the OLOPIA module. (See Section 2.5, Table 2.1a.)

Table 2.1b. OLYMPY Module (28 Subroutines) (Continued)

EQUIPMENT: Mainframe, TTY

MNEMONIC AND CALL	OPERATION
LIST, NUM1, NUM2 (cr)	LIST PROGRAM SEQUENCE A complete or partial listing of the program in the input buffer is output on the TTY. NUM1 = Start listing with statement number NUM1 NUM2 = Stop listing with statement number NUM2 If no parameters are entered a complete listing is obtained. If NUM1 but not NUM2 is entered, the listing begins with NUM1 and goes to the end. If both NUM1 and NUM2 are entered, the listing begins at NUM1 and ends with NUM2. Example: LIST, 10.0, 13.0
EDIT (cr)	ENTER INPUT MODE WITH BUFFER SAVED Statement causes the INPT module to be initialized to add statements to the existing input buffer. Editing an existing statement results in the corrected statement replacing the existing statement. The END statement is used to terminate input.
EXEC, NUM (cr)	EXECUTE PROGRAM IN INPUT BUFFER Processing and execution of the program in the input buffer is initiated at statement number NUM. If NUM is omitted, execution begins at the lowest statement number in the program. The manual interrupt on the TTY causes termination of execution and return of control to the idle loop. Manual interrupt is only processed in the EXEC module. Control returns to the EXEC module between the execution of each statement.
INT, h_1, h_2, h_3, h_4, NUM (cr) (Indirect mode only)	INTERRUPT HANDLING Where: h_1 = Value to be loaded into the M-register. h_2 = Delay or wait for interrupt h_2 times 100 microseconds. Positive number only.

Table 2.1b. OLYMPY Module (28 Subroutines) (Continued)

EQUIPMENT: Mainframe, TTY

MNEMONIC AND CALL	OPERATION
INT, h_1, h_2, h_3, h_4, NUM (cr) (Continued) (Indirect mode only)	h_3 = Core location where number of interrupting line (0-F) is stored. h_4 = 0, store line number in location specified by h_3. h_4 ≠ 0, type line number and store line number in location specified by h_3. Format of message is: "INT LINE XX" where $0 \leq XX \leq 15$. NUM = Statement number to which exit will be made if no interrupt occurs during delay time. This statement loads the mask register (M) with the value of h_1, sets up all 16 interrupt trap regions, enables interrupts, and waits in a delay loop whose time is specified by h_2. If an interrupt occurs while in the delay loop, interrupts are disabled, the line number is stored in the location specified by h_3, the line number is typed out if $h_4 \neq 0$, and exit is made to the next higher statement number. If no interrupt occurs while waiting in the delay loop, interrupts are disabled and exit is made to the statement number specified by NUM. Example: INT, FFFF, 100, (2000), F, 7.6 (cr) All interrupt lines are enabled by the mask. Routine will wait (256x100) about 25.6 milliseconds for interrupt. Line number will be stored in cell $2000. Line number will be typed out ($h_4 \neq 0$). If no interrupt occurs, exit will be made to statement number 7.6.

Table 2.1b. OLYMPY Module (28 Subroutines) (Continued)

EQUIPMENT: Mainframe, TTY

MNEMONIC AND CALL	OPERATION
INT, h_1, h_2, h_3, h_4, NUM (cr) (Continued) (Indirect mode only)	NOTE: Interrupts are always left disabled on exit. If more than one interrupt is present when routine is entered, only the lowest numbered line will be recognized. Interrupting device is not acknowledged by this routine.
NUM CLSN (cr)	CLEAR STATEMENT NUMBER This statement permits deletion of a statement that has been entered. It may be used during INPUT or EDIT operations. Example: NUM = Number of statement to be deleted 1.0 MSG, TEST1 2.0 MSG, TEST2 2.0 CLSN The deleted statement will neither appear on the listing nor be executed. The statement number deleted may be re-used for another statement. The NUM CLSN will not be listed.
LSFT, h_1, h_2, h_3 (cr)	LEFT SHIFT, END AROUND Where: h_1 = Location of the word to be shifted h_2 = Shift count h_3 = Location to store the result of the SHIFT instruction Example: LSFT, (2000), 4, (2000) If the contents of cell $2000 is $000F, the word is left shifted 4 places to the left end around, and the result ($00F0) is placed back into cell $2000. (Refer to Paragraph 2.3.1 for further information.)

Table 2.1b. OLYMPY Module (28 Subroutines) (Continued)

EQUIPMENT: Mainframe, TTY

MNEMONIC AND CALL	OPERATION
RSFT, h_1, h_2, h_3, (cr)	RIGHT SHIFT, SIGN EXTENDED Where: h_1 = Location of the word to be shifted h_2 = Shift count h_3 = Location to store the result of the SHIFT instruction. Example: RSFT, (2610), A, (2620) If the contents of cell $2610 is $1000, the word is shifted $A places to the right, sign extended, END OFF, and the result ($FFE0) is placed into cell $2620. (Refer to Paragraph 2.3.1 for further information.)

Table 2.1c. OLYMPUS 1742 Line Printer (OLDC42) Module (1 Subroutine)

PROGRAM NO. 88780800 CORE SIZE: $C5

EQUIPMENT: Mainframe, TTY, 1742 Line Printer

MNEMONIC AND CALL	OPERATION
DPL, Start Core, End Core (cr)	DUMP CORE ON 1742 LINE PRINTER The contents of the Core area (Start Core Absolute) to (End Core Absolute) are printed in hexadecimal form on the Line Printer. Lines whose words are the same as the last printed word are ignored by printing a row of asterisks.
ELP, Equipment Code (cr)	SET EQUIPMENT CODE This operation sets the equipment code in the software logic to the code selected by the hardware switch. Unless this entry is made the equipment code is assumed to be "4".

Table 2.1d. OLYMPUS Mainframe (OLMANF) Module (12 Subroutines)

PROGRAM NO. 392669XX CORE SIZE: $23F

EQUIPMENT: Mainframe, TTY

MNEMONIC AND CALL	OPERATION
LHX, Core Location, base (cr) Data*, Data*, ... , Data* (cr)	LOAD HEXADECIMAL INTO CORE This program allows the operator to load data into core. Loading starts at the location specified (core location + base) and continues at consecutive addresses until all the data is entered. Base is assumed to be zero if not entered. This OLYMPUS subprogram requires more than one line on the TTY to call. Any number of fields are allowable in the second (and subsequent) lines when using this call. NOTE Data* may be: a. A 4-digit hexadecimal number, e.g., 14EA. b. A one-word relative instruction: 2-digit OP code * 4-digit address, e.g., C8*1606, at core location P. This indicates that core location P is loaded with (C8hh where hh = 1606 - P). c. A one-word relative address: *Address, e.g., *1606 at location P with LHX, P as the subprogram. Core location P is loaded with hhhh, where hhhh = (1606 - P).
ADH, h_1, h_2 (cr)	ADD HEXADECIMAL VALUES h_1 is added to h_2. The sum is typed out on the TTY in the form: hhhh.
SBH, h_1, h_2 (cr)	SUBTRACT HEXADECIMAL VALUES h_2 is subtracted from h_1. The difference is typed out on the TTY in the form: hhhh.

Table 2.1d. OLYMPUS Mainframe (OLMANF) Module (12 Subroutines)(Continued)

EQUIPMENT: Mainframe, TTY

MNEMONIC AND CALL	OPERATION
DPC, Start Core, End Core, Base (cr)	DUMP CORE ON TTY, RELATIVE The contents of the core area (Start Core + Base) to (End Core + Base) are typed out in hexadecimal form on the TTY. Format is as shown in the DPC subprogram above. Base is assumed to be zero if not entered. The format is: Start Core Address (SCA), word 0, word 1,. . . word 7 SCA + 8 , word 8, word 9,. . . word F . . . SCA + 8N , word 8N,. . . last word
P, Core Location (cr)	START EXECUTION AT P Computer starts operation at address of core location. The A-, Q-, I-, and M-registers will be set to zero. If the SELECTIVE STOP switch is set, the computer will stop before executing the jump to program P. Execution is resumed when the operator momentarily presses the console STEP/RUN switch to RUN.
P, (cr)	START EXECUTION AT LAST SNAP LOCATION WITH THE REGISTERS RESTORED The P-, Q-, A-, M-, and I-registers, which had their contents stored during the SNAP operation, are restored to their previous values. Operations start at the restored P address. SNAPS are discussed in paragraph 2.6.2.

Table 2.1d. OLYMPUS Mainframe (OLMANF) Module (12 Subroutines)(Continued)

EQUIPMENT: Mainframe, TTY

MNEMONIC AND CALL	OPERATION
P, Core Location, Q, A, M, I (cr)	START EXECUTION AT P WITH Q-, A-, M-, AND I-REGISTERS SET TO THE SPECIFIED VALUES The operator exercises his option to reset the P-, Q-, A-, M-, and I-registers to any desired values before continuing the operation. Unspecified values will be set to zero.
RSN, Core Location, Q, A, M, I (cr)	RETURN JUMP TO SUBPROGRAM WITH REGISTERS SET AND A POST SNAP OLYMPUS causes a return jump to the routine. This occurs at the location specified in the call. The Q-, A-, M-, and I-registers are set to the values specified by the call.
SCN, Start Core, End Core, Number 1, Mask, Increment (cr)	SEARCH CORE FOR NUMBER The designated region of core is searched for the bits of words which contain those portions of Number 1 activated by the Mask. Activation is accomplished by a logical AND process. This allows the Mask to select from the Number 1 either a full word or any binary portion of it. "1s" in the Mask select portions of the word; "0s" in the Mask allow the "searched-for" word to have any values in those positions. The following examples demonstrate the process: Example 1 Number 1 = $2A74 = 0010 1010 0111 0100 Mask = $FF00 = 1111 1111 0000 0000 Search = $2Ahh = 0010 1010 xxxx xxxx specified unspecified

Table 2.1d. OLYMPUS Mainframe (OLMANF) Module (12 Subroutines)(Continued)

EQUIPMENT: Mainframe, TTY

MNEMONIC AND CALL	OPERATION
SCN, Start Core, End Core, Number 1, Mask, Increment (cr) (Continued)	Example 2 Number 1 = $2A74 = 0010 1010 0111 0100 Mask = $7F30 = 0111 1111 0011 0000 Search = x010 1010 xx11 xxxx specified / unspecified In hexadecimal form, these numbers would be $2A3h, $AA3h, $2A7h, $AA7h, $2AFh, and $AAFh. The search proceeds in steps of the size determined by "increment." If "increment" is blank, it is assumed equal to 1. A sample of the printout for the first example above would be: LOCATION = $hhhh_1$ NUMBER = $2Ahh LOCATION = $hhhh_2$ NUMBER = $2Ahh LOCATION = $hhhh_3$ NUMBER = $2Ahh . . . . . . LOCATION = $hhhh_n$ NUMBER = $2Ahh
MBC, Origin Block 1, End Block 1, Origin Block 2 (cr)	MOVE DATA BLOCK IN CORE The block of data in core starting at Origin Block 1 and ending at End Block 1 is transferred to a new location in core which starts at Origin Block 2.

Table 2.1d. OLYMPUS Mainframe (OLMANF) Module (12 Subroutines)(Continued)

EQUIPMENT: Mainframe, TTY

MNEMONIC AND CALL	OPERATION
MBC, Origin Block 1, End Block 1, Origin Block 2 (cr) (Continued)	NOTE There are no inherent safeguards in OLYMPUS which will protect data in unprotected core from being overwritten during a block transfer. The operator must take steps to assure that (a) valuable core information is not overwritten during transfers, and (b) the block does not overflow core and result in end-around loading into used low core locations.
SET, START CORE, END CORE, PATTERN (cr)	SET CORE TO SPECIFIED PATTERN The core between and including start core and end core is set with the one-word hexadecimal pattern specified.
SPE, Last Location (cr)	SEARCH CORE FOR PARITY ERROR All cells in core (from 0 to last location) are searched for a parity error. Printout takes the form: $hhhh_1$ . . . $hhhh_n$ } Cell numbers with a parity error present (if any) SEARCH FINISHED

Table 2.1d. OLYMPUS Mainframe (OLMANF) Module (12 Subroutines)(Continued)

EQUIPMENT: Mainframe, TTY

MNEMONIC AND CALL	OPERATION
SPP, Start Core, End Core (cr)	SET PROGRAM PROTECT BIT The program protect bit is set for every cell in the specified region of core.
CPP, Start Core, End Core (cr)	CLEAR PROGRAM PROTECT BIT The program protect bit is removed from every cell in the specified region of core.

Table 2.1e. OLYMPUS 1711/12 TTY (OL1712) Module (6 Subroutines)

PROGRAM NO. 395676XX CORE SIZE: $210
EQUIPMENT: Mainframe, 1711/12 TTY, 1721 PTR, 1723 PTP

MNEMONIC AND CALL	OPERATION
RTP, Core Location (cr)	READ 1712 TELETYPEWRITER PAPER TAPE The information on the paper tape on the 1712 TTY loads into core starting at the location specified. See note under MBC. If a Checksum Error exists, TTY prints out CHECKSUM ERROR.
PPT, Start Core, End Core (cr)	PUNCH 1712 TELETYPEWRITER PAPER TAPE RECORD OLYMPUS causes the contents of that portion of core located between Start Core and End Core to be punched out on a 1712 Paper Tape. Paper tape format is shown in Appendix A.
RPT, Core Location (cr)	READ PAPER TAPE FROM 1721 PAPER TAPE READER The information stored on the paper tape on the 1721 PTR loads into core starting at the location specified. See note under MBC. If a Checksum Error exists, TTY prints out CHECKSUM ERROR.
PPP, Start Core, End Core (cr)	PUNCH CORE ON 1723 PAPER TAPE PUNCH The contents of that portion of core between Start Core and End Core is punched out on the 1723 PTP. Paper tape format is shown in Appendix A.

Table 2.1e. OLYMPUS 1711/12 TTY (OL1712) Module (6 Subroutines)(Continued)

EQUIPMENT: Mainframe, 1711/12 TTY, 1721 PTR, 1723 PTP

MNEMONIC AND CALL	OPERATION
VPR, Core Location (cr)	VERIFY RECORD ON 1721 PTR AGAINST CORE The information of the paper tape record is verified against information in core starting at Core Location. Errors are printed out on the TTY in the form: Core Location_m Core Value_m T(Tape Value)_m . . . . Core Location_n Core Value_n T(Tape Value)_n (Checksum Error--If Present) NOTE If the tape is positioned at the wrong starting point, or if the wrong core location is given, every comparison will print out as an error.
OUT, Start Core, End Core (cr)	OUTPUT ASCII ON TTY The specified region of core is printed out on the TTY in ASCII code. Each hexadecimal word in core is translated into two ASCII characters.

Table 2.1e. OLYMPUS 1711/12 TTY (OL1712) Module (6 Subroutines)(Continued)

EQUIPMENT: Mainframe, 1711/12 TTY, 1721 PTR, 1723 PTP

MNEMONIC AND CALL	OPERATION
EXAMPLE	OUT, 1000, 1006/ Where these core locations hold the values shown: 1000 4142 1001 4344 1002 3132 1003 2A33 1004 4546 1005 4142 1006 432A The printout will have the form: ABCD12*3EFABC*

Table 2.1f. OLYMPUS 1711 TTY (OL1711) Module (4 Subroutines)

PROGRAM NO. 849680XX CORE SIZE: $171

EQUIPMENT: Mainframe, 1711 TTY, 1721 PTR, 1723 PTP

MNEMONIC AND CALL	OPERATION
	This module is identical to OL1712 but without statements RTP and PPT which drive the 1712 TTY. See Table 2.1e.

