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I.C.T. ATLAS 1
OPERATORS MANUAL Part 1

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CONTENTS

ATLAS 1 COMPUTER SYSTEM

OPERATORS' MANUAL

PART ONE

Introduction to 3rd Edition

This document describes the features of the Atlas 1 Computer and Supervisor as they affect operators. Details of the peripheral equipment and their operation are given in Part 2 of this manual, which is issued as a separate document.

The operating system as described here is that in effect at the end of May 1967. Some details of operation differ between the Atlas 1 installations; where the differences are significant they are mentioned in the text.

Any comments, criticisms and reports on errors in this manual should be sent to D.E. Cronin at 88 High Holborn, W.C.1.

1. THE WORKING OF THE OVERALL SYSTEM

To the operators the Atlas system consists of the following main items:

1. The Engineers Console.

2. Teleprinters (capable only of printing out from the computer) to give information to operators or engineers on the state of the system.

3. Input peripherals (paper tape readers, card readers etc.).

4. Output peripherals (paper tape punches, card punches, line printers etc.).

5. Magnetic tape decks.

The Supervisor program is partly built in to the computer (the fixed store) and has part use of the main store (drums and core store). It also has exclusive use of the working store. The remaining parts of the Supervisor (i.e. those not in fixed store) are kept on a magnetic tape called the Supervisor tape, and are called into the main store whenever the system is started up (or re-started). The Supervisor tape is normally kept isolated as writing to it during normal operation is not required.

Ordinary programs are known as jobs. A job consists of a number of documents, i.e. a number of paper tapes and/or packs of cards. To perform a job these documents are all read in through input devices and any magnetic tapes required by the job are mounted. Then follows (not necessarily immediately) execution of the job, and then output from it. The time sharing facilities of the system are such that input for several jobs, execution of others and output for yet a third group may be progressing at one point in time.

Input and output information is held for a time on the system tape(s) by the Supervisor. This buffering arrangement is necessary to match the low speeds of input/output devices with the high speed of the central processor.

More details of the operation of the Supervisor are given in the remaining sections of this document. This is presented as a series of fairly self-contained topics, and it must be emphasised that this corresponds to the real-life behaviour of the Atlas system, with a large number of somewhat independent activities proceeding at any one time, and with various incidents affecting operators

liable to happen at any time. Thus, the remaining sections of the document are not in any particular logical order, as no such order exists.

2. MACHINE TESTS

There are a number of machine test programs in the fixed store, and these are used by the engineers during maintenance of the machine.

There is also a series of tests, written so as to give a general test of certain parts of the machine without destroying any information belonging to programs in progress. They are entered automatically every five minutes, and last for three seconds, during which time all peripheral and magnetic tape activity will cease. Normal activity will resume after three seconds, provided no faults are found.

If faults are detected, an indication is printed on all the teleprinters and the log punch; a loop stop eventually occurs. The engineers should be notified of any faults. Normal activity can be resumed only after operator intervention.

The indications given are as below (this information is intended mainly for the engineers, and is given here only for completeness).

The monitoring on Teleprinter 0 is preceded by the line:

f 00010001 XXXXXXXX

where 00010001 indicates "machine tests failed", and XXXXXXXX is an octal number, the "or" of various octal numbers from the list below, each number representing a failed test.

All teleprinters and the log punch will output:

MACHINE TESTS HAVE FAILED

and this will be followed by one or several lines giving the name of the failed test. In the list below, each indication is shown with its octal number equivalent, as printed on teletype 0.

Octal number	Indication
00000001	Instruction Counter will not store correctly
00000002	Instruction Counter interrupting at the wrong time
00000004	Instruction Counter failing to interrupt
00000010	B-store switching test failed
00000020	Accumulator test 12 sub test 1 failed
00000040	" " 12 " 2 "
00000100	" " 12 " 3 "
00000200	" " 12 " 4 "
00000400	" " 12 " 5 "
00001000	" " 12 " 6 "
00002000	" " 12 " 7 "
00004000	" " 16 " 1 "
00010000	" " 16 " 2 "
00020000	" " 16 " 3 "
00040000	" " 17 " 1 "
00100000	" " 17 " 2 "
00200000	" " 17 " 3 "
00400000	" " 17 " 4 "

The purpose of these machine tests is to give a regular check on those parts of the machine which are not checked by hardware, and where faults arising might go unnoticed for a considerable time. It should be noted they cannot guarantee a complete absence of faults in the machine, as there may be an intermittent fault, or one only happening in circumstances not created by the tests.

