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IBM 7090/7094 Programming Systems FORTRAN II Input/Output Package

This publication describes a common input/output package, the IBM 7090/7094 FORTRAN II Input/Output Package, which is used by the 7090/7094 FORTRAN II System for all input and output operations. This Input/Output Package is used by the 7090/7094 FORTRAN II Monitor System operating independently and by the 7090/7094 FORTRAN II Processor operating under the 7090/7094 IBSYS Operating System. The Input/Output Package can perform tape, printer, and punch operations (and on-line card reading in the independent version of FORTRAN II).

This material is of a highly specialized nature and is intended for the experienced programmer who is familiar with the 7090/7094 FORTRAN II System and 7090/7094 symbolic machine language.

PREFACE

This publication describes a common input/output package, the IBM 7090/7094 FORTRAN II Input/Output Package, which is used by the 7090/7094 FORTRAN II System for all input and output operations. This Input/Output Package, hereafter referred to as the I/O Package, is used by the independent 7090/7094 FORTRAN II Monitor System and by the 7090/7094 FORTRAN II Processor operating under the 7090/7094 IBSYS System Monitor. This publication describes both versions of the I/O Package and compares the purposes, use, and operation of the two versions.

The minimum machine requirements for the use of the FORTRAN II System are found in the publication IBM 7090/7094 Programming Systems: FORTRAN II Programming, Form C28-6054.

The material contained in this publication is of a highly specialized nature and the programmer is expected to be familiar with the 7090/7094 FORTRAN II System and 7090/7094 symbolic machine language. This publication is supplemented by information contained in the following publications:

IBM 7090/7094 Programming Systems: FORTRAN II Programming,
Form C28-6054

IBM 7090/7094 Programming Systems: FORTRAN II Operations,
Form C28-6066

IBM 7090/7094 Programming Systems: FORTRAN II Assembly Program (FAP),
Form C28-6235

IBM 7090/7094 Programming Systems: System Monitor (IBSYS),
Form C28-6248

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GENERAL DESCRIPTION

The 7090/7094 FORTRAN II System uses a common I/O Package for all input and output operations. The I/O Package under the independent version of FORTRAN II is presently capable of performing tape (read, write, space), on-line printer (including clock), on-line punch, and on-line card-reader operations. Card-reader and clocking operations are not provided when operating under IBSYS. An additional feature is available in both versions for taking Snapshot dumps at any time the I/O Package is in use, including object program execution, provided logical tape 9 is available for this purpose.

The I/O Package is made available to object programs by use of the Type 1 monitor control card *IOP. The symbols referred to in this publication are defined for a FAP assembly by use of the SST pseudo-operation assembled under the appropriate version of the monitor. If the I/O Package is to be used, it should handle all input and output of the object program with the possible exception of input and output using IOEX. The I/O Package is self-checking, and errors are listed on the printer. The I/O Package of the independent version of the FORTRAN II System complies with DS Programming Systems Tape Error Recovery Standards. In addition, statistics are compiled for each logical tape. Statistics include:

1. Number of records written
2. Number of records read
3. Number of redundancy errors writing
4. Number of redundancy errors reading
5. Number of noise records written
6. Number of noise records read
7. Number of positioning errors reading

The I/O Package saves all registers and indicators upon entry to it, and restores them before returning to the caller. The "set tape density" feature is an exception and destroys the contents of the accumulator. Calling sequences to the I/O Package may be modified before or after initiating an input/output operation. The I/O Package retains all pertinent information within itself, including the input/output commands. The use of index registers and an indirect addressing scheme are unrestricted in calling sequences and may extend to any depth.

The I/O Package incorporates a provision for the labeling of binary records. All binary records internal to the compiler are labeled. Source program input records, the compilation listing and the binary object program records are the only unlabeled records. The labels are unique for each movement of a table from one tape position to another.