Table 2.1g. OLYMPUS 1713 TTY (OL1713) Module (4 Subroutines)

PROGRAM NO. 392670XX
EQUIPMENT: Mainframe, 1713 TTY

CORE SIZE: $153

MNEMONIC AND CALL	OPERATION
RPT, Core Location (cr)	READ 1713 TELETYPEWRITER PAPER TAPE Mnemonic and call have same operation on 1713 TTY as on 1712. See Table 2.1d.
PPP, Start Core, End Core (cr)	PUNCH 1713 TELETYPEWRITER PAPER TAPE RECORD Mnemonic and call have same operation on the 1713 TTY as on the 1712. See Table 2.1d.
VPR, Core Location (cr)	VERIFY RECORD ON TAPE READER AGAINST CORE Mnemonic and call have the same operation on the 1713 tape reader as on the 1721 Paper Tape Reader. See Table 2.1d.
OUT, Start Core, End Core (cr)	OUTPUT ASCII ON TTY Mnemonic and call have the same operation on the 1713 TTY as on the 1711/12. See Table 2.1d.

Table 2.1h. OLYMPUS 1728/430 Card Reader (OL8BIT) Module (4 Subroutines)

PROGRAM NO. 80880701 CORE SIZE: $140

EQUIPMENT: Mainframe, 1711/1712 TTY, 1728/430 CR

MNEMONIC AND CALL	OPERATION
E8D, Equipment Number (cr)	SET EQUIPMENT CODE This operation sets the equipment code in the software logic to the code selected by the hardware switch. Unless this entry is made the equipment code is assumed to be "$A". This instruction must precede all other Card Reader instructions.
R8D, Start Core (cr)	READ CARDS FROM 1728/430 CARD READER 8-BIT BINARY FORMAT The information stored on 8-bit binary cards that are loaded onto the 1728/430 are read into core starting at the location specified. See Note under "MBC". If a checksum error exists, the TTY prints out CHECKSUM ERROR.
P8D, Start Core, End Core (cr)	PUNCH CORE ON 1728/430 CARD READER IN 8-BIT BINARY FORMAT The contents of that portion of core between (Start Core) and (End Core) is punched out in the 1728/430 in 8-bit binary format similar to paper tape.
V8D, Start Core (cr)	VERIFY 8-BIT BINARY CARDS IN THE 1728/430 AGAINST CORE The information on 8-bit binary cards is verified against information in core starting at (START CORE). Errors are printed out on the TTY in the form: VERIFY ERROR

Table 2.1h. OLYMPUS 1728/430 Card Reader (OL8BIT) Module (4 Subroutines) (Continued)

EQUIPMENT: Mainframe, 1711, 1712 TTY, 1728/430 CR

MNEMONIC AND CALL	OPERATION
V8D, Start Core (cr) (Continued)	The data on 8-bit binary cards is in the format:

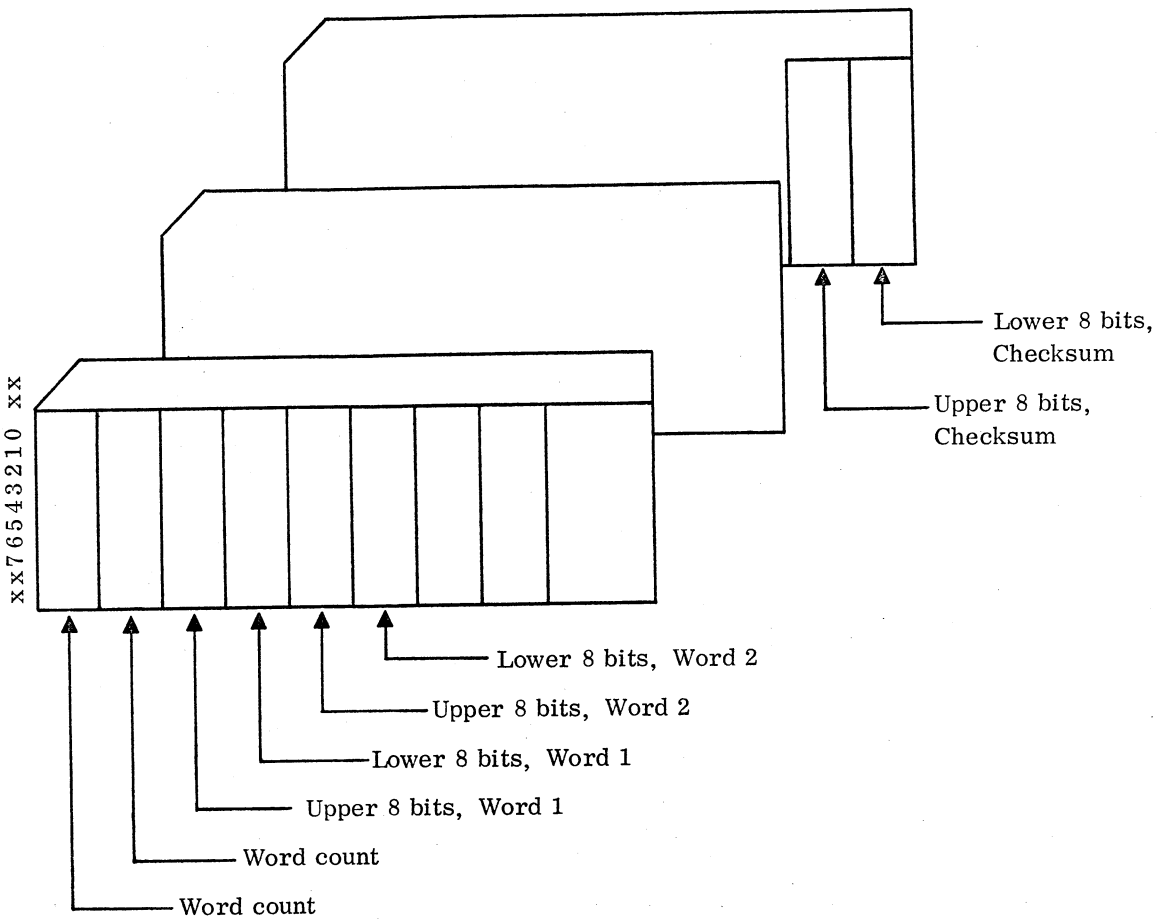


Table 2.1i. OLYMPUS Card Reader (OLC430) Module (2 Subroutines)

PROGRAM NO. 39235901 CORE SIZE: $417

EQUIPMENT: Mainframe, TTY, 1728/430 Card Reader/Punch

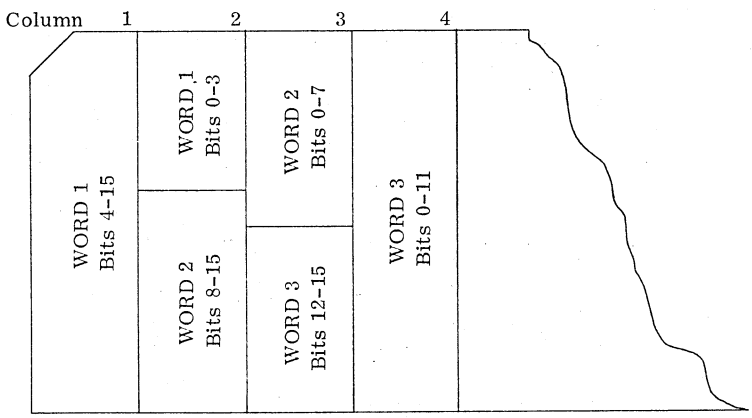
MNEMONIC AND CALL	OPERATION
PCR, Start Core, End Core (cr)	PUNCH 12-BIT BINARY CARDS The contents of that portion of core between (Start Core) and (End Core) is punched out on the 1728/430 in 12-bit binary format.
RCD, Start Core (cr)	READ CARDS FROM THE 1728/430 CARD READER 12-BIT BINARY FORMAT The information stored on 12-bit binary cards that are loaded onto the 1728/430 are read into core starting at the location specified in (Start Core). See Note under "MBC" in Table The data on 12-bit binary cards is in the format: 

Table 2.1j. OLYMPUS Drum (OLDR52) Module (3 Subroutines)

PROGRAM NO. 39759102 CORE SIZE: $2IE
EQUIPMENT: Mainframe, TTY, 1752 Drum

MNEMONIC AND CALL	OPERATION
	Refer to OLYMPUS Drum (OLDRUM) Module for operating instructions. Mnemonics and functions are identical to the 1751 Module.

Table 2.1k. OLYMPUS Reject Handling (OLYREJ) Module

PROGRAM NO. 849682XX CORE SIZE: $54
EQUIPMENT: Mainframe, TTY

MNEMONIC AND CALL	OPERATION
RJTP, N (cr)	SPECIFY REJECT OPTION Internal and external rejects may be handled by a common routine (see paragraph 2.6.2). This routine prints a comment containing information about the reject. This mnemonic allows user control of the comment printout by specifying N, where N may have the following values: N = 0, printout is bypassed N = m, printout is discontinued after m number of printouts if not re-initialized by this statement N = $8000, printout always occurs

Table 2.11. OLYMPUS Drum (OLDRUM) Module (3 Subroutines)

PROGRAM NO. 849951XX CORE SIZE: $11F
EQUIPMENT: Mainframe, TTY, 1751 Drum

MNEMONIC AND CALL	OPERATION
RDM, Start Core, End Core, MSB Drum, LSB Drum (cr)	READ DRUM TO CORE Data is transferred from drum to core. The drum is addressed by a two-word hexadecimal address called Most Significant Bits of Drum Address and Least Significant Bits of Drum Address(10). Data loading in core starts at Start Core. Transfer terminates when End Core address is reached.
WDM, Start Core, End Core, MSB Drum, LSB Drum (cr)	WRITE CORE ON DRUM Data is transferred from core to drum. Core starting address is at Start Core; drum starting address is at MSB Drum, LSB Drum. Transfer terminates when word stored at End Core is transferred.
VDM, Start Core, End Core, MSB Drum, LSB Drum (cr)	VERIFY DRUM AGAINST CORE Data on drum starting at location MSB Drum, LSB Drum is compared to data in core starting at Start Core. The contents of the two storage regions are compared word by word through the End Core address. If errors occur, they are printed out on the TTY in the following format.

(10) The drum is treated as a word addressable storage device. The MSB of the drum address selects a 32K block of storage. The LSB of the drum address selects a starting word within the 32K block. The maximum value of the LSB Drum address is $7FFF. $FFFF is illegal.

Table 2.11. OLYMPUS Drum (OLDRUM) Module (3 Subroutines)(Continued)

EQUIPMENT: Mainframe, TTY, 1751 Drum

MNEMONIC AND CALL	OPERATION
	Core Location$_m$ Core Contents$_m$ D (Drum Contents)$_m$ . . . . Core Location$_n$ Core Contents$_n$ D (Drum Contents)$_n$ NOTE If an error exists in any of the drum subprograms, the TTY will print out DRMERR and the status word in hexadecimal form. A complete list of the status bit meanings will be found in the 1751 Drum Interface Manual. An internal reject causes the message: INTERNAL REJECT An external reject causes the message and status to be output: EXTERNAL REJECT STATUS IS XXXX

Table 2.1m. OLYMPUS Disk (OL1739) Module (7 Subroutines)

PROGRAM NO. 39598801 CORE SIZE: $2E7
EQUIPMENT: Mainframe, TTY, 1739 Cartridge Disk

MNEMONIC AND CALL	OPERATION
EDK, UNIT (cr)	SET UNIT DISK NUMBER If this call is not used, disk number is assumed to be zero.
RDS, Start Core, End Core, MSB Drum, LSB Drum (cr)	READ DISK TO CORE USING DRUM ADDRESSING This is a mass data transfer subprogram similar to RDM except that mass memory is stored on a disk rather than a drum. Drum addressing is converted to disk addressing by OLYMPUS. Details are given in Appendix C. This type of addressing relieves the operator from the task of dividing word count by 96 to find the disk sector addresses.
WDS, Start Core, End Core, MSB Drum, LSB Drum (cr)	WRITE ON DISK FROM CORE USING DRUM ADDRESSING This is a mass data transfer to disk similar to the WDM mass transfer to drum. As in RDS, addressing is performed as if a drum was present instead of a disk.
RST, Start Core, Start Sector, Start Word, End Word, End Sector (cr)	READ DISK TO CORE, DISK WORD ADDRESSABLE MODE This subprogram transfers disk data to core. The information in the region specified on the disk is transferred to core starting at Start Core. See note on MBC.
RDK, Start Core, End Core, Start Sector, Start Word (cr)	READ DISK TO CORE, WORD ADDRESSABLE MODE This is an alternate way of addressing the RST operation.

Table 2.1m. OLYMPUS Disk (OL1739) Module (7 subroutines) (Continued)

EQUIPMENT: Mainframe, TTY, 1739 Cartridge Disk

MNEMONIC AND CALL	OPERATION
WST, Start Core, Start Sector, Start Word, End Word, End Sector (cr)	WRITE CORE ON DISK, DISK WORD ADDRESSABLE MODE This transfers data from core to disk. Information starting at Start Core is transferred to disk starting at Start Word, Start Sector. Transfer continues to End Word, End Sector.
WDK, Start Core, End Core, Start Sector, Start Word (cr)	WRITE CORE ON DISK, WORD ADDRESSABLE MODE This is an alternate way of addressing the WST operation. NOTE The following types of errors will cause TTY printouts for all disk subprograms: DISK ERROR: A hardware error. The operator may try the call again. REQUEST ERROR: An operator error. The mnemonic and call should be checked, corrected, and re-entered. NOT OPERABLE: The disk cannot operate in the present configuration. The operator should check to see if the unit is properly turned on and the correct equipment code is selected. INTERNAL REJECT: An internal reject has occurred. EXTERNAL REJECT STATUS IS xxxx: An external reject has occurred. The disk status is output.

Table 2.1n. OLYMPUS Disk (OLDISK) Module (7 Subroutines)

PROGRAM NO. 849952XX CORE SIZE: $2F6
EQUIPMENT: Mainframe, TTY, 1738/853-854, Disk

MNEMONIC AND CALL	OPERATION
EDK, UNIT (cr)	SET UNIT DISK NUMBER If this call is not used, disk number is assumed to be zero.
RDS, Start Core, End Core, MSB Drum, LSB Drum (cr)	READ DISK TO CORE USING DRUM ADDRESSING This is a mass data transfer subprogram similar to RDM except that mass memory is stored on a disk rather than a drum. Drum addressing is converted to disk addressing by OLYMPUS. Details are given in Appendix C. This type of addressing relieves the operator from the task of dividing word count by 96 to find the disk sector addresses.
WDS, Start Core, End Core, MSB Drum, LSB Drum (cr)	WRITE ON DISK FROM CORE USING DRUM ADDRESSING This is a mass data transfer to disk similar to the WDM mass transfer to drum. As in RDS, addressing is performed as if a drum was present instead of a disk.
RST, Start Core, Start Sector, Start Word, End Word, End Sector (cr)	READ DISK TO CORE, DISK WORD ADDRESSABLE MODE This subprogram transfers disk data to core. The information in the region specified on the disk is transferred to core starting at Start Core. See note on MBC.
RDK, Start Core, End Core, Start Sector, Start Word (cr)	READ DISK TO CORE, WORD ADDRESSABLE MODE This is an alternate way of addressing the RST operation.

