

3rd June, 1963.

ATLAS INTERMEDIATE SUPERVISOR

Introduction

The Intermediate Supervisor provides a limited amount of overlap of input and output on four control desks. Input for a job must consist of one stream only read in on reader n, where n = 0 to 3, and the output must consist of one stream only which appears on the associated output. Current control desk is displayed in B120 digits 4-3 as follows:-

	<u>Input</u>	<u>Output</u>
desk 0	Reader 0	Line printer
desk 1	Reader 1	Line printer
desk 2	Reader 2	7-hole paper tape
desk 3	Reader 3	5-hole paper tape

Temporary extracodes (see below) are provided for input in internal code (note 1) only on 5-hole or 7-hole tape and output in internal code or in binary. Each input and output equipment is provided with a buffer of 512 words in the main store. When an input buffer is filled, the reader is stopped. Only one program is executed at a time; when it empties the input buffer the program is halted while the reader refills the buffer. Similarly when the output buffer is filled, the output equipment is started and the program is halted while the equipment empties the buffer when the current program is continued. The output equipment is also started when a program ends.

The one-level store with automatic drum transfers is provided. A program may use main store block labels 0 to (octal) 3377. Some of the higher numbered blocks (e.g. octal 3300 to 3377 for the Intermediate Input Compiler) are used by the compiler. Working space (if any) during compiling is vacated before the program is entered so that block labels up to 3377 are available during execution of a program. If a block label 3400 to 3777 is used the program is monitored (note 2). The number of blocks actually used must not exceed the number of one-level-store blocks available. The Intermediate Supervisor, and the input and output wells use about 12 blocks. (If the drums and half of the core store are not working this leaves only about 4 blocks available to the program).

Preparation of Input

An input document must begin with a job description and end with an end of tape marker as follows:-

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JOB
(the title)
(further job description, which is ignored)
COMPILER (Compiler name)
(program and data)
***Z
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where the compiler name is:-

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AA      for Atlas Autocode
ABL     "  Atlas Basic Language
COMPILER "  the Compiler Compiler
IIC     "  Intermediate Input Version C
MAC     "  Mercury Autocode
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It may also consist of several tapes all except the last ending with ***T.

The first internal-code character in the range (octal) 20 to 76 must be J. Further characters on that line are ignored and the next line, i.e. the Job Title, is copied to the output n, preceded and followed by NL. Further lines of the job description are ignored until a line whose first character in the range 20 to 76 is

C and whose first character in the range 20 to 76 after the next space is A, C, I or M. (A second letter is examined for AA and ABL). Backspaces and case shifts are ignored throughout the job description.

Starting and Ending a Job

When a job is started a message "DESK (n) STARTED (time)" is printed on the teleprinter where the time is in hours, minutes, seconds and tenths of seconds. The job heading is examined and if not present the monitor is entered (see below). The compiler read in from tape if it is not already in the main store and is entered on main control. When the object program has been compiled, blocks of compiler working space, if any, are lost and the object program is entered on main control.

When a program ends a message "DESK (n) END (time)" is printed on the teleprinter. A succession of 12 NL's followed by a succession of 40 run out characters are also sent to output n and the equipment is started. If the output equipment is disengaged, the request to start it waits until the equipment is engaged. The input buffer is made empty and the reader is disengaged if it is waiting to read further input of the current program. If the reader is engaged waiting to read in another program the reader is started. The store blocks of the current program are lost. The control desks are scanned cyclicly from the current number to find another job which can be started, viz. the reader is stopped with something in the input buffer, the output buffer is empty.

Operating Procedure

When a reader is engaged by an operator, the reader is started and the tape is read into the input buffer if the buffer is empty or if the operator has re-engaged after disengaging (in this case reading continues from the last character read).

The reader is stopped when the buffer is full or on reading ***Z, ***T or on overshooting the end of tape. If no program is active a scan is entered to start this job. If the current program is based on this control desk the program is restarted if the output buffer is clear. If any other program is active nothing is done; the reader is left engaged on buffer full but is disengaged on ***Z, ***T or end of tape. End of tape with no characters read is treated as ***Z if the current program belongs to this control desk but is otherwise treated as ***T.

The reader is also stopped but not disengaged on reading ***A. The input buffer is made empty if this program has not been started; otherwise the program is restarted and allowed to read the characters already in the buffer. Finally, the reader is stopped and disengaged on a fault (parity or overdue); the fault and the reader number are printed on the teleprinter.