(Note. The above does not apply on MUSE, where machine test failures lead to fault monitoring as described in the next section.)

3. MACHINE FAULTS

3.1 Identification

Various machine fault conditions are signalled, immediately they occur, to the Supervisor. They are then classified into two types: those where no repetition of the failed operation is made, and those where it is.

The first group includes all store parity failures within Supervisor, and drum transfers incomplete after one second. On one (or more) of these faults occurring, a five-second loop stop is entered to permit all peripherals to stop, and then the following line is printed on the engineers' teleprinter (teleprinter 0):

fXXXXXXXX XXXXXXXX

XXXXXXXX represents a number, of 8 octal digits. In the first number, each bit indicates one type of fault (see 3.2 for details). The second number will appear only on a drum fault (when it gives information on the location of the fault) or when machine tests fail (see sec. 2 above).

If a large number of faults has been signalled, a loop stop is entered with the first octal number displayed in B120; otherwise, the diagnostic routines are entered (see sec. 3.2 below). The details printed out should be passed to the engineers. The Supervisor then restarts automatically and the comment

SUPERVISOR RE-ENTERED

is output on all teleprinters and the log punch (Note that this may not appear if there is a tape fault following the central machine fault). All input equipment and tape decks other than the Supervisor and System tapes are disengaged, and normal work may then recommence; all jobs completely in at the time of failure will be executed, all others must be read again from the beginning.

The second type of fault is a drum transfer failure. The Supervisor makes up to 50 attempts to complete the drum transfer successfully; if any of these attempts succeeds, fault printing is output on the operators' teleprinter, as shown below, and work proceeds normally.

If no success is achieved after 50 attempts overall, the diagnostic routines are entered (see sec 3.2). Note that the diagnostic printing may not in fact appear, as the program which performs it may itself be on the drum.

The fault printing (after success within 50 attempts) takes the form:

F DRUM a b c

where

a is r for read
w for write

b is one of:

PARITY	
DCF	(Drum Count Failed)
DBI	(Drum Band Isolated)
DCA	(Drum Cabinet Absent)
DRI	(Drum Request Ignored)

c is four digits:

Sector number	(0 to 5)
Band number	(0 to 7)
Drum number	(0 to 3)
Cabinet number	(always 0)

Note that DBI will only occur through a machine fault, or because an isolation switch has been moved during operation, as the Supervisor checks all drum bands at start or restart and uses only non-isolated bands.

3.2 Diagnostics

As mentioned above, the first line output on teleprinter 9 is of the form

f XXXXXXXX XXXXXXXX

For machine test failures, the second number indicates which tests have failed; for drum failures, the second number is of the form 0a0b0c0**d**, where a,b,c,d are respectively sector, band, drum and cabinet number. Otherwise, the second number does not appear.

The first number, which is printed and/or shown in B120, is made up of one bit for each type of fault present. Possible indications are:

4000000a	drum request ignored
20000000	non-equivalence on Interrupt
1000000a	drum band isolated
04000000	illegal function in Supervisor
0200000a	drum cabinet absent
01000000	fixed store parity
0040000a	drum count fail
00200000	working store parity
0010000a	drum parity
00040000	SVO or SVI in Supervisor
0002000a	drum transfer incomplete
00010001	machine tests failed
00004000	block not defined
00002000	core store parity
00001000	manual entry
00000400	(spare)
00000200	(spare)
00000100	(spare)
00000040	non-equivalence tape or drum

On drum faults, a = 1 for read transfer
a = 0 for write transfer

Diagnostic messages are output on all teleprinters and the log punch. The first line of the message gives the date and time. Then follows information about the fault or faults encountered. (A full list of possible messages if of interest only to the engineers). If no machine fault was found (e.g. spurious store parity), this information is followed by the line:

PM

which indicates that a Post Mortem is being printed on the line-printer.