Table 2.1n OLYMPUS Disk (OLDISK) Module (7 Subroutines)(Continued)

EQUIPMENT: Mainframe, TTY, 1738/853-854, Disk

MNEMONIC AND CALL	OPERATION
WST, Start Core, Start Sector, Start Word, End Word, End Sector (cr)	WRITE CORE ON DISK, DISK WORD ADDRESSABLE MODE This transfers data from core to disk. Information starting at Start Core is transferred to disk starting at Start Word, Start Sector. Transfer continues to End Word, End Sector.
WDK, Start Core, End Core, Start Sector, Start Word (cr)	WRITE CORE ON DISK, WORD ADDRESSABLE MODE This is an alternate way of addressing the WST operation. NOTE The following types of errors will cause TTY printouts for all disk subprograms: DISK ERROR: A hardware error. The operator may try the call again. REQUEST ERROR: An operator error. The mnemonic and call should be checked, corrected, and re-entered. NOT OPERABLE: The disk cannot operate in the present configuration. The operator should check to see if the unit is properly turned on and the correct equipment code is selected. INTERNAL REJECT: An internal reject has occurred. EXTERNAL REJECT STATUS IS xxxx: An external reject has occurred. The disk status is output.

Table 2.1o. OLYMPUS 601 Magnetic Tape (OL601M) Module (9 Subroutines)

PROGRAM NO. 392671XX CORE SIZE: $1E8
EQUIPMENT: Mainframe, TTY, 601 Magnetic Tapes

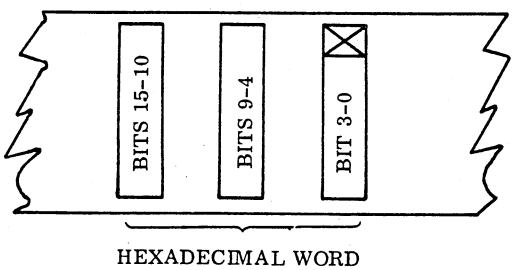
MNEMONIC AND CALL	OPERATION
EMT, Equipment Code (cr)	SET EQUIPMENT CODE This operation sets the equipment code in the software logic to the code selected by the hardware switch. This instruction must precede all other 601 Magnetic Tape instructions.
RMT, Unit Number, Start Core, End Core (cr)	READ MAGNETIC TAPE ONTO CORE Information on the magnetic tape located on the specified unit number is loaded into core. Tape information starts at the location (start of record or start of file) where the tape is currently positioned. Information loads into core starting at Start Core. Information transfer terminates when End Core is reached. NOTE The format on the 601 tapes is as shown below:  A parity bit is included in each column of bits. Parity is always odd. Data is always written in binary mode with the Most Significant Bit (MSB) first. Data density is 556 characters per inch, where a character is six data bits plus a parity bit in the same column.

Table 2.1o. OLYMPUS 601 Magnetic Tape (OL601M) Module (9 Subroutines)(Continued)

EQUIPMENT: Mainframe, TTY, 601 Magnetic Tapes

MNEMONIC AND CALL	OPERATION
	NOTE When a 601 Magnetic Tape subprogram is called from a user's program, the A-register is loaded with the magnetic tape status before the return to the user's program. A complete description of the 601 Magnetic Tape status bit meanings will be found in the 1700 Standard Peripheral Reference Manual.
WMT, Unit Number, Start Core, End Core (cr)	WRITE CORE ONTO MAGNETIC TAPE Data in core region between Start Core and End Core is transferred to the magnetic tape located on the specified unit. The transferred information constitutes one record on the tape.
BSF, Unit Number, N Files (cr)	BACKSPACE N FILES ON MAGNETIC TAPE The magnetic tape on the specified unit is backspaced N files. If the number of files specified exceeds the number of files between present position and tape load point, the tape will stop at the load point. The operator receives no indication that the full number of files have not been counted during the backspace operation.
ADF, Unit Number, N Files (cr)	ADVANCE N FILES ON MAGNETIC TAPE The magnetic tape on the specified unit is advanced N files. The same consideration applies to counting the number of files during advancing as during backspacing.

Table 2.1o. OLYMPUS 601 Magnetic Tape (OL601M) Module (9 Subroutines)(Continued)

EQUIPMENT: Mainframe, TTY, 601 Magnetic Tapes

MNEMONIC AND CALL	OPERATION
REW, Unit Number (cr)	REWIND TAPE The magnetic tape on the specified unit is rewound.
WEF, Unit Number (cr)	WRITE END OF FILE MARK ON MAGNETIC TAPE The End of File mark is written on the tape located on the specified unit.
ADR, Unit Number, N Records (cr)	ADVANCE N RECORDS ON MAGNETIC TAPE The magnetic tape on the unit is advanced the specified number of records. An End of File mark is counted as a record during this operation.
BSR, Unit Number, N Records (cr)	BACKSPACE N RECORDS ON MAGNETIC TAPE The magnetic tape on the specified unit is backspaced N records. The same file considerations apply to backspacing records as apply to advancing them. Internal or external rejects will cause the following messages to be output: INTERNAL REJECT EXTERNAL REJECT STATUS IS XXXX

Table 2.1p. OLYMPUS 8000 Magnetic Tape (OL8000) Module (9 Subroutines)

PROGRAM NO. 846230XX
EQUIPMENT: Mainframe, TTY, 8000 Magnetic Tape

CORE SIZE: $2C8

MNEMONIC AND CALL	OPERATION
MAF, Unit Number, N Files (cr)	ADVANCE N FILES ON 8000 MAGNETIC TAPE The high-speed magnetic tape on the specified unit is advanced N files. If the number of files specified exceeds the number of files between present position and end of tape, the tape stops at the end. The operator receives no indication that the full number of files have not been counted. Unspecified N will advance one file.
MBF, Unit Number, N Files (cr)	BACKSPACE N FILES ON 8000 MAGNETIC TAPE The high-speed magnetic tape on the specified unit is backspaced N files. Unspecified N will backspace one file. Backspacing terminates if Load Point is encountered.
MBR, Unit Number, N Records (cr)	BACKSPACE N RECORDS ON 8000 MAGNETIC TAPE The high-speed magnetic tape on the specified unit is backspaced N records. End of file marks count as a record during this operation. Unspecified N will backspace one record. Backspacing terminates if Load Point is encountered.
MEF, Unit Number, Number of File Marks (cr)	WRITE END-OF-FILE MARK ON 8000 MAGNETIC TAPE End-of-File marks are written on the tape on the unit specified. Unspecified N will write one file mark.

Table 2.1p. OLYMPUS 8000 Magnetic Tape (OL8000) Module (9 Subroutines)(Continued)

EQUIPMENT: Mainframe, TTY, 8000 Magnetic Tape

MNEMONIC AND CALL	OPERATION
	NOTE The write ring must be mounted in the tape reel for this function to work.
MRD, Unit Number, Start Core, End Core, Parity, Mode (cr)	READ 8000 MAGNETIC TAPE INTO CORE Information on the selected high-speed magnetic tape is read into core starting at location Start Core, and continuing until End Core location is reached. Parity is odd (0) on binary tapes; it is even (1) on Binary-Coded-Decimal (BCD) tapes. Mode is defined as follows: Mode 0 or 4: Triple character format on seven-track binary tapes (bits 15-10, 9-4, 3-0 of core word). Mode 1: Single character format on seven- or nine-track tapes. Nine-track tape uses bits 15-8 of core word; seven-track tape uses bits 13-8 of core word. Mode 2: Double character format on seven-track BCD or nine-track binary or BCD tape. Nine-track tape uses bits 15-8 and 7-0 of core word; seven-track tape uses bits 13-8 and 5-0 of core word. Mode 3: Double character format on seven-track tape. This uses bits 15-10 and 9-4 of core word.

Table 2.1p. OLYMPUS 8000 Magnetic Tape (OL8000) Module (9 Subroutines)(Continued)

EQUIPMENT: Mainframe, TTY, 8000 Magnetic Tapes

MNEMONIC AND CALL	OPERATION
	NOTE During the read operation, the core data block is modified so that necessary control words may be included. This is accomplished by buffer chaining. Buffer chaining requires swapping of information in core, including that stored in a special loading buffer. If the reading operation is interrrupted during the transfer of data to core, the data input routine will be irreparably altered. To restore the buffers and the data, the entire sequence must be restarted from the beginning of the MRD operation.
MRW, Unit Number (cr)	REWIND 8000 MAGNETIC TAPE The magnetic tape on unit is rewound to the Load Point.
MSB, Unit Number, Number of Skips (cr)	SKIP BAD SPOT ON 8000 MAGNETIC TAPE A 4.5-inch section of the selected tape (the "bad spot") is erased. If the number of skips is not specified, it is assumed to be one.
MUN, Unit Number (cr)	REWIND AND UNLOAD 8000 MAGNETIC TAPE The selected tape is completely rewound on the reel and is ready to be unloaded.
MWT, Unit Number, Start Core, End Core, Parity, Mode (cr)	WRITE CORE INTO 8000 MAGNETIC TAPE Core information starting at location Start Core and continuing to location End Core is written into the selected magnetic tape. Parity

Table 2.1p. OLYMPUS 8000 Magnetic Tape (OL8000) Module (9 Subroutines)(Continued)

EQUIPMENT: Mainframe, TTY, 8000 Magnetic Tapes

MNEMONIC AND CALL	OPERATION
MWT, Unit Number, Start Core, End Core, Parity, Mode (cr) (Continued)	
	and mode are described under the MRD operation. Swapping occurs during this operation also, and the same precautions should prevail as for the MRD operation. The write ring must be mounted in the reel for this function.

Table 2.1q. OLYMPUS Input Instruction (OLREAD) Module

PROGRAM NO. 849974XX
EQUIPMENT: Mainframe, TTY

CORE SIZE: $39

MNEMONIC AND CALL	OPERATION
READ, h_1, h_2, h_3, h_4, h_5 (cr)	EXECUTE INPUT INSTRUCTION Where: h_1 = Contents of Q-register first or second input instruction. h_2 = Core location to store data h_3 = Contents of Q-register first input only (optional) h_4 = Core location to store reject code (optional) h_5 = Data (A-register) will be printed if any h_5 is entered. This statement causes two input instructions to be executed, the first as specified by h_3 to connect (station address), and the second specified by h_1 to continue (channel address). If stations only are being addressed, parameter h_3 may be omitted and only the input specified by h_1 will be executed. The contents of the A-register after the h_1 input is stored in the cell specified by h_2. Reject status is in cell specified by h_4 as follows: $h_4 = 0$ No reject occurred $h_4 \neq 0$ Reject occurred Parameters h_1 and h_2 must always be entered Parameters h_3, h_4, and h_5 are optional The following example executes one input instruction to equipment code 8 station 0 to connect followed by a second input command to digital channel 1. The contents of the A-register resulting from the second input operation are stored in location $2000. Location $2001 = 0 if no reject has occurred. READ, 9001, (2000), 400, (2001) (cr) This statement requires the Internal/External Reject processor.

Table 2.1r. OLYMPUS Output Instruction (OLRITE) Module

PROGRAM NO. 849973XX
EQUIPMENT: Mainframe, TTY

CORE SIZE: $26

MNEMONIC AND CALL	OPERATION
RITE, h_1, h_2, h_3, h_4 (cr)	EXECUTE OUTPUT INSTRUCTION Where: h_1 = Contents of Q-register for output instruction h_2 = Data to be outputted h_3 = Contents of Q-register for input instruction (optional) h_4 = Core location to store reject code (optional) This statement causes an input instruction to be executed as specified by h_3 followed by an output instruction as specified by h_1. The first input instruction is a connect command (station address) followed by the output instruction. If the output instruction is a connect command (station address), parameter h_3 may be omitted and only one output instruction will be executed. The data specified by h_2 is output. Reject status is stored in the location specified by h_4 as follows: $h_4 = 0$ No reject occurred $h_4 \neq 0$ Reject occurred The following example issues a connect command to equipment code 8 station 0 followed by an output command to digital channel F. The value $800 will be output. Cell $1000 = 0 if no reject occurred. RITE,900F,800,400,(1000) (cr) This statement requires the Internal/External Reject Processor.

Table 2.1s. OLYMPUS Sequential Enter (OLENTR) Module

PROGRAM NO. 395680XX CORE SIZE: $10
EQUIPMENT: Mainframe, TTY

MNEMONIC AND CALL	OPERATION
ENTR, h_1, h_2, $\cdots h_8$ (cr)	SEQUENTIAL ENTR This statement permits storing of up to 7 different hex values (h_2 to h_8) in sequential core locations starting at cell h_1. This statement may be used in DIRECT and INDIRECT modes. Example: 10.0 ENTR, 20, AAAA, BBBB, AAAA (cr) Core Address Cell — Contents 20 — AAAA 21 — BBBB 22 — AAAA

Table 2.1t. OLYMPUS Digital Input (OLRDGI) Module

PROGRAM NO. 849971XX CORE SIZE: $195
EQUIPMENT: Mainframe, TTY, 1750 DCT, 1544

MNEMONIC AND CALL	OPERATION
RDGI, h_1, h_2, A, h_4, h_5 (cr)	READ DIGITAL INPUT Where: h_1 = First digital input channel address h_2 = Last digital input channel address A = Starting core location for data storage h_4 = Store/Type/Compare h_4 = 0, Data is stored only h_4 = 1, Data is compared with previously stored data and any variation results in data being stored and printed $h_4 \geq 2$, Data will be stored and typed h_5 = W-E-S code (equipment number of DCT) This statement reads, prints, stores, and compares digital inputs as specified. The Internal/External Reject Processor will be called if hardware rejects occur. All parameters must be entered once. Thereafter, only parameter h_1 must be entered. The statement uses previously entered values for h_2 through h_5 if these parameters are not entered. Hardware required is the 1544 Digital Input Interface or the 1547 Digital Events Counting Interface. Example 1: RDGI, 0, 1, 10, 2, 400 (cr) Digital input channel addresses of 0 and 1 will be stored in cells 10 and 11. A comment will be printed with the following format.

Table 2.1t. OLYMPUS Digital Input (OLRDGI) Module (Continued)

EQUIPMENT: Mainframe, TTY, 1750 DCT, 1544

MNEMONIC AND CALL	OPERATION
RDGI, h_1, h_2, h_3, h_4, h_5 (cr) (Continued)	DGI CHNL 0000 IS hhhh DGI CHNL 0001 IS hhhh Where hhhh is the value read in hexadecimal. Examples 2 and 3: (2) RDGI,0,F,10,0,400 (cr) (3) RDGI,0,F,10,1 (cr) Example 2 causes digital input channels 0-F to be stored in cells 10 through 1F. Example 3 causes digital input channels 0-F to be read and compared with previously stored values. Any variations will cause the following comment to be printed: DGI CHNL CCCC IS $h_1h_1h_1h_1$ WAS $h_2h_2h_2h_2$ Where: CCCC = Channel Address $h_1h_1h_1h_1$ = New Value $h_2h_2h_2h_2$ = Old Value Examples 4 and 5: (4) RDGI,0,0,10,2,400 (cr) (5) RDGI,2 (cr) Examples 4 and 5 illustrate the abbreviated format of the statement once the parameters have been initially loaded. Example 4 reads channel 0, Example 5 reads channel 2. Note that the statement always reads from h_1 through h_2. Thus, to insure only one channel is read, h_2 must be set less than h_1, i.e., zero. The comment for Example 5 is: DGI CHNL 0002 IS hhhh Where: hhhh = Hexadecimal Value.