When a program exhausts its input buffer and tries to read further input, the monitor is entered (see below). Otherwise the output equipment is started and the program halted. If more input is expected and the reader is engaged, the reader is started; if the reader is disengaged the request to start it waits until the reader is engaged.

A job is not started until the output buffer is empty. When the buffer is filled the output equipment is started and the program is halted. The output equipment is also started when a program ends. If tape on a punch runs out or paper on a printer is low the output equipment is disengaged. When the punch is re-engaged output will restart from the beginning of the buffer (unless tape or paper is low when it will be disengaged again by the supervisor).

Temporary Extracodes

1050 Select input n.

This extracode is a dummy instruction; it is only possible to read on input 0 with the Intermediate Supervisor.

1051 Find selected input.
 ba' = number of selected input = 0
 1052 Find peripheral equipment number.
 ba' = V-store address of the reader used
 1053 Test binary/internal code

This extracode is a dummy instruction since it is only possible to read in internal code with the Intermediate Supervisor.

1054 Read next chapter to ba/jump to n.

This reads the next 6-bit character in internal code into the least significant 6-bits of ba. Normally C' = C+1 but if the end of the record has just been exceeded, C' = n and the least significant 6-bits of ba' = the "carriage control character". Bits 23-6 of ba' are cleared to zero in both cases.

End of line character

octal 21 for NL on 7-hole tape	octal 21 to 37 for 1 to 15 NL's on 7-hole tape
octal 20 CR on 5-hole tape	octal 20 to 37 for CR plus 9 to 15 LF's on 5-hole tape
octal 01 LF on 5-hole tape	octal 41 for PT, home on channel 1 on line printer

1056 read ba characters to store location, S

This reads the next ba characters from the currently selected input and places them in 6-bit store locations S onwards. The information remains packed 4 characters per half word. Bit 23, of ba is ignored. Provided the end of the record has not been reached ba is unaltered except for bit 23 which is set to 1 and bits 1 - 0 which are cleared to zero. If the end of the record is reached ba is set as follows:-

bit 23 = 0
 bits 22 - 0 = number of characters actually read.

1057 Read next record to S.

This reads the next complete record and places it in store locations beginning at S. On exit ba contains:-

bit 23 = 0
 bits 22 - 0 = number of characters read

If the record has been partly read (by use of 1054 or 1056) this transfers the remaining part of the record.

1060 Select output n.

If bit 0 of n = 0 all succeeding output instructions are of internal code characters; if bit 0 = 1 all succeeding output instructions are of binary characters. Bits 23 - 1 are ignored with the Intermediate Supervisor. If no output is selected then internal code is assumed.

1061 Find selected output
 ba' = number of the currently selected output

i.e. ba' = 0.0 if internal
 = 0.1 if binary

1062 Find peripheral equipment type.
 ba' = V-store address of paper tape punch 0
 = (octal) 6004 2000 (see note 3)

1063 Delete output

This deletes any output which remains in the buffer store.

1064 Print character n.

This outputs the character in the least significant 6-bits of n. If internal code has been selected this will output one internal code character; if binary has been selected the extracode must be used twice to write the most significant bit of 7-hole tape from bit 0 of n and then the least significant 6-bits of 7-hole tape from bits 5 - 0 of n. Bits 23 - 6 of n are ignored.

1065 End this record.

This outputs the end of line character (see extracode 1054) from bits 5 - 0 of n. Bits 23 - 6 of n are ignored. If binary is selected, the carriage control character is stored in the supervisor's buffer store but is not punched out.

1066 Write ba characters from store location, S.

This outputs ba characters beginning at address S. If bit 23 of ba = 1 the record is not ended. If bit 23 of ba = 0 the record is ended and the last character, which is in address (S + ba - 0.1), is interpreted as the carriage control character (see extracode 1054). If output has already been started by the use of the extracode 1064 then the first transfer is to whichever 6-bit character position of the supervisor's store extracode 1064 would have written to next.

1067 Write a record from store location, S.

This outputs the record beginning at the character location S to the currently selected output. Bit 23 of ba is ignored and the effect is the same as extracode 1066 when 1066 is entered with bit 23 of ba = 0.