Noise records are defined as records fewer than three words in length. Every labeled record (including one of zero word count) will have a three word label appended to it by the I/O Package when writing. The I/O Package will check and delete the label when reading. Because record length in the independent version of FORTRAN II is checked by IOP prior to a redundancy check, a short, unlabeled record will be considered

a noise record and will be ignored. The labels are also used by the I/O Package to determine whether or not the correct record of information has been read. If a tape positioning error has occurred, the label permits the I/O Package to directly locate the desired record.

I/O PACKAGE UNDER THE IBSYS SYSTEM MONITOR

For the FORTRAN II Processor, the I/O Package forms an interface between FORTRAN (including IBSFAP) and IOEX. All data transmission and forward skips are performed using trapping (IOEX); non-data operations are performed using (NDATA).

Because the system may reside on disk, a special test is made for calls involving logical unit 1. If a call is made for logical unit 1 and the unit is on a 7909 channel, the System Load routine (SYSLDR) is used for reading.

The following material applies to both versions of the I/O Package except where otherwise noted.

Entry points to the I/O Package are:

- (LOAD) - Reads next system record from the system tape.
- (DIAG) - Calls the General Diagnostic.
- (TAPE) - Performs all tape operations (reading, writing, and spacing).
- (PRNT) - Prints BCD on-line.
- (PNCH) - Punches cards on-line.
- (READ) - Reads cards on-line.*
- (STAT) - Locates tape statistics.
- (REST) - Restores console and registers.
- (STDN) - Sets tape densities high or low.
- (SECL) - Calls the Source Program Error Record.
- (MECL) - Calls the Machine Error Record.

Communications cells within the I/O Package are:

- (ES1S) - Logical Sense Switch 1*
- (ES2S) - Logical Sense Switch 2*
- (ES3S) - Logical Sense Switch 3*
- (ES4S) - Logical Sense Switch 4*
- (ES5S) - Logical Sense Switch 5*
- (ES6S) - Logical Sense Switch 6*
- (PGCT) - Decrement field contains the number of lines to output per page.
- (LIBT) - Decrement field contains the logical tape number of the library file.
- (DATE) - Current date.
- (SNCT) - Count of SNAPSHOTs taken.
- (MSLN) - Flag cell for error records.
- (ENDS) - Current END switch settings for FAP output options.
- (FGBX) - Address field contains the location of FLAG BOX.

* Relevant to independent FORTRAN II Monitor System only.

- (LNCT) - Address field contains the location of LINE COUNT.
- (SCHU) - Base of store channel table.
- (LODR) - Entry point and record number times ten of current system record. **
- (LBLD) - Load address for library prior to relocation. **

** Relevant to FORTRAN II Processor under IBSYS only.

TAPE READING AND WRITING

The calling sequence to read or write a record is:

```
TSX (TAPE), 4
PZE IOCOM, T1, (****)
PZE LABEL, T2, TAPNO
PZE ERRET, T3, 0
```

T1, T2, and T3 are index registers 1, 2, and/or 4.

IOCOM, T1 is the location of the first input/output command of a list of not more than five commands. The command list should not include commands to read or write more than one record, and should not contain a TCH unless more than five commands are required to read or write the record. If more than five commands are needed, the fifth command must be a TCH to the sixth. Only the first five commands are retained by the I/O Package, and those in excess of five may not be modified until a positive check has been made of the operation. When operating under IBSYS, if the number of commands exceeds five, the list should end with an IOCT, IORT, or IOST command.

(****) is the operation mnemonic:

(RDNC)	(RDEC)	(RDNP)	(RDEP)
(RBNC)	(RBEC)	(RBNP)	(RBEP)
(WBNC)	(WBNP)	(WDNC)	(WDNP)

Mnemonic character definitions are:

R	Read	W	Write
B	Binary	D	Decimal
E	End of file permitted.		
N	End of file not permitted.		
C	Delay and check operation immediately.		
P	Initiate operation and proceed, check later.		

An additional operation (WROW) writes row binary card images on tape in a format, such that the cards produced by a peripheral tape to punch operation will be row binary cards.

An unchecked operation "P" will be checked when another input/output operation calls for the same channel. However, since all tapes may be on different channels, the operation cannot be assumed to have been checked until the same tape is called for again.