The monitor is terminated by the lines

JOBS DONE n JOBS IN m

SUPERVISOR RE-ENTERED

The following messages may appear on teleprinter 0 during the machine monitoring

message	meaning
monitor abandoned	insufficient usable pages can be found into which to read down the second and third monitor blocks.
engage supervisor	the supervisor tape is disengaged. On engaging it, the monitor should proceed.

message	meaning
restart from handswitches as after 66	a fault has been detected which may necessitate a different type of restart from the previous one.
supervisor block 0 not read correctly	block 0 has been read down and found not to have checksum 52525252.

The following displays may appear in B120 during machine monitoring

display	meaning
07070707	monitor about to be entered (drum transfer initiated if required).
52525252	deck fail on supervisor tape deck.
0000000a	fault on reading block off supervisor a = 1 checksum a = 2 not 512 words a = 4 end of tape These faults can occur in conjunction.
630abcde	disagreement between a block address read from tape and the expected one. The number abcde gives EBA-PBA.
60042abc	fault condition on monitor output peripherals a = 0 teletype a = 6 teleprinter fault type bc = 10 disabled bc = 04 paper low bc = 01 disengaged These faults can occur in conjunction.
0001775	normal display. Supervisor tape has wound back to the start, then read down the monitor blocks

3.3 Core store parities

If a core store parity is signalled in a store area owned by an object program, the Supervisor will monitor the program and continue without a break in running. Information of interest to the engineers will be printed on the operators' output, in one of two formats.

If a parity is found:

```
CORE STORE PARITY
STACK 0 BOTTOM 05077650  30420370  00012340
JOB
F1234, JOB TITLE
```

Line 2 gives the location of the word where the parity occurred; line 4 is the title of the job.

If no parity is found:

```
CORE STORE PARITY
NO PARITY FOUND
JOB
F5678, JOB TITLE
```

If a core store parity occurs in an area of store held by the Supervisor, monitoring is as described in 3.1 and 3.2 above.

4. PERIPHERAL EQUIPMENT FAULTS AND WARNINGS

All peripheral faults are detected by the Supervisor, and reported on the chief operator's teleprinter (except for faults in the teleprinter itself, for which see below). A list, with the necessary actions, is given below. In all cases the peripheral is disengaged. The comment as given below is printed followed by "reader" for an input device, or "p" for an output device, and then the identifier of the peripheral concerned. (See section 9).

4.1 Input Devices

DISABLED or OVERDUE

Report the fault to the engineer. When repaired (or alternatively using another reader), the document must be re-read from the beginning.

PARITY (7-track tape only)

Inspect the paper tape. If an even-parity character exists, or the tape is badly punched, the job cannot be run until a correct tape is prepared.

If the tape seems correct, the document should be read again from the beginning. Persistent failure should be reported to the engineer.

CHECK FAIL (Card Reader only)

Take the rejected card from the reject stacker, place at the base of the pack and re-engage. Persistent failure should be reported, and a specially prepared ***A card should be read to terminate the document. (In some conditions ***Z may be used, but it should be noted this permits the program to proceed with only part of the input stream present. A ***A card is one with 7 and 8 punched in Column 1, and "A" in column 80. Similarly for ***Z).

CARD LEVEL

The input hopper should be replenished with more cards and the reader re-engaged. Alternatively, the stacker may be full, and should be emptied before re-engagement.

A card wreck is signalled by the "DISABLED" message. If a card is genuinely wrecked, report to the engineer. If the card appears good (or is damaged but can be reperforated) it may be placed at the bottom of the pack and the reader re-engaged. If the trouble is persistent, treat as CHECK FAIL.

4.2 Output Devices

In all cases, provided the device has been repaired or attended to as requested, the Supervisor will recommence output on re-engagement from the beginning of the record where failure occurred.

LEVEL

This implies a low level of stationery. The device should be re-loaded and re-engaged. (This stop on the line printer is sometimes due to paper break rather than low stationery).

C FAIL

This is check fail on a card punch or Creed 3000 paper tape punch.

On the card punch no action other than re-engagement is necessary and the card will be re-punched. Cards to be removed from the pack are off-set. These may include correctly punched cards, since the punch is already punching another card when mis-punching in one is detected. However, such cards will be punched again on re-engagement, and so all off-set cards should be removed.