Table 2.1u. OLYMPUS Read Analog Converter (OLRADC) Module

PROGRAM NO. 849970XX CORE SIZE: $195
EQUIPMENT: Mainframe, TTY, 1750 DCT, 1530/34

MNEMONIC AND CALL	OPERATION
RADC, h_1,h_2,A,h_4,h_5,h_6,h_7,h_8 (cr)	READ ANALOG CONVERTER Where: h_1 = First channel address h_2 = Last channel address A = Starting core location for data storage h_4 = Gain or speed (0 = lowest, 3 = highest) h_5 = Type/Store/Compare. h_5 = 0, Data is stored only h_5 = 1, Data will be stored and printed $h_5 \geq 2$, Data is compared to previously stored data and any variation $\geq h_5$ causes data to be stored and printed h_6 = W-E-S code (DCT equipment number and analog to digital converter (ADC) station address) h_7 = Positive full scale ADC count h_8 = Shorted input ADC count This statement is designed for use with 1530/34 A/D systems and will sequentially scan all analog inputs specified by parameters h_1 and h_2 at the gain/speed specified and type, store, or compare as specified by parameter h_5. The program uses parameters h_7 and h_8 to determine whether the ADC is a 210, 212, 214, or DADIT. Stored data is raw, unshifted data as read from the ADC. Typed data is in percent of full scale as follows.

Table 2.1u. OLYMPUS Read Analog Converter (OLRADC) Module (Continued)

EQUIPMENT: Mainframe, TTY, 1750 DCT, 1530/34

MNEMONIC AND CALL	OPERATION
	Sample Typeout: + CH 801=-000.15 %FS * Either +, -, or *. *Bad data bit set. Parameter h_1 must always be entered. Parameters h_2 through h_8 must be entered once. The program stores these as constants and they need not be reentered each time this statement is used. Any time a parameter is entered, all preceding parameters must be entered also. This statement requires the Internal/External Reject Processor. Example 1: RADC, 800, 80F, 1000, 3, 1, 456, 3F7A, 186A (cr) DADIT analog inputs 800 through 80F will be scanned at their highest speed, stored in cells 1000-100F, and typed out. The 3F7A and 186A specify a DADIT. Example 2: Once Example 1 has been executed, setting up the program's parameters, the following call may be used. RADC, 802 (cr) Results: Same as Example 1 except inputs 802 through 80F are used. Examples 3 and 4: (3) RADC, 800, 830, 2000, 3, 0, 456, 3F7A, 186A (cr) (4) RADC, 800, 830, 2000, 3, 4 (cr)

Table 2.1u. OLYMPUS Read Analog Converter (OLRADC) Module (Continued)

EQUIPMENT: Mainframe, TTY, 1750 DCT, 1530/34

MNEMONIC AND CALL	OPERATION
	Example 3 reads DADIT inputs 800-830 at its highest rate of read and stores data into cell 2000 through 2030. Example 4 reads the same inputs and compares them with the values from Example 3. Any variation $\geq \pm 4$ counts causes the new value to be stored and printed. Examples 5 and 6: (5) RADC, 800, 0 (cr) (6) RADC, 80F (cr) Setting parameter h_2=0 insures that only one channel is read. Thus, Example 5 reads channel 800; Example 6 reads channel 80F. The data will be printed, stored, or compared, depending on the present value of parameter h_5.

Table 2.1v. OLYMPUS Analog Input Histogram (OLHIST) Module

PROGRAM NO. 39226901 CORE SIZE $3B1
EQUIPMENT: Mainframe, TTY, 1750 DCT, 1530/34

MNEMONIC AND CALL	OPERATION
HIST, h_1, h_2, h_3, h_4, h_5, h_6, h_7, h_8 (cr)	Where: h_1 = First channel address h_2 = Last channel address h_3 = Number of passes. If bit 15 is set, the histogram printout is deleted. h_4 = Gain - This is a packed parameter word. The gain of each of the eight channels is set by two bits in the word. The most significant two bits refer to the first channel. Example: h_4 = AAFF Channel = 0 Gain = 2 1 2 2 2 3 2 4 3 5 3 6 3 7 3 h_5 = Scale Factor - The deviation in counts from the average is divided by this number prior to collecting in the histogram. If bit 15 is set, values outside the histogram span are typed out as errors. h_6 = W-E-S code. Example: 0456 h_7 = ADC counts for 100% FS input Example: 212 7CF 214 1FFF h_8 = ADC counts for 0% FS

Table 2.1v. OLYMPUS Analog Input Histogram (OLHIST) Module (Continued)

EQUIPMENT: Mainframe, TTY, 1750 DCT, 1530/34

MNEMONIC AND CALL	OPERATION
	The number of input channels selected must be a multiple of eight (8). Each average value and each histogram column represents the reading of all eighth channels; i.e., if channels 800 through 80F are selected, the data from channels 800 and 808 is combined, the data from 801 and 809 is combined, etc. All eight parameters must be entered the first time after loading; however, for subsequent calls, only those parameters which change need be entered provided all parameters up to and including the changed parameter are entered. Example: 1st use — HIST, 800, 80F, FF, 0, 4, 456, 1FFF, 0 2nd use, change passes — HIST, 800, 80F, 7F 3rd use, no change — HIST, 800 One parameter must always be entered. Histogram Format As used in this specification, a histogram refers to the printout for each eighth channel in terms of deviation from a calculated norm. The deviation is given in terms of ADC counts or multiples thereof as determined by the "Scale Factor" parameter.

Table 2.1v. OLYMPUS Analog Input Histogram (OLHIST) Module (Continued)

EQUIPMENT: Mainframe, TTY, 1750 DCT, 1530/34

MNEMONIC AND CALL	OPERATION

Sample typeout:

CHNL	0	1	2	3	4	5	6	7
+4	0000	0000	0000	0000	0000	0000	0000	0000
+3	0001	0000	0000	000A	0000	0002	0000	0000
+2	000F	0000	0007	000F	0000	0004	0000	000B
+1	0010	0000	0020	002F	0000	000F	0020	0030
0	0070	007F	006B	005C	0070	0061	0067	005B
-1	001F	0000	001A	003C	0000	004A	002C	0010
-2	0000	0000	0000	0000	0000	0000	0000	0000
-3	0000	0000	0000	0000	0000	0000	0000	0000
-4	0000	0000	0000	0000	0000	0000	0000	0000

Program Function

OLHIST, when entered with the appropriate parameters from the executive OLYMPUS, first reads all selected analog input channels 16 times, calculates the average for each eighth channel, stores the average, and prints out the average in terms of decimal percent of full scale. The subroutine, if selected, then reads all selected channels the requested number of times comparing the reading each time to the average reading. The deviation is scaled by the "Scale Factor" parameter, and the summary results are output as the Histogram. If the error typeout option has been selected, all channels which fall outside the histogram after scaling (i.e., greater than ±4 counts from the average) are typed out with the error in hex counts.

The subroutine allows the gain of each eighth channel to be specified by an input parameter.

Table 2.1w. OLYMPUS Relay DAC Output (OLRDAC) Module

PROGRAM NO. 88776000 CORE SIZE:
EQUIPMENT: Mainframe, TTY, 1750 DCT, 1558, 1560

MNEMONIC AND CALL	OPERATION
RDAC, h_1, h_2, h_3, h_4, h_5, h_6	EXECUTE DAC OUTPUT VALUE h_1 = Channel address of the DAC board to be tested h_2 = 0 = Calibrate routine The test outputs the percent of full scale desired and exits. The DAC output can then be checked for accuracy. h_2 = 1 = Ramp Test The test outputs changing value to the DAC board creating a ramp wave form at the output. The ramp can be monitored for errors. h_3 = Percent of full scale to be output during the calibrate test (In hex). +100% = 64_{16} Full Scale +50% = 32_{16} Full Scale +25% = 16_{16} Full Scale +0% = 0_{16} Full Scale -25% = $FFE9_{16}$ -50% = $FFCD_{16}$ -100% = $FF9B_{16}$ Not available on a 1560 DAC Module h_4 = Delay Time delay between different digital output values during the ramp test. Each count is ≃ 100 microseconds. This determines the ramp frequency. h_5 = Interrupt line for the 1558. The test is interrupt driven and requires an interrupt line from the 1558. Enter hex number (0-F). h_6 = WES code for the 1558 Output Controller. Program Function OLRDAC, when entered with the appropriate parameters from the executive OLYMPUS, conducts a calibrate test on the 1560 DACs. A desired percent of Full Scale is output to the DAC board under test. The operator can then monitor the DAC output value and check it for accuracy, or adjust the output if required. The ramp test outputs a 0/0 Full Scale

Table 2.1w. OLYMPUS Relay DAC Output (OLRDAC) Module (Continued)

EQUIPMENT: Mainframe, TTY, 1750 DCT, 1558, 1560

MNEMONIC AND CALL	OPERATION
	digital value and then increments it by 1 until Full Scale is reached. When Full Scale has been output the DAC output is again zeroed. The ramp frequency is determined by the delay parameter and can be selected to get a clear presentation on the device used to monitor the ramp. The test uses the interrupt line from the 1558 and has a comprehensive list of error checks and messages. These are: A. Parameter Input Errors B. Internal/External Interrupts C. Lost Interrupts D. Select Errors E. Status Checks F. Interrupt Disabled Errors At the completion of the ramp test the program can be exited by momentarily setting the Skip switch on the mainframe console. The program can be used in an indirect program list to scan all channels if more than one is to be tested. The DAC Output requires an external piece of test equipment in order to monitor the voltage waveforms or simply a current meter. Caution should be used in setting up the output monitor so as not to create errors in the impedance loop used by the DAC. Many tests can be run using the customers equipment such as a trend recorder or set point station. Example 1: Calibrate Test: RDAC, 85, 0, 32, 0, C, 458, (LF)(cr) DAC channel address 85 on DET, equipment number 8, station address 58 will now output 50% of Full Scale and wait for a 1558 interrupt on line 12. If no interrupt occurs within $\simeq$100 microseconds an error message is printed. If the interrupt does not occur, the test outputs a message — "Calibration output complete. Check DAC board output".

Table 2.1w. OLYMPUS Relay DAC Output (OLRDAC) Module (Continued)

EQUIPMENT: Mainframe, TTY, 1750 DCT, 1558, 1560

MNEMONIC AND CALL	OPERATION
	Example 2: Ramp Test: RDAC, 81, 1, 0, 100, 5, 458, (LF)(cr) DAC channel address 81 on DCT equipment number 8 station 58 will now output a ramp signal. A message will be printed on the TTY "Ramp test. Observe wave form at DAC board." After each output to the 1558 an interrupt occurs and is processed. Frequency of the ramp signal is determined by h_4. In this case, a delay of 10 milliseconds between outputs will occur. The interrupt is expected on line 5. h_3 has now meaning in this test. Momentarily hit the Skip switch to exit test.

Table 2.1x. OLYMPUS Data Conversion (OLTYPD) Module

PROGRAM NO. 39179201 CORE SIZE: $71
EQUIPMENT: Mainframe, TTY

MNEMONIC AND CALL	OPERATION
TYPD, h_1, h_2, h_3 (cr)	DATA CONVERSION STATEMENT Where: h_1 = Location of data to be converted h_2 = Value in hex of 100% full scale value h_3 = Value in hex of 0% full scale value This statement converts a 15-bit plus sign hex number to percent full scale, and types it out. Typeout format is: ** + 100.00% FS ** - 77.36% FS The high order bit of the data (bit A_{15}) is assumed to be the sign bit. All three parameters must always be entered. Examples: TYPD, G, 1000, 0 (cr) assume G = $800 Type-out will be ** + 50.00% FS TYPD, (3FFF), FFF, 0 (cr) assume location $3FFF contains $F000 Type-out will be ** - 100.00% FS

Table 2.1y. OLYMPUS General Purpose Analog Input Histogram (OLGHST) Module

PROGRAM NO. 39548101 CORE SIZE: $5EC

EQUIPMENT: Mainframe, TTY, 1750; 1797/1571 optional;
MDC optional; 1534 or 1538 or 1536, 1742 optional

MNEMONIC AND CALL	OPERATION
GHST, h_1, h_2, h_3, h_4, h_5, h_6, h_7, h_8 (cr)	h_1 = First channel address Set bit 15 for 1534 Set bit 14 for 1742 Line Printer histogram output 8 channels are processed h_2 = $CLBA C = Control Parameter C=0 Histogram only C=1 Limit Check only C=2 Histogram and Limit Check C=3 No Printout L = Limit test limits in ADC units B = Data Mode B=0 Zero behind (1536 on MDC) B=1 One behind (1534 or 1538) B=2 Two behind (1536 on 1797/1571) A = Number of passes for both average and histogram Passes = 2^A h_3 = $CMSS C = Converter (ADC) Type C=0 Right justified ADC's C=0 16 bit ADC C=1 15 bit ADC C=2 14 bit ADC C=3 13 bit ADC C=4 12 bit ADC M = I/O Mode M=0 Direct A/Q M=1 1797-1571 Buffered M=2 MDC Buffered SS = Scale Factor Range is 0 to $FF

Table 2.1y. OLYMPUS General Purpose Analog Input Histogram Module (OLGHST) (Continued)

PROGRAM NO. 39548101 CORE SIZE: $5EC

EQUIPMENT: Mainframe, TTY, 1750; 1797/1571 optional;
MDC optional; 1534 or 1538 or 1536, 1742 optional

MNEMONIC AND CALL	OPERATION
GHST, h_1, h_2, h_3, h_4, h_5, h_6, h_7, h_8 (cr) (continued)	h_4 = Location to store back address of average value table - table is 8 locations long. h_5 = Analog Controller Function Word 1534 use $0010 1538 use $151D 1536 use $0 h_6 = Interrupt line in hex h_6=0 for I/O Mode 0 h_7 = W-E-S Code for Channel Interface h_7=0 for I/O Modes 0, 2 h_7=$460 for I/O Mode 1 h_8 = W-E-S Code for Analog Controller 1750 or MDC Equip Code = $8 h_8=$44E for 1538 or 1536 h_8=$456 for 1534 After once entering all parameters the program may be recalled by entering only GHST, h_1 (cr). Provided that the average value table is not required to be referenced through parameter h_4. PROGRAM DESCRIPTION This module is a general purpose histogram and limit check routine useable with the 1534, 1538, or 1536 Analog Input Controller. It allows these controllers to operate as follows: A. I/O MODE 0 1. 1534, 1538, or 1536 connected direct to 1750. 2. 1534, 1538, or 1536 connected through the 1797/1571 or MDC but operated in direct A/Q mode.