LABEL, T2 is the location of a BCD word describing the data being transmitted. Labels may be 1 through 6 characters, left-justified and filled out with blanks. All internal records must be labeled. Source program input records, the compilation listing, object program deck output and chain tape records are the only records which will be unlabeled. The labels are unique for each movement of a table from one tape position to another. If LABEL, T2 = 0, a label will not be expected when reading, or will not be appended when writing.

A list of labels for records written by each section of FORTRAN is attached.

TAPNO is the logical tape number. The input/output unit table (9FIOPU00) currently accepts Logical Tape numbers 1-16.

<u>Logical</u>	<u>Physical</u> (Independent FORTRAN II)	<u>System Function</u> (FORTRAN II Processor)
1	A1 A1	SYSLB1
2	B2 A4	SYSUT3
3	B3 B4	SYSUT4
4	A4 A3	SYSUT1
5	A2 RD	SYSIN1
6	A3 B1	SYSOU1
7	B4 B2	SYSPP1
8	B1 B3	SYSUT2
9	A5	SYSCK1
10	B5	SYSCK2
11	A6	SYSUAV, 0, 1
12	B6	SYSUAV, 1, 1
13	A7	SYSUAV, 0, 2
14	B7	SYSUAV, 1, 2
15	A8	SYSUAV, 0, 3
16	B8	SYSUAV, 1, 3

ERRET, T3 is an optional error return address. It is not permitted to have indirect addressing. Special error procedures are not used normally. Instead, the fourth word of the calling sequence is omitted, and is the return from the I/O Package after initiating (and, if required, checking) the requested input/output operation. If ERRET, T3 does not exist, the I/O Package will follow a standard error procedure. Further, the operation code in the fourth word must include at least one bit in either the decrement field or in bit positions 2 and/or 3 of the prefix field. If ERRET, T3 does exist, return will be made to the fifth word of the calling sequence, while an error return will be made as specified. The error return will not be made immediately upon discovery of an error unless it is a delay and check operation. In the case of an error on a proceed operation, the error return will be taken when the same logical unit is called for again, not at the time that another unit on that channel is used. The contents of the registers will be restored to the condition of the current call to the I/O Package. In a call for (SNAP), (TPER) or space backwards, the use of ERRET, T3 is not significant; however, it will be treated properly. A call for tape operation can not be followed by the instruction HTR since it would be interpreted as an error return address.

When return is made to ERRET, T3 the location of (SCHU) + TAPNO will be set as follows:

Bit Position "ON"	Indication
S, 1&2	Internal to I/O Package
3-17	Address field obtained from execution of an SCHX when a permanent redundancy error has occurred in reading. Otherwise, the contents of this field are internal to the I/O Package.
18-27	Internal to I/O Package.
28	Tape is at beginning of file (used by I/O Package under IBSYS only).
29	Record has been read in the wrong mode.
30	Internal to the I/O Package.
31	I/O Check indicator on.
32	Redundancy error.
33	End of file read.
34	End of tape sensed.
35	Beginning of tape sensed.

If the error was an attempt to read in the wrong mode, the I/O Package positions the tape in front of the record in error before taking the error return except on a permanent read redundancy error. In the event of an error on an intermediate tape, execution, compilation and/or assembly may be suspended. The system output tape, Logical Tape 6, is an exception. The I/O Package will automatically write a double end-of-file mark, rewind/unload the tape, inform the operator to mount a new tape, and rewrite the record on the new tape.

(SCHU) - The I/O Package will execute an SCHX into the location of (SCHU) + TAPNO following a read operation. If an end of file was sensed, and permitted, the contents of this cell will be set to zero. The contents of this cell will not be disturbed by a subsequent write or space operation, but only by another read operation on the same logical tape.

If an end of file has been sensed as the result of a read and proceed operation, the next request to read that logical tape will not be executed; instead, (SCHU) + TAPNO will be set to zero and the normal return taken.