C FAIL on the card punch may also occur because of too many or too few interrupts (i.e. a hardware fault). This will lead to repeated failures and should be reported to the engineers.

On the Creed 3000 only re-engagement is necessary but the output tape must be labelled with a note indicating that it may contain spurious characters: it will be unsuitable for re-input and will not produce a clean print-out without editing.

On both devices frequent faults should be reported to the engineer.

O DUE and DA

Report to the engineer.

O FLOW (Line printer only)

This implies more than 120 characters have been sent to a line. The Supervisor has a programmed check against this, so this message implies equipment fault and should be reported to the engineer.

DISENGAGEMENT OF TELEPRINTER

If a fault arises on the teleprinter itself, it will disengage, and the system will stop as soon as a queue of messages develops. The supply of paper should be checked. If this is adequate and correctly loaded, report to the engineer. The output can be transferred to another suitable device by an operators request to permit work to continue (See Section 10).

4.3 Log punch and teleprinters 0 and 1

If a fault develops, or paper runs out, on the log punch or teleprinter 0 or 1, the Supervisor will eventually idle. B120 will display (for a limited period only) an identifier for the device as follows.

Log Punch	0004202	(Muse)
	0004200	(London/Chilton)
Teleprinter 0	0004260	
Teleprinter 1	0004261	

4.4 Output warnings

The message

OUTPUT WAITING Pn
(job title)

indicates that output device n should be engaged; the output produced is for the job named. When this output is complete, the following message appears:

OUTPUT COMPLETE Pn
(job title)

When a datalink output terminal has to be switched to 5-hole or 7-hole transmission, one of the following will appear:

5-HOLE Pn
7-HOLE Pn

5. MAGNETIC TAPE FAULTS

Faults on magnetic tape are printed on the tape operator's teleprinter. They fall into two distinct types, known as E and F. With E-type faults it is possible for the Supervisor to attempt the operation called for again and this is done indefinitely if hand-switch 4 (or 6 for half-inch tapes) is set to zero. If, however, this switch is set to one, the number of attempts is limited to seven, and if this limit is reached the fault becomes F-type (F9 on one-inch tape). The occurrence of the fault is always reported, with the number of repetitions that took place.

With F-type faults it is not possible for the Supervisor to try to repeat the operation. The program concerned is halted and monitored; TAPE FAIL is printed (or IBM TAPE ERROR for half-inch tape), together with the usual monitor printing. It is common practice to try the job again using a different deck or, in some circumstances, a different tape, as this is often the easiest way of determining whether the fault is due to the deck or the tape.

5.1 One-inch tapes

The format of the E-type fault printing is

E m/n DECK d xxxxyyyy

where

m is the fault number
n is the number of repetitions (modulo 7)
d is the deck number
xxxx and yyyy are two block addresses (in octal) relevant to the fault.

The faults are:

E1	Leading Block Address fault
E2	Trailing Block Address fault
E3	Checksum failure
E4	Not 512 words
E5	Tape not stopped. (PBA changed when stop interrupt occurs but TCR stays stopped)
E6	Deck fail reset within 100 u.s.
E7	Write crisis

E8 Non-equivalence, tape. The PAR is not reset between attempts.

E9 Read crisis.

Eα Read digit is not set or reset in TCR. (This condition arises for example when a deck is modified.)

Eβ Tape-to-core parity (may monitor more than one channel.)

E+ Stop digit not set in TCR when stop interrupt occurs.

E- Tape buffer parity.

Ea Absence of B.A. interrupts within a block after 0.1 seconds or more.

wE No write permit or end of tape. These are usually programming or operator errors. End of tape is indicated if block addresses 8189, 8190, 8191 are encountered unexpectedly. End of tape may also be indicated if a tape with a duff title block is engaged, since it may appear as an Orion tape.

For faults involving block address faults, xxxx is the address encountered, yyyy is the address required. Otherwise, xxxx is normally the last block address read, and yyyy is the address of the block involved. Normally xxxx will be zero for forward reading (because a trailing block address was read last), but for backwards reading it will be yyyy-1.