Table 2.1y. OLYMPUS General Purpose Analog Input Histogram Module (OLGHST) (Continued)

PROGRAM NO. 39548101 CORE SIZE: $5EC

EQUIPMENT: Mainframe, TTY, 1750; 1797/1571 optional;
MDC optional; 1534 or 1538 or 1536, 1742 optional

MNEMONIC AND CALL	OPERATION
GHST, h_1, h_2, h_3, h_4, h_5, h_6, h_7, h_8 (cr) (continued)	B. I/O MODE 1 1. 1534, 1538, or 1536 operated in buffered mode (DSA) through the 1797/1571 C. I/O MODE 2 1. 1536 operated in buffered mode (DSA) through the MDC. I/O Mode 0 operates as fast as the analog controller will operate but not more than about 25 KHz. Control is by "busy". I/O Mode 1 operates as fast as the analog controller will operate up to the limit of about 400 KHz (DSA limitation). I/O Mode 2 operates at 50 KHz. Data collection is done in burst mode for any I/O Mode. A total of ten channels are read for each burst and from these readings 8 data values are extracted and processed according to the Data Mode specified (parameter B in h_2). Parameter h_1 specifies the first channel address of a block of 8 channels which will be processed for a given call. If bit 15 is set a delay is engaged which limits the maximum sample rate on any one channel to 6 conversions per second. Setting bit 15 also adds $400 to the channel address to put it in proper form for the 1534. Setting bit 14 transfers the histogram output from the TTY to the 1742 Line Printer. Note: LPRNT3 must be linked in OLYMPUS. Parameter h_2 is a packed parameter which specifies the print mode, limit test interval, Data Mode, and number of passes. The limit test which may be used alone or with a histogram print out automatically determines if all channels pass a 3σ limit with the interval specified by L in h_2. If L is specified by 2 for example a particular channel will be good if 99.7% of the readings are contained between +2

Table 2.1y. OLYMPUS General Purpose Analog Input Histogram Module (OLGHST) (Continued)

PROGRAM NO. 39548101 CORE SIZE: $5EC

EQUIPMENT: Mainframe, TTY, 1750; 1797/1571 optional;
MDC optional; 1534 or 1538 or 1536, 1742 optional

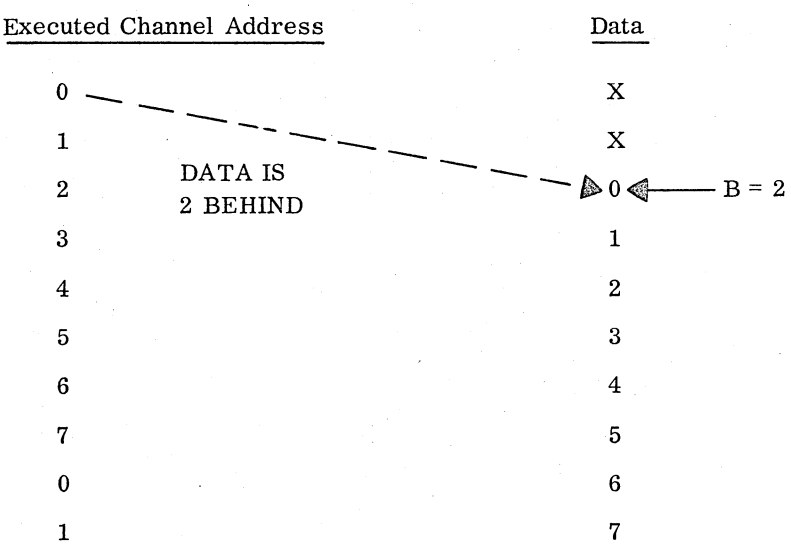
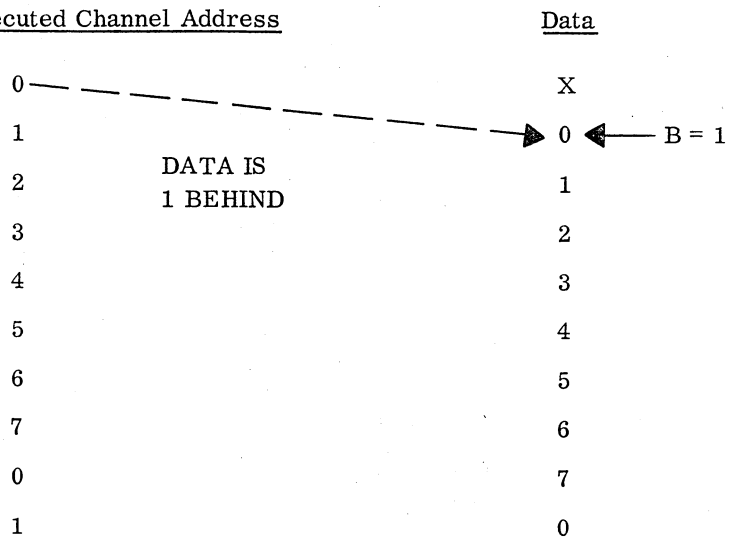
MNEMONIC AND CALL	OPERATION
GHST, $h_1, h_2, h_3, h_4, h_5, h_6, h_7, h_8$ (cr) (continued)	and-2 ADC counts from the mean value. If more than 0.3% of the readings are outside these limits the channel number and the total number of out-of-limit readings will be printed. The limit test is useful for large subsystems to reduce the print out time or for a go-no go test. The Data Mode parameter B in h_2 specifies the method of processing the ten readings taken for each burst of data collection. Depending upon the configuration of the controller and the method of interfacing to the computer the channel data may correspond to the channel address, be one behind the channel address, or be two behind the channel address. The Data Mode parameter is simply an index to the collected data specifying the location of the data for the first channel. Example for 1536 

Table 2.1y. OLYMPUS General Purpose Analog Input Histogram Module (OLGHST) (Continued)

PROGRAM NO. 39548101 CORE SIZE: $5EC

EQUIPMENT: Mainframe, TTY, 1750; 1797/1571 optional;
MDC optional; 1534 or 1538 or 1536, 1742 optional

MNEMONIC AND CALL	OPERATION
GHST, $h_1, h_2, h_3, h_4, h_5, h_6, h_7, h_8$ (cr) (continued)	Example for 1538/1534



The above examples apply only to I/O Mode 1 (1797/1571). When operating Mode 0 (Direct A/Q) the last channel (channel 7) is reread twice rather than repeating 0 and 1 to fill the 10 word data buffer.

In I/O Mode 2 the data is automatically corrected in the MDC for two behind operation, hence B = 0. Also for this reason neither the 1538 or 1534 will operate correctly through the MDC in I/O Mode 2 by this routine. If this is attempted the printout will be displaced by one channel (i.e., channel 1 on the printout will actually be channel 0).

Parameter A of h_2 specifies the number of passes as a power of 2. If A = 2 for example, 2^2 or 4 passes will be taken for the average and 4 passes for the histogram. Parameter A should be specified large enough to obtain an accurate average and a representative histogram. Value of A between $8 and $F are suggested.

Table 2.1y. OLYMPUS General Purpose Analog Input Histogram Module (OLGHST) (Continued)

PROGRAM NO. 39548101 CORE SIZE: $5EC

EQUIPMENT: Mainframe, TTY, 1750; 1797/1571 optional;
MDC optional; 1534 or 1538 or 1536, 1742 optional

MNEMONIC AND CALL	OPERATION
GHST, h_1, h_2, h_3, h_4, h_5, h_6, h_7, h_8 (cr) (continued)	Parameter h_3 specifies the type of converter, I/O Mode, and histogram scale factor. C of h_3 permits the program to normalize all data to ADC units. The histogram scale factor SS allows the user to compress the histogram if desired. Normally this parameter is entered as $1, however, to troubleshoot channels having excessive noise this parameter may be increased in order to contain all readings within the histogram limits. SS parameter affects only the histogram scale. Parameter h_4 gives the user the means to find the table of average values for the 8 channels processed. This parameter is typically entered as a labeled storage location (i.e., G, H, etc.). After the program has executed the location specified by this parameter will contain the address of the first channel average. This mechanism may be used together with the no-print option to enable the user to read only the average value of each channel. These averages may be converted to percent full scale by the TYPD call. Parameters h_5 through h_8 are related to configuration, equipment codes, and interrupt assignments. Although values are listed for these parmeters they are typical only and may vary system to system. The program operates to first read eight channels (starting with the channel number specified in h_1) the number of times specified in h_2. From this data an average value is calculated and stored for each channel. This average value is used as the reference value for construction of the histogram. Next the program reads each of the eight channels again the number of times specified in h_2. Each data value obtained is compared to the appropriate average and the deviation in ADC units is calculated. Based on the deviation and the scale factor the appropriate histogram bin is incremented.

Table 2.1y. OLYMPUS General Purpose Analog Input Histogram Module (OLGHST) (Continued)

PROGRAM NO. 39548101 CORE SIZE: $5EC

EQUIPMENT: Mainframe, TTY, 1750; 1797/1571 optional;
MDC optional; 1534 or 1538 or 1536, 1742 optional

MNEMONIC AND CALL	OPERATION
GHST, $h_1, h_2, h_3, h_4, h_5, h_6, h_7, h_8$ (cr) (continued)	If the limit check is specified the deviation calculated for each reading is also compared to the limit parameter in h_2. A count is kept of the number of times each channel's deviation from the mean exceeds the limit. At the end of the run this count is examined and if it exceeds 0.3% of the number of readings taken the channel number and total number of out of limit readings are printed. Sample Calls: GHST, 0, 2A, 3101, G, 0, D, 460, 44E Typical for 1536 running buffered on 1571/1797 First Channel is 0 Histogram Only Two Behind Data 1024 Passes 13 Bit ADC I/O Mode 1 (1797/1571) Scale Factor 1 GHST, 0, 120A, 3202, G, 0, A, 0, 44E 1536 Operating Buffered on MDC First Channel = 0 Limit Check Only Limit = 2 Zero Behind Data 1024 Passes 13 bit ADC MDC I/O Scale Factor 2

Table 2.1y. OLYMPUS General Purpose Analog Input Histogram Module (OLGHST) (Continued)

PROGRAM NO. 39548101 CORE SIZE: $5EC

EQUIPMENT: Mainframe, TTY, 1750; 1797/1571 optional;
MDC optional; 1534 or 1538 or 1536, 1742 optional

MNEMONIC AND CALL	OPERATION
GHST, h_1, h_2, h_3, h_4, h_5, h_6, h_7, h_8 (cr) (continued)	GHST, 8000, 18, 4002, G, 10, 0, 0, 456 1534 connected direct A/Q or operated direct A/Q through 1797/1571 or MDC First Channel = 0 One Behind Data 256 Passes 12 bit ADC I/O Mode 0 Scale Factor = 2 Sample Programs: These programs are typical of techniques used to extend the capability of OLGHST. The GHST calls shown are structured for the 1536 operating Buffered (I/O Mode 2) on the MDC. (1) Type out average values in % Full Scale for 8 channels. 1.0 MSG, AVG VAL OUT 2.0 MSG, G=FIRST CHNL 3.0 DEFN, G 4.0 STOR, O, J 5.0 GHST, G, 300A, 3201, H, O, A, O, 44E 6.0 TYPD, (H), FAO, O 7.0 ADD, 1, J, J 8.0 ADD, 1, H, H 9.0 IFLT, J, 8, 6.0 10.0 IFSK, 12.0 11.0 GOTO, 2.0 12.0 EXIT

Table 2.1y. OLYMPUS General Purpose Analog Input Histogram Module (OLGHST) (Continued)

PROGRAM NO. 39548101 CORE SIZE: $5EC

EQUIPMENT: Mainframe, TTY, 1750; 1797/1571 optional;
MDC optional; 1534 or 1538 or 1536, 1742 optional

MNEMONIC AND CALL	OPERATION
GHST, h_1, h_2, h_3, h_4, h_5, h_6, h_7, h_8 (cr) (continued)	(2) Run a limit check on several groups of 8 channels 1.0 MSG, LIMIT TEST 2.0 MSG, G=FIRST CHANNEL 3.0 MSG, H=NO. OF GROUPS OF 8 CHANNELS 4.0 DEFN, G, H 5.0 GHST, G, 120A, 3201, J, O, A, O, 44E 6.0 SUB, H, 1, H 7.0 IFEQ, H, O, 10.0 8.0 ADD, 8, G, G 9.0 GOTO, 5.0 10.0 EXIT

Table 2.1z. OLYMPUS Hex to Decimal (OLHX2D) Module

PROGRAM NO. 39567900 CORE SIZE: $28
EQUIPMENT: Mainframe, TTY

MNEMONIC AND CALL	OPERATION
HX2D, NUM (cr)	HEX TO DECIMAL This statement converts a hex number NUM into decimal and prints the decimal equivalent. Example: HX2D, F statement HEX 000F = DECIMAL 00015 printout The statement does not recognize negative numbers. All sixteen bits are considered magnitude. The statement works in DIRECT and INDIRECT modes

Table 2.1aa. OLYMPUS Teletype Plotting Module (OLGRAF)

EQUIPMENT: Mainframe, TTY

MNEMONIC AND CALL	OPERATION
GRAF, h_1, h_2, A, B, h_3 (cr)	Where: h_1 = Value for Y = 0 h_2 = Y axis scale factor A = Starting address of buffer B = Ending address of buffer h_3 = Skip parameter This statement used the TTY to plot data in graphical form from a core buffer. Example: Assume the following data is in core starting at location $5000. It is desired to plot each value in the buffer from $5000 to $501F. The lowest Y value desired is $FFF0. FFF0,FFE0,FFFF,0,7,F,1F,2,2F,FFFF,2,3,4,5,6,7,8,9,0,1,2,3,4,5,FFE0, FFF7,FFF8,FFF9,FFFA,FFFB,FFFC,FFFD,FFFE,FFFF,0,1,2,3,4,5,6,7,8,9,0

Table 2.1aa. OLYMPUS Teletype Plotting Module (OLGRAF) (Continued)

EQUIPMENT: Mainframe, TTY

MNEMONIC AND CALL	OPERATION

GRAF, h_1, h_2, A, B, h_3 (cr) (Continued)