Write End of File

The calling sequence to write an end-of-file mark on a tape is:

```

TSX (TAPE), 4
PZE ,, (****)
PZE LABEL, T2, TAPNO
PZE ERRET, T3

```

(****) is (WEFC) to delay and check the writing of the end-of-file mark or (WEFP) to initiate the WEFX operation and check later.

LABEL, T2 is the location of a BCD word describing the file.

TAPNO and ERRET are the same as for reading or writing.

Empty files may not be written on labeled tapes. If a particular table is the only information within a file, at least one record must be written. The record may be of zero length. It is necessary to write at least one record for a table in order to define the existence of the table. The I/O Package will not attempt to read a labeled table that does not exist.

Tape Spacing

The calling sequence to reposition a tape is:

```
TSX (TAPE), 4
PZE SKLST, T1, (****)
PZE LABEL, T2, TAPNO
PZE ERRET, T3
```

SKLST, T1 is the location of a skip command in the form:

```
PZE NRECS, ,NFILS for forward spacing
MZE NRECS, ,NFILS for backward spacing
```

NRECS is the count of records to be spaced, and
NFILS is the count of files to be spaced.

File spacing and record spacing may both be accomplished by a single call to the I/O Package. NFILS will be spaced before spacing NRECS. An end-of-file mark must be counted as a file.

Parameter peculiarities are:

```
PZE , , -1 causes the specified unit to be rewound
MZE , , -1 causes the specified unit to be rewound and
unloaded on the 7090
PZE 0, , 0 initiates nothing, but is interpreted as a request
to check the previous operation on the designated
unit effectively (TCOX).
```

(****) is (SKBP) or (SKDP) to space over binary or BCD information, respectively. The operation mnemonics specify that the skipping be checked later. (SKBC) or (SKDC) will cause the skipping operation to be checked immediately. In addition, a check immediate on a backspace operation will initiate a special procedure to test for the beginning of tape mark. In this case, the flags resulting from the backspace operation will be placed in the location of (SCHU) + 0 and must be interrogated before performing another input/output operation. The flags are set as indicated under the description of ERRET, T3.

LABEL, T2 is the location of the BCD label attached to the information being spaced to by this call.

It is not permissible to space into the middle of a multi-record table from outside of its file. It is necessary to space to the first record of that table, and then to the desired record within that table.

Forward spacing over mixed binary and decimal records will result in a redundancy error which will be noted on-line by a diagnostic message. This is a critical error, and the message may be suppressed by using error condition options described in another section.

Tape Checking

The calling sequence to check prior activity on a tape is:

```
TSX (TAPE),4  
PZE TAPNO, T1, (CHKU)
```

The I/O Package will compute the logical tape number by subtracting the contents of index register T1 from the number TAPNO. Of course, if no index register is specified, the logical tape number is TAPNO.

The calling sequence to check prior activity may be used to close out all tapes at the end of a section by means of:

```
AXT TAP, T1  
TSX (TAPE),4  
PZE TAP+1, T1, (CHKU)  
TIX *-2, T1, 1
```

If there are any pending errors, normal diagnostic procedures will be followed, including return to the machine error records or to the error return specified in the calling sequence initiating the input/output operation.

Tape Availability

For FORTRAN II operating under IBSYS, the calling sequence required to change the status of tapes in the availability chain is:

```
TSX (TAPE),4  
PZE TAPNO, T1, (****)
```

(****) is either (SUNV) to remove a tape from the availability chain, or (SUAV) to replace it in the availability chain. If TAPNO, T1 is not given, tapes 11-16 will be removed or replaced.

Only the availability bit in the unit control block is affected by these calls. Availability chain addresses are neither created nor destroyed. Inter-system Reserve Units will not be affected.

Related Input/Output Errors

In the event that the I/O Package has not detected an input/output error, but some error related to input/output is discovered by the program (incorrect word count, secondary label, contents of the table, etc.), the following call should be made:

TSX (TAPE), 4
**1 ERROR, T1, (TPER)
**2 LABEL, T2, TAPNO
PZE ERRET, T3

ERROR, T1 is the location of a BCD word describing the program-discovered error (e.g., COUNT, LABEL, FORMAT, etc.).