Note that Eα and Eβ will appear as e] 3[and e] 4[respectively on lower-case teleprinters.

The format of F-type fault printing is

F m x deck d

where

m is the type of fault
x is f for forward reading
r for reverse reading
d is the deck number

The faults are described below. It should be noted that the information is mainly for engineers rather than for operators.

F1 Block address not found on tape after five attempts.

F5 Deck fail not reset after around 50-100 u.s. (A common cause of this fault is the opening of the door of the deck, or switching it to standby, whilst the tape is in actual operation. The program will be faulted on TAPE NOT DEFINED if it attempts a further operation whilst the deck is in this state. Thus if the door has been opened or the deck switched to standby inadvertently, the job should be run again.)

F+ Failure to detect interrupts in interblock gap for 6 seconds after 3 attempts to set start digit.

FB Incorrect read bias in TCR when trying to start in interblock gap, after 7 attempts to set the TCR.

FN Incorrect speed set in TCR under same conditions.

FV Incorrect direction set in TCR under same conditions.

FA End-of-tape signal during transfer operation.

F9 Failure to clear an E-type fault after at least seven attempts.
The E-type fault is also recorded.

5.2 Half-inch tapes

The format of E-type fault printing is

IBM DECK d Eα/n xxxxxxxx

where

α is 1 for lateral or longitudinal parity fail when reading
2 for lateral or longitudinal parity fail when writing

n is the number of repeats (modulo 8)
d is the deck number
xxxxxxxx is the contents of the Tape Command Register, and is of no immediate interest to operators.

The supervisor will continue to make attempts at transfer indefinitely, unless handkey 6 is set, when it repeats only 7 times. When reading, 'recover read' is set after the first failure; when writing, 'long gap' is set in order to skip past any bad tape. During transfer attempts, the B120 display alternates between *00000007 and *00000070. On failure, there will be a distinctive display in B120 of *6363001n, where n is the deck number.

For F-type faults, the following is printed:

IBM DECK d fα xxxxxxxx

where

d is the deck number

α is z: too many parities when reading

y: too many parities when writing

x: no L.A.M. from deck in reasonable time

W: mechanical failure.

xxxxxxxx is the contents of the Tape Command Register, and is of no immediate interest to operators.

Although these are monitored as deck faults, they may sometimes be the fault of the programmer, rather than of the hardware:

Fz can be caused by a programmer selecting the wrong parity when reading.

Fw can be caused by an attempt to write a character 00 when in even parity mode.

The programmer cannot cause an Fy or Fx.

Fw may be caused by the operator disengaging the deck, opening the door, or otherwise tampering with the deck while it is under supervisor control. If, part-way through a job, the operator disengages a deck while it is stationary, the machine will wait for the deck to be re-engaged.

In general, the operators must not touch the deck while it is under supervisor control.

6. JOB DESCRIPTION, WARNING SEQUENCE AND JOB TITLE

Job descriptions are read and decoded immediately by the Supervisor, (as opposed to almost all other information, where the Supervisor merely performs a simple code translation and stores the information for later interpretation by the compiler or program concerned). Thus faults in job descriptions are reported immediately on the chief operators teleprinter, introduced by

READER n INCORRECT FORMAT

where n is the identifier for the input device concerned. This is followed by a copy of the line in which a fault has been detected. (In some circumstances the line printed may be the one following the incorrect line.) The device is disengaged. The job may be tried again when the Job Description has been corrected.

The only other fault ininput information with which the Supervisor is concerned is when an incorrect warning sequence is found, e.g. ***Z not preceded by any information. In this case

READER n FAULT

is printed and the device disengaged.

When a warning sequence indicating a switch to a non-standard input code occurs, the input peripheral is disengaged and the message

READER n CODE m

is printed. The reader should be re-engaged.

A difficulty that occasionally arises is when wrongly prepared data results in no reported fault, but leads to the job failing to register as complete. Sometimes this is caused by the lack of ***Z at the end of a document: in this case a short tape, or cards, containing ***Z may be fed in immediately after that document and on the same input device. This procedure should only be attempted where the cause of the trouble is clear, or on consultation with a duty programmer if available. Note that if a further document is read in on an input device where a termination has been missing, it will have to be fed in again, as it will not have registered.