1117 End program

This ends the current program and outputs

"DESK (n) END (time)"

The punch is started and, if the reader is engaged waiting to read further input, the reader is disengaged. A scan is entered to start the next program which is ready to go.

1477 Universal extracode

This adds 0 to B127 to clear PI odd and jump to the address in B91 using extracode control b121' = BA and b119' = n + bm.

Programming Errors and Monitoring

Several programming errors are detected by hardware or by the supervisor. The program is halted and the monitor (part of the supervisor) is entered. This selects internal code and outputs:-

1. NL
2. IS (inner shift)
3. ILLEGAL FUNCTION etc.
4. NL
5. INST
6. (location of instruction as a decimal number)
7. F, Ba, Bm, S
8. ba = (signed decimal)
9. bm = (signed decimal)

10. b (decimal integer) = (contents of b line, as a decimal integer. Octal digit)
11. NL
12. ACCUMULATOR
13. SP or -
14. 0.
15. (fractional part of AM in decimal)
16. /
17. (YA as a signed decimal integer)

Items 4 - 9 are printed for 3 locations the address of the last being, M, the contents of main control when the program was ended.

Item 8 is omitted if BA = 0;
Item 9 is omitted if BM = 0.

If any of these 3 locations are in private stores or in an unused block of main store, then

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is printed instead of items 7 - 9. Item 10 is printed for non-zero B-lines 1 to 99. The value printed for the contents of all b-lines is, of course, the value when the program was ended. The fractional part of the accumulator is printed to 13 decimal digits or until all following (decimal) digits are zero; -1.0 is printed as "-1".

The following are the programming errors which are monitored:-

ILLEGAL FUNCTION	i.e. octal codes 0000 - 0077 or 0400 - 0477
EXP OVERFLOW	Accumulator exponent overflow
SV OPERAND	Request for an operand in a private store
SV INSTRUCTION	Control transferred to a private store
DIV OVERFLOW	Division overflow
C TIME EXCEEDED	(Not used by the Intermediate Supervisor)
EXCESS BLOCKS	Reference is made to more main store blocks than there are available.
ILLEGAL BLOCK	Reference is made to a main store block 3400 - 3777
INPUT ENDED	(See above)
NO JOB HEADING	(See above)

Computer Failure

Several parts of Atlas have checks for computer faults, e.g. parity checks. Except for drum failure the action is as follows. When the first fault occurs, a loop in the supervisor is obeyed for about one second to allow all the peripheral equipment and the current drum transfer (if any) to stop and cause an entry to be inserted in the appropriate SER queue whence they can easily be restarted. The clock and instruction counter are then stopped and a special direct output routine (which works with interrupts inhibited) is entered and the following is printed on the teleprinter:-

NL F SP (fault marker)

The 'Fault marker' is 8 octal digits of a half word in the subsidiary store as follows:-

20000000	non-equivalence on interrupt control
04000000	fixed store parity
01000000	subsidiary store parity
00200000	core store parity

(This printing may appear when a line of printing on the teleprinter is only partly done). The fault marker is also displayed in B120 and a hoot-and-loop stop is entered.

If a second computer fault occurs while waiting for the peripherals to stop, in a state where they can easily be started again (see above) the direct printing on the teleprinter is commenced immediately. This may cause paper tape readers to

miss a character (overdue)

For drum failures the action is as follows. First a loop of instructions on extracode control is obeyed until all four readers stop. The drum transfer is then repeated indefinitely. If a repeat transfer succeeds normal machine operation is continued and a supervisor routine is initiated to print on the teleprinter the following information (using the normal time shared buffering):-

"NL F SP DRUM SP (R or W for read or write)
(type of failure) SP θ b d c
where the "type of failure" is

PARITY for drum parity
DCF for drum count fail
DCA for drum cabinet absent
DBI for drum band isolated
DRI for drum request ignored

Note 1. With the supervisor, the code of the various input equipments (7-hole paper tape, 5-hole paper tape, cards, etc.) is normally converted into a standard code, Internal code, before the read instructions of an object program are obeyed. Similarly output from an object program is usually specified in internal code and the supervisor translates this into the code for the relevant equipment.

Note 2. The supervisor is not locked out in the core store so that an object program could accidentally (or deliberately) overwrite the Intermediate Supervisor. In practice this seldom happens; the final supervisor is completely protected.

Note 3. The original plan for the intermediate supervisor was for output on 7-hole paper tape only.