LABEL, T2 is the location of the BCD label associated with the information in error, or a BCD word which describes the information (e.g., CITS, TIFGO, INPUT, etc.).

The following message will be printed:

(LABEL, T2) (ERROR, T1) ERROR.

Appended to the above message will be either of the following, depending upon the prefix **1:

PZE = CONDITION CAN NOT BE IGNORED.
MZE = CONDITION IGNORED.

Control will then be transferred to the machine error record if the prefix **2 is PZE, or to the caller if the prefix **2 is MZE.

It is not possible for the error return ERRET, T3 to be taken on a call to (TPER).

Error Condition Options

The program may exercise limited control over the I/O Package when an error occurs. The prefixes in the calling sequence are used to transmit the control information.

TSX (TAPE), 4
**1 Variable
**2 Variable
**3 ERRET, T3

**1 = PZE Print "CONDITION CAN NOT BE IGNORED"
MZE Print "CONDITION IGNORED"

**2 = PZE Check labels when reading
MZE Do not check labels when reading

This prefix is used to control subsequent action in the case of (TPER).

**3 = PZE Print error message.
MZE Do not print error message.

ON-LINE OPERATIONS

Printing

The calling sequence to print a line is:

```
TSX (PRNT),4  
*** FIRST,,COUNT
```

FIRST is the location of the first BCD word to be printed.

COUNT is the number of consecutive words to be printed starting with the location of FIRST. COUNT may not exceed 20 words (120 characters).

*** = PZE(PON) Print under program control.
Program control character is deleted.

MZE(MON) Print single space.
All characters are printed.

PON and MON indicate that the clock is to be printed with the line of BCD. In this case the first six characters must be blanks, not zeros. The first character may be a program control character.

The following calling sequence is restricted to clocking operations and may not be used to print a line of BCD information. However, the clock will be printed.

```
TSX (PRNT),4  
*** FIRST,,1
```

*** = PTW Read clock into given core location.
MTW Reset clock to the value in the given core location.

In a strict clock call, the location of FIRST contains a six digit BCD number, 000000-999999.

There are no error returns from the print routine. All printer operations are considered successful.

The clocking routines in the I/O Package are coded to use the 716 Printer Program Accounting Clock - RPQ 78054.

The clocking operation may not be used in 7090/7094 FORTRAN II operating under the IBSYS Basic Monitor.

Card Punching

The calling sequence to punch a card image is:

```
TSX (PNCH),4  
*** FIRST,,COUNT
```

*** = PZE Punch row binary. The number of words may exceed a card image.

 MZE Punch column binary. The routine assumes a 24 word row binary card image in core, with the 7-9 column binary bits included in the decrement field and check sum. Therefore, there can not be any hash within this 24 word image.

 PON Punch Hollerith. The input to the I/O Package is a BCD character string of up to 12 words (72 characters) in length.

FIRST is the location of the first word of the string to be punched.

COUNT is the count of consecutive locations starting at FIRST which are to be punched.

There are no error options with the on-line card punch. All operations are considered successful. Any errors will be merely noted on the printer.

Card Reading

The calling sequence to read a card is:

```
TSX (READ),4
*** FIRST, ,COUNT
```

*** = PTW Initiate operation, delay and check.
 MTW Initiate operation, check later.
 (This is similar to a proceed operation when reading tape)
 SVN Simulate load button.

FIRST is the first location the information is to be read into.

COUNT is the number of words to be read under count control.

The load address and word count are inserted into an IOCT command. Therefore, more than one card image may be read at a time.

The "simulate load button" call will simulate the load button sequence and transfer control to location 1 if a card is present in the card reader. FIRST and COUNT are ignored in this calling sequence. If an end-of-file condition is found at the card reader, control will be returned to the caller.

An input/output check error while reading cards will terminate the operation and cause control to be transferred to the machine error record.

The on-line card reading operation may not be used in 7090/7094 FORTRAN II operating under the IBSYS Basic Monitor.