GRAF,FFF0,1,5000,501F,1

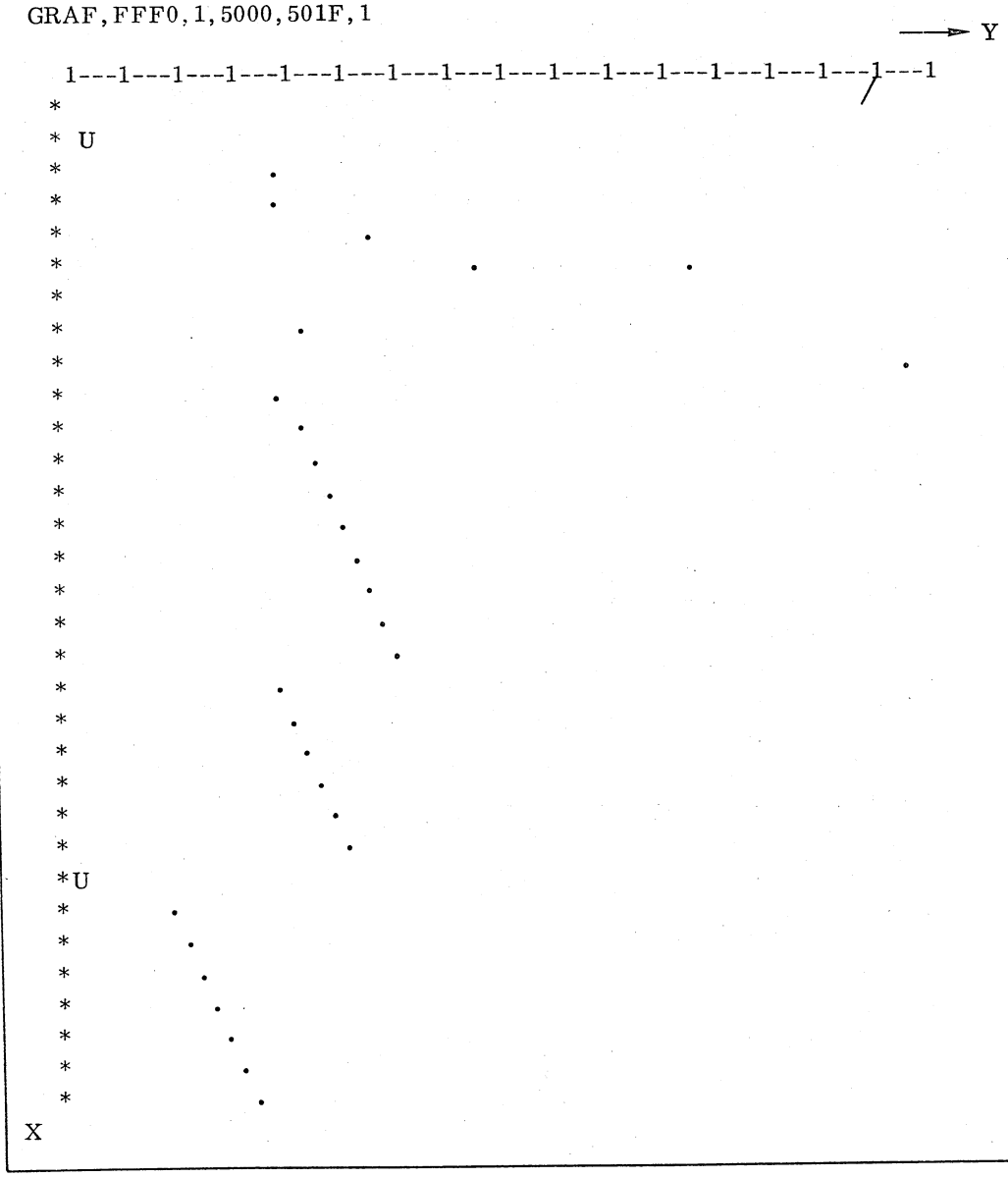


Table 2.1aa. OLYMPUS Teletype Plotting Module (OLGRAF) (Continued)

EQUIPMENT: Mainframe, TTY

MNEMONIC AND CALL	OPERATION
GRAF, h_1, h_2, A, B, h_3 (cr)	(Continued)
	Values less than FFF0 are marked with "U" for under range at Y = 0. Values greater than full scale are marked on the plot with "0" for overrange at the Y = 64 position. The Y scale extends from zero (0) to 64_{10}. The value of the data word in core is plotted on the Y axis. The Y axis may be scaled by h_2. The location of the data word in the buffer corresponds to the X axis. Each nth word in the buffer is plotted where h_3 specifies n; i.e., if $h_3 = 8$ in this example, the following locations will be plotted: $5000 $5008 $5010 $5018

Table 2.1ab. OLYMPUS Silly Loader (OLSILY) Module (4 Subroutines)

PROGRAM NO. 39267200 CORE SIZE: $CC0

EQUIPMENT: Mainframe, TTY, PTR or CR

MNEMONIC AND CALL	OPERATION
LOAD, Core Location, Mode (cr)	LOAD RELOCATABLE BINARY INPUT Card or paper tape form of the relocatable binary input is loaded into core starting at the specified location. If mode = 0, loading is done from paper tape. If mode ≠ 0, loading is done from card. At the end of each subprogram input, the TTY types out an *. At this point three operations are possible: 1. Another subprogram may be loaded immediately after the preceding one. The operator loads the new input and types a (cr) on the same line as the *. The input loads, and when completed the TTY replies with another *. 2. Another subprogram may be loaded at an arbitrary location. The operator loads the input device and types hhhh (cr) on the same line as the *. The program loads at location hhhh, and when completed the TTY replies with an *. 3. The loading operation may be terminated. The operator types F (cr) on the same line as the *. This is the only command which terminates the load operation within the OLYMPUS program.
LINK (cr)	LINK THE LOADED PROGRAMS This program links all the programs loaded by the LOAD operation. At the termination of this link operation, the TTY types out: "NAME" NOT AN ENTRY POINT for each routine not loaded. The LOAD operation must then start over and load all needed programs or determine that they will not be needed for his programming purposes.

Table 2.1ab. OLYMPUS Silly Loader (OLSILY) Module (4 Subroutines)

EQUIPMENT: Mainframe, TTY, PTR or CR

MNEMONIC AND CALL	OPERATION
PEP(cr)	PRINT ENTRY POINTS This subprogram prints the entry point, names, and locations in core of all programs loaded by the LOAD operation.
CNT(cr)	CONTINUE LOAD The loader initializes back to the starting point of the last tape loaded. NOTE If there is a Checksum Error "CHECKSUM ERR C" will be typed out. Type a (cr) to continue. The loader will initialize back to the start of the last input program. To abort the loading, type "F(cr)."

2.6 GENERATING NEW OLYMPUS ROUTINES

The following rules and interface specifications are given as information to the user who wishes to write his own special statement processors to be loaded and operated under the OLYMPUS executive.

OPERATION	PROCEDURE

2.6.1 WRITE PROGRAM CONFORMING TO OLYMPUS REQUIREMENTS	1. Write a subprogram that will perform the desired function. The routine will be entered by a return jump. Exit must be to caller location plus one or two, depending on whether the statement was executed or not, respectively.
	2. On entry to the processor, the Q-register contains the address of the address table and the I-register contains the address minus one of the value table. Only the address table should be referenced by OLYMPUS modules. The parameters may be picked up using the following operations:
	`ADQ =N$8000`
	`STQ- I`
	`LDA- (I)`
	`STA* PARAMI`
	`RAO- I`
	`LDA- (I)`
	`STA* PARAMZ`
	`etc.`
	3. The mnemonic for each statement must be defined in a table at the beginning of the module. The table contains a three-word entry per mnemonic. Two words contain the mnemonic in ASCII, two characters per word. Spaces should precede a mnemonic with less than four characters. The third word contains a relative increment to the entry point of the processor. The last entry in the table must be a relative increment which threads the table to the table in the next module. This entry has the following format:
	`ADC (END-*)`
	Where END is defined as the last location in the module + 1. This procedure is accomplished by placing an equivalence card as the last card of the module in the following format:
	`EQU END (*)`
	NOTE
	Adding processors using NUM as a parameter requires modifications in the program OLYMPY.

OPERATION	PROCEDURE

	SAMPLE MODULE
	
	A module containing one statement processor, the add processor, would be coded as follows:
	
	`NAM ADD`
	`ALF 2, ADD ADD STATEMENT MNEMONIC ENTRY`
	`ADC ADD-* IN MNEMONIC TABLE`
	`ADC (END-*) LINK TO MNEMONIC TABLE IN NEXT MODULE`
	`* ADD STATEMENT PROCESSOR`
	`ADD NOP 0`
	`ADQ* BIT#15`
	`STQ- I`
	`LDA- (I)`
	`RAO- I`
	`ADD- (I)`
	`RAO- I`
	`STA- (I)`
	`JMP* (ADD)`
	`BIT#15 NUM $8000`
	`EQU END(*)`
	`END`

2.6.2 OLYMPUS INTERFACE ROUTINES Several OLYMPUS routines are available for use by user processors.	The interfaces with other OLYMPUS modules shall consist of the following routines only: UEXASC, PRINT, READCH, SNAP, INTREJ, EXTREJ, BINASC UEXASC - Hexadecimal to ASCII conversion. Converts a hexadecimal number to four ASCII characters formatted one character per word. The hexadecimal number is passed in the A-register. Q and I are not affected. The location of the four words to be filled are defined for the absolute and relative cases as follows.

OPERATION	PROCEDURE

Calling Sequence:

```
Abs.    RTJ     UEXASC
        ADC     LIST
Rel.    RTJ     UEXASC
        ADC     (LIST-*)
```

Return is made to call + 2.

Example:

NUM = $1234

The calling sequence is:

```
LDA     NUM
RTJ     UEXASC
ADC     BUFFER
Next Instruction
```

The number $1234 will be converted to:

Location	Contents
BUFFER + 0	0031
BUFFER + 1	0032
BUFFER + 2	0033
BUFFER + 3	0034

This format is acceptable for printout since "0's" are ignored.

PRINT or PRINTE

Prints on the TTY ASCII characters from a list formatted two ASCII characters per word. The end-of-text character ($03) must be the terminating character in the list. The calling sequence is defined for the absolute and relative cases as follows:

PRINT returns with interrupts inhibited. PRINTE returns with interrupts enabled. Q & I not affected.

OPERATION	PROCEDURE
	Calling Sequence: Abs. RTJ PRINT ADC LIST Rel. RTJ PRINT ADC (LIST-*) Example: RTJ PRINT ADC (MESSAG-*) Next Instruction MESSAG ALF 5, UNIT 2 OFF NUM $0D 0A, $0300 LF, (cr), end The message output is: UNIT 2 OFF LPRNT3 Prints on the 1742 Line Printer ASCII characters from a list formatted two ASCII characters per word. The end-of-text character ($03) must be defined for the absolute and relative cases as follows: Calling Sequence: Abs. RTJ LPRNT3 ADC LIST Rel. RTJ LPRNT3 ADC (LIST-*) Example: RTJ LPRNT3 ADC (MESSAG-*) MESSAG ALF 8, PRINTED MESSAGE NUM $0D 0A, $0300

OPERATION	PROCEDURE
	The message output is: PRINTED MESSAGE (LF) (CR) The call requires the addition of OLYMPUS module "LPRNT3". The module also provides the operator with a call to the module as follows: LEQ, EQUIPMENT CODE: Set Equipment Code This operation sets the 1742 equipment code in the software logic to the code selected by the hardware switch. Unless this entry is made, the equipment code is assumed to be "$4". READCH Read one character from the TTY or input buffer. The character is returned in the A-register. The calling sequence is: RTJ READCH The return is to call + 1. In the Direct mode of operation the character is read from the TTY; in the Indirect mode the character is read from the input buffer. In this case, the user must specify to the READCH subroutine the location in the input buffer where the characters are to be found.
REJECT HANDLING	INTREJ and EXTREJ Link the user's module to the common reject handling routine. The routines output a comment containing information about the reject. The comment may be bypassed, printed a specified number of times, or always printed, depending on a parameter specified to the routine used. The parameter is specified via a statement as follows: RJTP, n(cr)

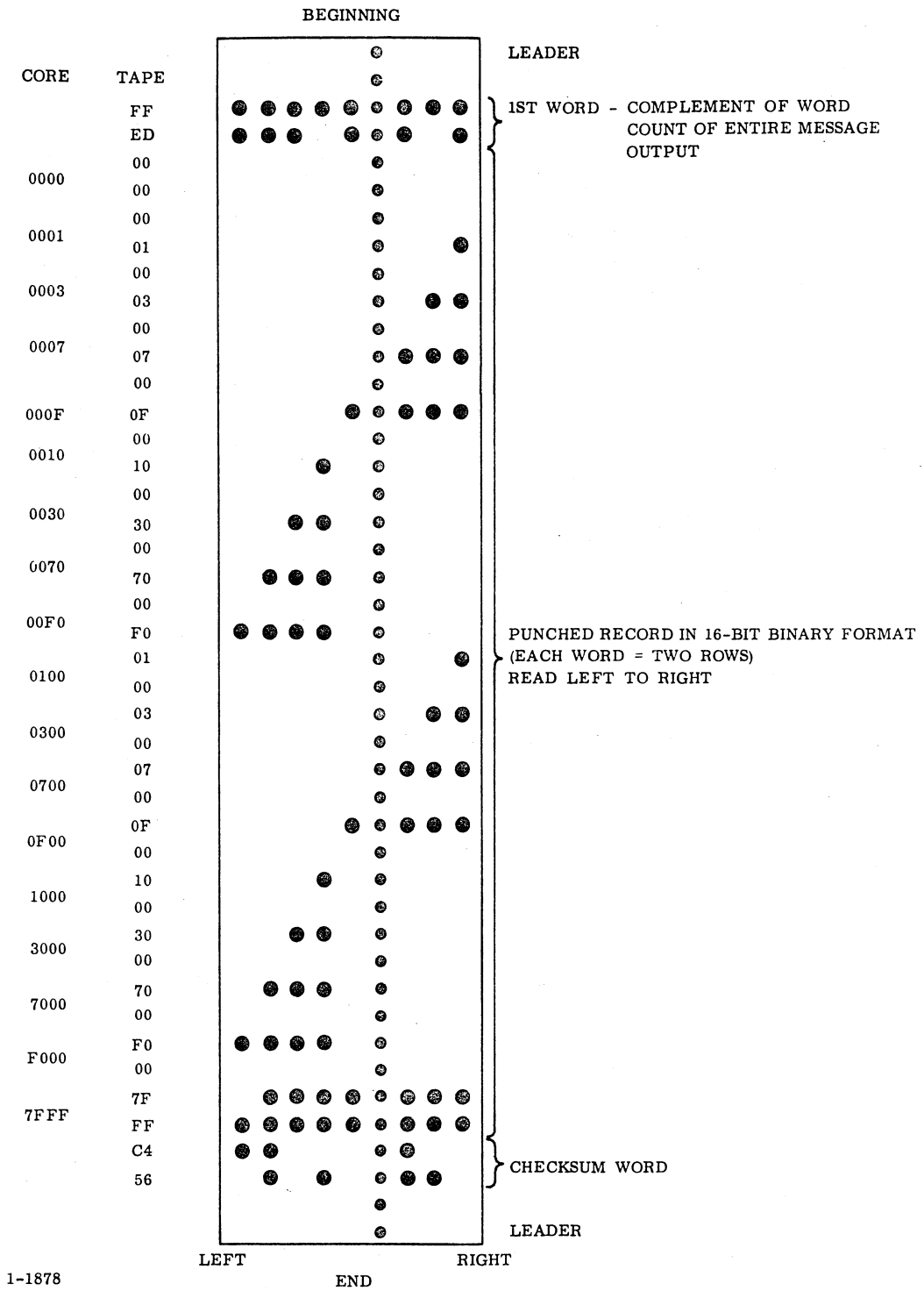
OPERATION	PROCEDURE
	where n may have the following values: n = 0, printout is bypassed n = m, printout is discontinued after m number of printouts if not reinitialized by this statement n = $8000, printout always occurs The format of the comment is as follows: For internal rejects: IN REJ Q=(q) X=(x) P=(p) For external rejects: EX REJ Q=(q) X=(x) P=(p) Where q = contents of the Q-register x = input/output instruction p = absolute core location containing instruction The routine has two entry points, one for internal and the other for external rejects. Coding of input and output commands must be done in the following manner for the routine to obtain the required information for printout. Input coding sequence: INP 2 JMP * *+7 JMP * *+3 RTJ EXTREJ RTJ INTREJ JMP * REJXIT (program continues here)

OPERATION	PROCEDURE
	Where EXTREJ and INTERJ are entry points to the reject handling routine and must be defined as externals. All registers are restored on exit from these two routines. REJXIT is an entry point in callers routine to handle rejects properly. Note that if no reject handling is required by caller; i.e., rejects are to be ignored, the coding can be done as follows: INP 2 JMP * *+6 JMP * *+3 RTJ EXTREJ RTJ INTREJ (program continues here) No change in the format is permitted since the reject handler uses position to determine where the I/O instruction is. SNAP or SNAPE The contents of the P-, Q-, A-, and I-registers are typed out on the TTY whenever a SNAP is called. SNAPs are inserted in the user's program during assembly or may be patched-in using the OLYMPUS LHX routine (see Table 2.1c). The SNAP Call returns with interrupts inhibited; the SNAPE Call returns with interrupts enabled. The calling format is a return jump. No parameters are passed. Example: RTJ SNAPE The output on the TTY has the form: P = hhhh, Q = hhhh, A = hhhh, I = hhhh

OPERATION	PROCEDURE
	BINASC Converts a hex number to decimal to five ASCII characters formatted one character per word. The hex number is passed in the A register. The location of the five words to be filled is defined for the absolute and relative cases as follows: Abs. RTJ BINASC ADC LIST Rel. RTJ BINASC ADC (LIST-*) Return is made to call + 2.

Appendix A

OLYMPUS PAPER TAPE FORMAT FOR OUTPUT RECORDS



Appendix B

EQUIPMENT CODE ASSIGNMENT ASSUMED BY OLYMPUS PROGRAM

Equipment Code	Device
1	Low-Speed Input/Output (This can be changed only by rewiring) includes 1711, 1713, 1721, 1723, 1729
2	1751/1752 Drum Controller
3	1738 Disk Controller
4	1742 Line Printer
5	
6	
7	1731 Magnetic Tape Controller for 601
8	Data and Control Terminal No. 1 (8000 Magnetic Tape)
9	Data and Control Terminal No. 2
A	1728/430 Card Reader
B	
C	
D	
E	
F	

Appendix C

USEFUL OLYMPUS LANGUAGE PROGRAMS

This section contains equipment diagnostics developed by various users and written in OLYMPUS language.

The following programs are intended as skeleton diagnostics. They do not check all functions, only major ones. They provide a starting place to check out 1500 products.

Cables, address jumpers and interrupt lines are assumed to be per 1700 A/D Systems Recommended Equipment Codes, etc. (39005300).

1572 Sample Rate Generator

This test has three parts:

Test 1 is in the Elapsed Time mode. The 1572 is cleared, and enabled. The counter status is read and tracked by parameter H. Error typeout occurs if the counter skips or counts too fast. (The oscillator pickoff should be jumpered at a low rate on the PA card.) When the count reaches I, the test ends.

H = Internal program counter (usually start at 1).
I = Highest counter desired before exiting.
K = Status G = Status-1

Test 2 is similar, but the count is not checked. Test 2 is in the Sample Rate mode. When the count reaches G, an interrupt is generated and acknowledged. (Interrupt 11)(B) is expected.)

Test 3 creates a test loop for observing the sample rate generator sync pulse output.

NOTE

The following diagnostic test routine printout represents the Teletype output for each routine. Underscored comments are program documentation, not user input.

1572 Sample Rate Generator

LIST

```
1.0 MSG, THIS IS A COMBINATION TEST FOR THE 1572 IMP/MOD.
1.1 MSG, TEST 1.  CTR. CK.  H=PASS CT.  I=PRESET NO. OF PASSES DESIRED
1.2 DEFN, H, I
2.0 RITE, 400, 1
2.1 RITE, 403, 500                    Elapsed Time mode
3.0 READ, 402, G
3.1 GOTO, 3.2
3.2 STOR, G, K
4.0 IFEQ, G, H, 3.0
4.1 IFLT, G, H, 3.0
5.0 SUB, G, 1, G
6.0 IFEQ, G, H, 7.1
7.0 GOTO, 8.0
7.1 IFEQ, H, I, 9.1
7.2 GOTO, 7.3
7.3 ADD, 1, H, H
7.4 GOTO, 2.1
8.0 TYPE, G, H, K
8.1 IFSK, 9.0
8.2 GOTO, 2.0
9.0 EXIT
9.1 TYPE, H, I
9.2 MSG, END OF TEST 1.  EXECUTE STATEMENT 10.0 FOR TEST 2.
9.3 EXIT
10.0 MSG, SAMPLE RATE GEN MODE/INTERRUPT LINE 11.  G= DESIRED COUNT.
11.0 DEFN, G
12.0 RITE, 400,1
13.0 RITE, 403, 2, 400
14.0 RITE, 402, G                     Set Compare register
15.0 RITE, 403, 8900                  Set Sample Rate mode
16.0 INT, 800, I
17.0 IFEQ, I, B, 19.0
18.0 GOTO, 16.0
19.0 TYPE, I
19.1 RITE, 403, 2, 400
19.2 MSG, END OF TEST 2.  EXECUTE STATEMENT 20.0 FOR TEST 3.
19.3 EXIT
20.0 MSG, TEST 3.  PULSE LOOP TEST.  G=F FOR GOOD DELAY.
20.1 MSG, EXIT/SKIP SW.  STOP/CLEAR.
21.0 DEFN, G
22.0 RITE, 400, 1
23.0 RITE, 403, 2, 400
24.0 RITE, 403, 8900
25.0 RITE, 402, G
26.0 DELY, 100
```

1572 Sample Rate Generator (Continued)

```
27.0 IFSK, 29.0
28.0 GOTO, 23.0
29.0 MSG, END OF TEST 3.
29.1 EXIT


EXEC

 THIS IS A COMBINATION TEST FOR THE 1572 IMP/MOD
 TEST 1. CTR. CK. H=PASS CT. I=PRESET NO. OF PASSES DESIRED

H=1
                (THIS COMBINATION TAKES ≈65 SECONDS TO EXECUTE.)
I=FFFE

H=FFFE I=FFFE
 END OF TEST 1. EXECUTE STATEMENT 10.0 FOR TEST 2.

EXEC, 10.0

 SAMPLE RATE GEN MODE/INTERRUPT LINE 11. G= DESIRED COUNT.

G=FFFF(—► THIS VALUE TAKES ≈65 SECONDS TO EXECUTE.)

I=000B
 END OF TEST 2. EXECUTE STATEMENT 20.0 FOR TEST 3.

EXEC, 20.0

 TEST 3. PULSE LOOP TEST. G=F FOR GOOD DELAY.
 EXIT/SKIP SW. STOP/CLEAR.
G=F
 END OF TEST 3.
```

1573 Line Sync Generator

This test has two parts:

Part one reads and types DCT status, then enters a loop enabling and disabling the 1573 from the sync 1 line in the DCT. The sync 1 driver in the DCT (T. P. 23, card 20) may be monitored.

Part two enables the line sync interrupt, accepts it, types it, acknowledges it, and repeats in a loop.

Part 1 H = 6000
K = 9000

Part 2 H = 9000

The line sync should be set up per the manual procedure.

1573 Line Sync Generator

```
LIST

1.0 MSG, A0-RDY, A4=INTR, A6=1573
1.1 MSG, LINE SYNC TEST, TP23, CARD 20
2.0 DEFN, H, K
3.0 READ, 400, G
4.0 TYPE, G
5.0 RITE, 400, H
6.0 RITE, 400, K
7.0 GOTO, 5.0
7.1 MSG, NEW TEST, INTERRUPT ON LINE 2.
8.0 DEFN, H
9.0 RITE, 400, H
10.0 INT, 4, J, 0
11.0 IFEQ, J, 4, 10.0
12.0 RITE, 401, 0
12.1 TYPE, J
13.0 GOTO, 10.0


EXEC

 A0-RDY, A4=INTR, A6=1573
 LINE SYNC TEST, TP 23, CARD 20
```

1573 Line Sync Generator (Continued)

```
H=6000

K=9000

G=0051

EXEC, 7.1

 NEW TEST, INTERRUPT ON LINE 2.

H=9000
INT LINE 0002

J=0002
INT LINE 0002

J=0002
```

1577 Stall Alarm Test

This test repeatedly clears the 1577 after a desired time period.

When the period is short enough, no alarm occurs. When the time is too long, the alarm sounds.

X = Time number

An X of 275 results in about a 100 ms period. Numbers larger than this result in alarms.

The alarm must be reset manually.

1577 Stall Alarm Test

```
LIST

1.0 MSG,STALL ALARM TEST PROGRAM.
1.5 MSG,X=$275 TO GIVE DELAY TIME OF 100 MILLISECONDS
2.0 DEFN,X
3.0 STOR,X,G
4.0 SUB,G,1,G
5.0 IFEQ,G,0,7.0
6.0 GOTO,4.0
7.0 RITE,408,5
8.0 GOTO,3.0


EXEC

 STALL ALARM TEST PROGRAM.
 X=$275 TO GIVE DELAY TIME OF 100 MILLISECONDS
```

1544/1553 Compare Test

This test outputs a data pattern to 1553 channels and reads the complements back through the 1544. The output and input are compared (H+S = 0) and a typeout occurs on errors.

Eight channels are tested (as written).

The data is incremented by one after each pass through the channels. A two-word pass counter (P and Q) allows FFFF FFFF passes (many hours).

Setting the Skip switch exits the program.

The test is useful for long runs while performing margin, temperature or transient tests.

H = Start of data (usually 0)
J = 9000 (starting channel, test 0-7)
J = 9008 (starting channel, test 8-F)

There is no typeout suppression, so repeated errors will produce much Teletype paper.

1553/1544 Compare Test

LIST

```
1.0 DEFN, H, J
1.2 STOR, O, Q
1.3 STOR, O, P
1.5 RJTP, 1
2.0 STOR, 9000, G
2.5 STOR, J, K
3.0 RITE, G, H, 400
3.5 IFSK, 15.0
4.0 READ, K, S, 400
5.0 ADD, H, S, T
6.0 IFEQ, T, O, 8.0
7.0 TYPE, H, S, K
8.0 ADD, 1, G, G
8.5 ADD, 1, K, K
9.0 IFLT, G, 9008, 3.0
10.0 ADD, 1, P, P
10.5 ADD, 1, H, H
11.0 IFNE, P, FFFF, 2.0
12.0 ADD, 1, Q, Q
```

1553/1544
Compare Test
(Continued)

```
13.0 IFNE,Q,FFFF,2.0
14.0 TYPE,Q
15.0 EXIT


EXEC

H=0

J=9000

TYPE,G,H,J,K,S,T,P,Q

G=9000 H=13F0 J=9000 K=9000 S=EC10 T=0000 P=13F0 Q=0000
```

1544/1553 Digital Input/Output Test

This test outputs desired data words to the 1553 and reads the complements back through the 1544. No comparison is done.

The 1553 must be cabled to the 1544.

Channels 0-7		Channels 8-F	
Chan.	1553 1554	Chan.	1553 1544
0, 1	J1 - J1	8, 9	J1 - J5
2, 3	J2 - J2	10, 11	J2 - J6
4, 5	J3 - J3	12, 13	J3 - J7
6, 7	J4 - J4	14, 15	J4 - J8

H = First channel
J = Last channel
K = Data (in hex)
L = 2 for typeout
L = 0 for no typeout

The sequence repeats unless the Skip switch is set. The 1545 sync's are not checked.

1544/1553 Digital Input/Output Test

```
LIST

1.0 DEFN, H, J, K, L
1.1 RJTP, 1
2.0 STOR, 9000, G
2.1 RITE, G, K, 400
2.2 ADD, 1, G, G
2.3 IFGT, G, 9007, 3.0
2.4 GOTO, 2.1
3.0 RDGI, H, J, M, L, 400
3.1 IFSK, 4.0
3.2 GOTO, 3.0
4.0 EXIT


EXEC

H=0

J=7
```

1544/1553 Digital Input/Output Test (Continued)

K=0

L=2

DGI CHANL 0000 IS FFFF

DGI CHANL 0001 IS FFFF

DGI CHANL 0002 IS FFFF

DGI CHANL 0003 IS FFFF

DGI CHANL 0004 IS FFFF

DGI CHANL 0005 IS FFFF

DGI CHANL 0006 IS FFFF

DGI CHANL 0007 IS FFFF

1547 Event Counter

Channel 0 of 1553 is used to increment each counter. The counter is checked after each count and typeout occurs with any error. The counter is preset to all 1's and checked, then preset to all 0's and checked.

Variable	
T = 0000	Preset all 0's.
U = 00FF	Preset all 1's.
V = 0400	DCT station (connect) address.
W= 545F or 1	Clear everything function to DCT.
X = 9000	1553 channel 0 address.
Y = 9200	1547 counter 0 address.
Z = 00FF	End-of-count.
G = Counter status	
H = Program counter	

Channel 0 of 1553 (J1) must be cabled to input of 1547 (J1). Cable must be moved to check counters other than counter 0.

The counter address, total count, and presets are variables.

Interrupt on end-of-count is not checked with this test.

1547 Event Counter

LIST

```
1.0 MSG, EVENT COUNTER COUNT TEST
2.0 MSG, T=0000, U=00FF, V=0400, W=545, X=9000, Y=9200, Z=00FF
3.0 DEFN, T, U, V, W, X, Y, Z
4.0 RJTP, 3.0
5.0 RITE, V, W                    Clear
6.0 RITE, Y, U, V                 Preset event counter to 00FF
7.0 READ, Y, G, V
8.0 IFNE, G, U, 32.0              Check counter status
9.0 RITE, Y, T, V
10.0 READ, Y, G, V                Preset event counter to 0000
11.0 IFNE, G, T, 29.0             Check counter status
12.0 STOR, 1, H
13.0 RITE, X, 1, V                Set 1 in 1553
14.0 DELY, 1
15.0 RITE, X, 0, V                Set 0 in 1553
16.0 DELY, 1
17.0 READ, Y, G, V                Read counter status
18.0 IFNE, G, H, 22.0             + check + 1
```

1547 Event Counter (Continued)

```
19.0 ADD,1,H,H                    Increment program counter
20.0 IFEQ,H,Z,27.0                End-of-count check 00FF
21.0 GOTO,13.0
22.0 MSG,COUNTER ERROR. SHOULD BE
23.0 TYPE,H
24.0 MSG,IS
25.0 TYPE,G
26.0 GOTO,34.0
27.0 MSG,END OF COUNT TEST
28.0 GOTO,34.0
29.0 MSG,COUNTER PRESET ERROR. SHOULD BE 0000,IS
30.0 TYPE,G
31.0 GOTO,12.0
32.0 MSG,COUNTER PRESET ERROR. SHOULD BE 00FF,IS
33.0 TYPE,G
33.1 GOTO,9.0
34.0 EXIT
```

```
EXEC

 EVENT COUNTER COUNT TEST
 T=0000, U=00FF, V=0400, W=545F, X=9000, Y=9200, Z=00FF

T=0
U=00FF
V=0400
W=545F
X=9000
Y=9200
Z=00FF
 END OF COUNT TEST
```

1549 Interrupt Expander

This test uses the 1553 (Digital Output) to cause interrupts to the 1549. The Mask register in the 1549 is loaded for each interrupt. The complement of the mask is loaded into the 1553 and causes an interrupt to occur in that position in the 1549. (The complement is used because of the inverting by the signal conditioners.)

16 Interrupts are generated from channel 0 of the 1553, and connected to each group in turn by moving the cable and repeating the test.

	1553		1549	Mask Station G	Acknowledge Station H
(16 Interrupts)	J1	Cable →	-J1	414	410
			-J2	415	411
			-J3	416	412
			-J4	417	413

Move Card 34 → 35
37 → 38

To get from "Form C" inputs to "Ready-Resume" logic level inputs.

Interrupt jumper: slot 8 pin 9 to slot 9 pin 7 (Interrupt 12). Group 1 all 16 bussed together slot 8.