SNAPSHOT

The calling sequence to dump the console and memory is:

```
TSX (TAPE), 4
PZE SNLST, T1, (SNAP)
PZE LABEL, T2, PARNO
PZE ERRET, T3 (NOT SIGNIFICANT)
```

SNLST, T1 is the origin of a list of no more than five parameters which specify the areas to be dumped. The parameters may be set up as input/output commands (IORT, IOCT, IOCD). If no parameters are given, only the console will be dumped. The console consists of the AC, MQ, SI, divide check and overflow triggers, sense lights, sense switches, and index registers.

LABEL, T2 is an optional BCD word which will appear in the page heading of the SNAPSHOT.

PARNO is the number of parameters in the SNAPSHOT list.

There is no limit on the number of SNAPSHOTs which may be taken during execution of the system. The SNAPSHOTs are dumped on Logical Tape 9 in binary during system execution. The SIGN-ON record outputs the SNAPSHOTs on the monitor output tape following execution of the object program, or following the last compilation or assembly of a job. The SNAPSHOTs will appear as partial core storage dumps with mnemonics and page headings.

Call for Next System Record - 1 to CS

The calling sequence to read the next system record is:

```
TSX (LOAD), 4
PZE
```

The second word of the calling sequence is not used in the independent version; the second word is the record name when FORTRAN II is operating under IBSYS from a 1301 Disk or a 7320 Drum Storage Unit. If the record name is given, the decrement field of the TSX instruction must contain a 1 in the low-order position.

System Diagnostic

The calling sequence to the diagnostic is:

```
TSX ERRNN, 4
.
.
.
ERRNN TXI (DIAG), , -NN
```

The value of - NN is zero for a machine error, or a unique number associated with a source program error message in the general diagnostic program.

If the error is a machine error, the message

PROBABLE MACHINE ERROR
PLEASE REFER TO SYSTEM LISTINGS

will be printed on-line, along with the location of the call and the system record number. The listings should contain documentation pertinent to the error.

If the error is a source program error, the routine will call in the General Source Error Diagnostic. In this case, the two locations following the location of ERRNN may be used to transmit pertinent information to the diagnostic. There may be any number of TSX's to ERRNN.

Error Record Callers

To call the machine error record or the source program error record, one of the following calling sequences should be used:

TSX (MECL), 4 or TSX (SECL), 4

These callers are primarily for the use of the diagnostic routines, and do not perform any function other than reading into memory the requested error record.

Console and Memory Restoring

When an input/output error occurs, or a call is made to (DIAG) or (TPER), the I/O Package dumps a portion of lower memory and the console on Logical Tape 6. This permits the machine error record to give the option of restoring the console and memory to the condition at the time of the error. However, this option does not exist if the error return ERRET, T3 has been taken. In that case, a subsequent call must be made to (TPER) in order to perform the core storage dump.

If the saving process has been accomplished, the following sequence will restore the AC, MQ, SI console triggers and index registers:

STL (REST)+3
NOP *+2 RETURN ADDRESS from IOP
TRA (REST)

Set Tape Density

The densities of the logical tapes may be set to either high or low by the following call to the I/O Package:

```
TSX (STDN), 4
*** TAPNO
```

```
*** =   PZE Set density high
        MZE Set density low
```

This call is an exception and destroys the contents of the AC.

Tape Statistics

The tape statistics may be obtained by the following calling sequence:

```
TSX (STAT), 4
```

Return from the I/O Package is made to 1, 4. When return is made to 1, 4 index register 1 will contain the base address of the I/O Package Unit Table. The table format is:

```
      PZE T      , PE
          (TN)
      .
      .
      PZE T      ' PE      logical tapes
          (2)
      PZE T      ' PE      1 through TN
          (1)
BASE   PZE , , TN
```

TN = Number of logical tapes in table.

T = Physical tape address for that logical tape.

(n)

PE = Number of positioning errors encountered reading that tape.