9-11-13------39

1549 Interrupt Expander

LIST

```
1.0 RJTP,1
2.0 DEFN,G
2.1 SUB,G,4,H
2.2 RITE,400,1                  Clear
3.0 STOR,1,M
3.1 RITE,9000,FFFF,400          All 1's to 1553 zero interrupts
4.0 RITE,G,M                    Set Mask
5.0 READ,H,S
5.1 IFEQ,S,0,6.0
5.2 TYPE,S,M                    Status check and loop if error
5.3 GOTO,3.1
6.0 SUB,FFFF,M,K
6.1 RITE,9000,K,400             Complement of M to 1553
6.2 INT,FFFF,I,1
6.3 IFEQ,FFFF,I,6.2             Wait for interrupt
```

1549 Interrupt Expander (Continued)

```
6.4 GOTO,6.5
6.5 READ,H,S  }
6.6 TYPE,S    }   Type status
7.0 GOTO,7.1
7.1 IFEQ,S,M,8.0  }
7.2 TYPE,S,I,M    }   Error typeout
7.3 GOTO,3.1
8.0 RITE,H,M,400          Acknowledge interrupt
8.1 READ,H,S      }
8.2 IFEQ,S,O,9.0  }   Check status
8.3 TYPE,S
8.4 GOTO,8.0              Clear interrupt at 1553
9.0 RITE,9000,FFFF,400
9.1 ADD,M,1,M
9.2 IFEQ,M,10,10.0
9.3 GOTO,3.1
10.0 TYPE,M   }
10.1 EXIT     }   End of test
```

```
EXEC

G=414
INT LINE 0012

S=0001
INT LINE 0012

S=0002
INT LINE 0012

S=0003
INT LINE 0012

S=0004
INT LINE 0012

S=0005
INT LINE 0012

S=0006
INT LINE 0012

S=0007
INT LINE 0012
```

1549 Interrupt Expander (Continued)

S=0008
INT LINE 0012

S=0009
INT LINE 0012

S=000A
INT LINE 0012

S=000B
INT LINE 0012

S=000C
INT LINE 0012

S=000D
INT LINE 0012

S=000E
INT LINE 0012

S=000F

M=0010

1583 I/O Typewriter

This test is an "echo" test. One types a character, and the program immediately types it back.

Executing the test, the program turns on the typewriter and unlocks the keyboard.

The Computer-Manual switch on the typer box must be in computer position.

"Non-echo" characters are upper and lower case; red and black ribbon, etc. See manual for codes. These may be done by Direct OLYMPUS commands:

RITE,430,46,400 (red ribbon)

All echo characters may now be done in red, upon re-executing the program. (On our Selectrics, upper and lower case are the same type.)

Machine functions (Keyboard Lock, Power On/Off) may also be done by Direct OLYMPUS commands:

RITE,431,25,400 (power off)
G = Interrupt line (6)
S = Status
K = Character code
T = Test (for busy loop)

Address is for typer one.

1583 I/O Typewriter

LIST

```
2.0 RITE,431,95,400          Clear
2.1 READ,431,S
2.2 AND,S,3,T                Busy loop
2.3 IFEQ,3,T,3.0
2.4 GOTO,2.1
3.0 INT,40,G                 Wait for input character
3.1 IFEQ,G,FFFF,3.0
3.2 IFEQ,G,6,4.0             Error on interrupt
3.3 TYPE,G
4.0 READ,431,S
4.1 AND,S,3,T                Busy loop
4.2 IFEQ,3,T,5.0
4.3 GOTO,4.0
5.0 READ,430,K,400           Read character
```

1583 I/O
Typewriter
(Continued)

```
5.1 RITE,431,95,400      Acknowledged character
5.2 RITE,430,K,400       Type character back
6.0 READ,431,S
6.1 AND,S,3,T            }
6.2 IFEQ,3,T,7.0         } Busy loop
6.3 GOTO,6.0
7.0 GOTO,2.0
```

EXEC

RITE,430,45

EXERCISE - DC115B, FR102C, 1544, 1553

Information

Description

This OLYMPUS program operates in the Indirect mode. The operator types in two parameters upon request by the program. If buffered operation is requested, the FR102C is directed to a buffer(s) located in core loaded previously by the operator. Two input instructions follow the output: one for status and one for NMA. Printout occurs for each if the Skip switch is down. The data buffer for buffered-read instructions must be examined by exiting the program.

Program length 400_{16} (Figure C1.)

Instructions

1. Load Buffer(s) where desired in core, 13_{10} words each.
   a. For basic buffer see page C.20.
   b. For modification to basic buffer see page C.21.
2. Execute program from beginning (EXEC, 1.0).
   a. For W & I entries see pages C.21-C.23.
   b. For definition of status bits and NMA see page C.23.
   c. To exit program to check buffer(s), enter (cr) when asked for value of W by typewriter (Skip switch must be down).

PROGRAM

```
1.0 MSG, EXERCISE - DC115B, FR102C, 1544, 1553
1.1 RJTP, 3
2.0 W = WES, I = INSTRUCTION
2.1 DEFN, W
3.0 DEFN, I
4.0 RITE, W, I
5.0 AND, W, FFF7, G
5.1 READ, G, S
```

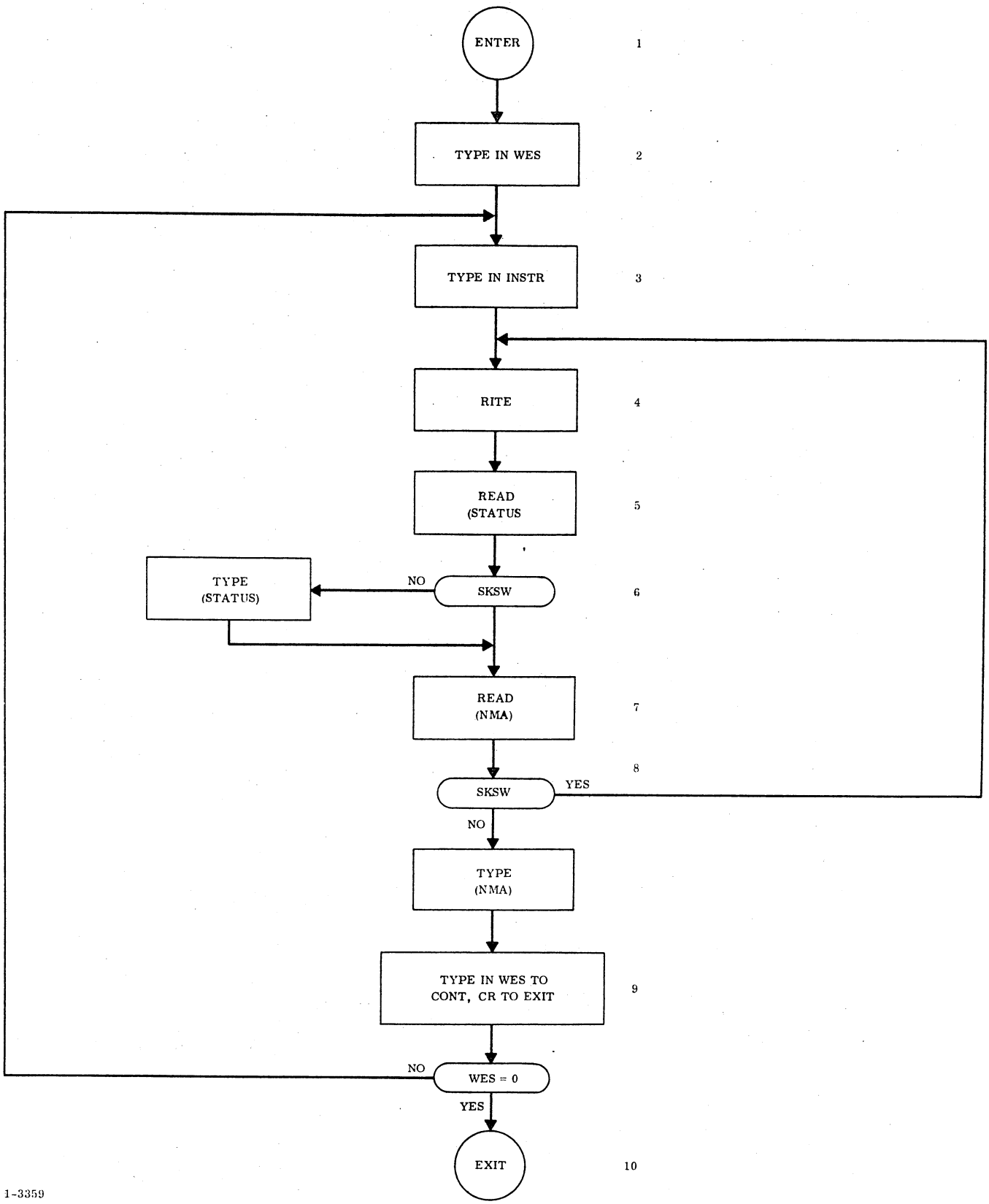


Figure C1. Exercise - DC115B, FR102C, 1544, 1553 Flowchart

```
6.0 IFSK,7.0
6.1 TYPE,S
7.0 ADD,G,8,H
7.1 READ,H,N
8.0 IFSK,4.0
8.1 TYPE,N
9.0 DEFN,W
9.1 IFNE,W,0,3.0
10.0 EXIT
```

BASIC BUFFER (Output and Terminate)

Core Location	Contents	Description
FWA	8255	Output and Disable Terminate and Interrupt
FWA+1	E000	First and next Ch. = 0
FWA+2	9008	Last Ch. +1 = 8
FWA+3	(LMA)	*Last memory address (FWA+B)
FWA+4	(Ch. 0)	Data
FWA+5	(Ch. 1)	Data
FWA+6	(Ch. 2)	Data
FWA+7	(Ch. 3)	Data
FWA+8	(Ch. 4)	Data
FWA+9	(Ch. 5)	Data
FWA+A	(Ch. 6)	Data
FWA+B*	(Ch. 7)	Data
FWA+C	8000	Terminate

MODIFICATIONS TO BASIC BUFFER

Mod	Core Location	Contents
1. Input and terminate	FWA	8155
2. Chain	FWA+C	(New FWA)
3. Enable T on EOS (terminate End of Sequence)	FWA	8256
4. Enable NT on EOS	FWA	8259
5. Enable NT on EOB (End of Block)	FWA	8265
6. Enable NT on EOP (End of operation).	FWA	8295
7. Reset Ch. Address control	FWA	8455

BASIC INSTRUCTIONS

1. Output instruction to start buffered operation

   RITE, W, I

   W = WES (Execute 460-465)

   I = FWA (first-word address of memory block)

2. Input instruction to check status

   READ, W, I

   W = WES (Execute 460-465)

   I = core location to store status

3. Input instruction to check NMA (next memory address)

   READ, W, I

   W = WES (Execute 468-46D)

   I = core location to store NMA

*These two instructions are contained in program and require no entries from operator.

4. Output instruction to stop buffered operation

RITE, W, I — W = WES (Execute 468-46D)
I = 0001

5. Output instruction to restart buffered operation

RITE, W, I — W = WES (Execute 468-46D)
I = 0002

6. Output instruction to reset EOS NT FF

RITE, W, I — W = WES (Execute 468-46D)
I = 0003

7. Output instruction to reset EOB NT FF

RITE, W, I — W = WES (Execute 468-46D)
I = 0004

8. Output instruction to reset EOP NT FF

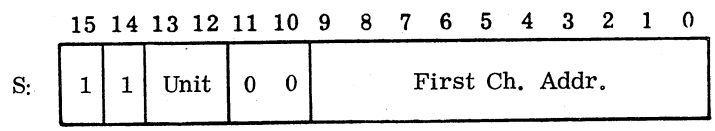
RITE, W, I — W = WES (Execute 468-46D)
I = 0010

9. Output instruction to clear controller

RITE, W, I — W = WES (Execute 400)
I = 0001

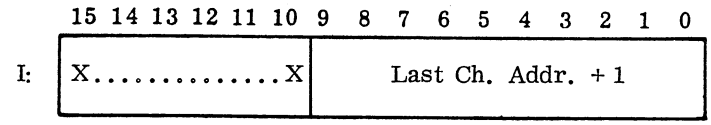
*10. Output instruction to set up Sequential Channel Address

RITE, S, I, W



Unit	SAM jumpers card position 42 (FR102C)
01	42-44, 45-46
10	40-42, 43-44
11	40-42, 45-46, 47-48

*Instructions 10 and 11 can be executed only by replacing statements 4.0 and 5.1 (or 7.1). See Teletype printout, page C.18.



W = WES (Execute 468-46D)

*11. Input instruction to check Next Channel Address

READ, S, I, W

S: Same as above (bits 10-15 only required)

I = Core location for NCA to be stored

W = WES (Execute 468-46D)

FR102C (1571B) STATUS

Bit	Definition
0	Ready
1	Busy
2	EOS
3	EOB
4	EOP
8	Protect Fault
9	Output Mode
10	True, if no 1572

FR102C (1571B) NMA

Bits 0-15	Next core location to be accessed.
Bit 16	If 0, bits 0-15 OK
	If 1, bits 0-15 changed during input and are invalid.

*Instructions 10 and 11 can be executed only by replacing statements 4.0 and 5.1 (or 7.1). See Teletype printout, page C.18.

Appendix D

GLOSSARY OF TERMS

MF	1700 Computer Main Frame
TTY	1711, 1712, or 1713 Teletypewriter
PTP	1723/1724 Paper Tape Punch
PTR	1721/1722 Paper Tape Reader
DRUM	1751/1752 Drum Controller and Drum
DISK	1738/1739 Disk Controller and 853 Disk Drive Unit
MTAPE	1731 Magnetic Tape Controller and 601 Magnetic Tape Transport
LPRT	1742 Line Printer
UNIT NUMBER	The Unit Number of a Magnetic Tape Transport
CR	1729 Card Reader or Carriage Return
LF	Line Feed
B	Bell on Teletype
(cr)	A Line Feed followed by a Carriage Return
RELOCATABLE BINARY	The format of output of a compiled or assembled program including control information regarding program name, entry points, externals, transfer address, and command sequence storage. A program in this form may be absolutized by a relocating loader. NOTE: Assembler output tapes are in relocatable form
RUN ANYWHERE PROGRAM	A program which, when absolutized, may be moved elsewhere in core and run at that location successfully. This is accomplished by using relative addressing.

ABSOLUTE TAPE	A tape which is composed of command sequence storage information only. Tapes of this type may be loaded by a Bootstrap Loader.
MSB DRUM	Most significant 16-bits of the two-word, drum address.
LSB DRUM	Least significant 15-bits of the two-word, drum address.
Parameter List	Statement list following the mnemonic. (For the purposes of this manual only.)
BOOTSTRAP LOADER	A short program, normally entered into the computer via the Maintenance Panel, which will read command sequence storage information into core. See paragraph 2.2.2. A Bootstrap is used to initially start up the computer.
STATEMENT	A group of up to eight fields of hexadecimal numbers which, together with the MNE, make up a call for an OLYMPUS subprogram. In the Indirect mode of operation the statement number is included.
LABELED STORAGE	A group of twenty cells which may be referenced by one of the letters G-Z.
DIRECT MODE	A mode of operating OLYMPUS in which each statement input via the TTY is executed immediately.
INDIRECT MODE	A mode of operating OLYMPUS in which a predefined sequence of OLYMPUS statements are executed in a user-defined order.

COMMENT SHEET

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