Index register 2 will contain the base address of the read/write statistics. The format of the statistics table is:

	PZE	RCRC	,,	CNSEC	
		(TN)		(TN)	
Read	.				
Error	.				
Counts	PZE	RCRC	,,	CNSEC	
		(1)		(1)	
	PZE	WCRC	,,	WCON	
		(TN)		(TN)	
Write	.				
Error	.				
Counts	PZE	WCRC	,,	WCON	
		(1)		(1)	
	PZE	CRR	,,	CNRR	
		(TN)		(TN)	
Count					
of Records	.				
Read	.				
	PZE	CRR	,,	CNRR	
Count		(1)		(1)	
of Records	.				
Written	.				
	PZE	CRW	,,	CNRW	
		(1)		(1)	

RCRC	=	Cumulative redundancy count reading
CNSEC	=	Consecutive redundancy count reading
WCRC	=	Cumulative redundancy count writing
WCON	=	Consecutive redundancy count writing
CRR	=	Cumulative count of records read
CNRR	=	Cumulative count of noise records read
CRW	=	Cumulative count of records written
CNRW	=	Cumulative count of noise records written

A peculiarity exists with respect to redundancy errors and noise records. An attempt to erase tape may give a redundancy indication, in which case a noise record is considered to have been written. However, when reading, the tape unit may pass over this same section of tape as blank tape without any noise indication. Therefore, the tape statistics may show that noise records have been written, but that none have been read.

MISCELLANEOUS INPUT/OUTPUT INFORMATION

Indirect Addressing in Calling Sequences

A scheme has been provided to permit indirect addressing in calling sequences. Indirect addressing is specified by a "-1" in the decrement field of the parameter. Indirect addressing (and indexing) may extend to any depth.

For example:

```
PARM4    TSX (TAPE),4          WRITE RECORD
          PZE PARM1 ,,-1      ON TAPE 1.
          PZE PARM2 ,,-1
          TSX (PRNT),4        PRINT RECORD
          PZE IOCOM ,,-1      ON-LINE.
          TSX (TAPE),4        WRITE RECORD
          PZE PARM4 ,,-1      ON TAPE 2.
          PZE PARM3 ,,-1
          .
          .
          .
          .
PARM1    PZE IOCOM ,,(WBNC)
PARM2    PZE LABEL , ,TAPNO1
PARM3    PZE *+1 ,,-1
          PZE LABEL , ,TAPNO2
IOCOM    IOCD FWORD , ,6      SAME AS PZE FWORD , ,6
LABEL    BCI 1,EXAMPL
FWORD    BCI 6, THIS IS INDIRECT ADDRESSING.
```

The above calling sequences would write the same labeled record on two different tapes and also print it on-line under program control.

Error Flags - (MSLN)

The machine error record and the source error record require sense lights in order to determine the proper course of action to pursue. Therefore, it is necessary that the location of (MSLN) be set by certain system records. This location is set to either 0, 1, 2, 3, or 4 in the address field.

<u>Contents of (MSLN)</u>	<u>Set By</u>
0	Card-to-tape simulator
1	FAP
2	Monitor
3	EXEM - execution error monitor in object program
4	Sections 1 through 6 in the compiler and the General Diagnostic

<u>Section</u>	<u>Data Description</u>	<u>Logical Tape Number</u>	<u>Label</u>
Section II	Intermediate table	3	TAGTAG
	Intermediate output from Block I	3	DOTAGA
	Intermediate output from Block II	2	DOTAGB
	COMPDO CITS	4	COMPDO
	Transfer level Table	4	TRALEV
	A) Subroutines	3	A)FUNC
Section III	Assign constants	2	ASCON3
	Arithmetic CITS	3	FFILE
	Merged CITS	4	CITSO3
	Arithmetic Statement Functions	3	A)FUNC
	Merged A) subroutines and Arithmetic State- ment Functions	4	A)FUN
	Fixed point constants	2	FIXCN3
Section IV	Intermediate table	3	TAG
	Intermediate table	3	BLIST
Section V	Merged CITS and subroutines	3	CITSO5
	Modified Assign constants	2	ASCON5
Section VI	Intermediate TEIFNO	4	TEIFN6
	CITS	4	CITS6
	Output (BCD)	6	none
	Output (binary)	7	none
General			
Diagnostic	Diagnostic messages	6	none