More often failure to register is due to a discrepancy between the document headings and the input section of the job description. The operators should check that all required documents have been read in and that their titles do tally with those listed in the job description. The Spring Cleaning Routine is useful in analysing matters of this nature. (see section 11).

7. PROGRAM RESULTS

The output from a program is created mainly by the program, and may take almost any form. However, the output is processed by the Supervisor, and certain standard information is output before and after each 'stream' of output from the program, to permit identification and give useful information to the operators and the programmer.

An example of the Supervisor monitoring at the head of an output stream is as follows:

```
00.0013  /  10.05.67  09.29.55
OUTPUT   0
F1234, BEETLE SURVEY
```

00.00.13 is a number given to the output document by the Supervisor, and has no significance to the operator or programmer. Then come the date and time at which the output concerned began to be printed.

OUTPUT 0 indicates output stream 0 of this program; a program is allowed up to 7 output streams.

F1234, BEETLE SURVEY is the job title. F1234 is in fact an account number, which will invariably appear in any job title.

Following these three lines comes the output from the compiler and/or program, and at the end of the output stream will appear, for example, END OUTPUT 5 BLOCKS, showing that there were 5 blocks of output in this stream. A block contains around 4000 characters of output.

At the end of each job, the Supervisor outputs some information about the job; this output appears in standard form at the end of Output Stream 0. The exact form of this output may vary between installations, but will generally be of the following form:

F1234, BEETLE SURVEY

DATE 27.04.67
TIME 22.37.39
SERIAL NUMBER 1207042

	REQUESTED	USED	COMPILE
INSTRUCTION INTERRUPTS	40000	14391	6
COMPILE STORE	70	15	
EXECUTION STORE	69	47	
	DECKS	BLOCKS	WAITING
MAGNETIC TAPES	2	812	21
	STORE TIME	DRUM TIME	DECK TIME
	7551	39	219
COMPILER NUMBER	2		
FAILURE NUMBER	65536		

TAPE 2	1	CHANNEL WRITE INHIBIT
TAPE 0	2	CHANNEL WRITE PERMIT
INPUT 1	1	BLOCKS READER 163
INPUT 0	2	BLOCKS READER 163
OUTPUT 0	12	RECORDS LINE PRINTER
OUTPUT 1	4	RECORDS ANY

Line 1 gives the title of the job; lines 2 and 3 give the date and time at which the program ceased execution.

Line 4 is a serial number allocated to the job by the Supervisor, and is usually of no interest to the programmer or operator.

Line 6 shows that the programmer asked for a time allocation of 40000 instruction interrupts. (One interrupt corresponds to 2048 basic instructions). 6 interrupts were used during compiling, and 14391 for compilation plus execution of the program.

Lines 7 and 8 show that the programmer requested 70 and 69 blocks of store during compilation and execution respectively, and actually used 15 and 47 blocks (One block is 512 words of store).

Line 10 gives information about the magnetic tape usage of the program. In this example, 2 tape decks were used, a total of 812 blocks was transferred to or from magnetic tape, and the program was held up for 21 seconds while waiting for the completion of data transfers to or from tape.

The numbers in line 12 have the following significance:

"Store time" is a cumulative total of store usage: every second, the number of store blocks currently held by the program is added to the total. The final sum is

therefore the number of "store-seconds" used.

"Drum time" gives a measure of the amount of drum usage occasioned by the program. The total, in seconds, is made up of around 20 ms per drum transfer.

"Deck time" is calculated in a way similar to "Store Time"; total "deck-seconds" used by the program.

Line 13 gives the number of the compiler used; for details, see section 8.3.

Line 14 will appear only for jobs ending on a magnetic tape failure; the number can be interpreted to give details of the fault.

Lines 15 and 16 give details of the magnetic tapes used by the program. The tape numbers are those given in the Job Description. (This logging appears only at MUSE).

The remaining information concerns the input and output of the program, giving details of input document or output stream number, amount of input/output, and the identity of the peripheral concerned. Note that "ANY" as an output peripheral will normally be the Line Printer.

The logging described above will appear at the end of Output 0 for every job. However, this logging may be preceded by Supervisor Fault Monitoring if the program has been terminated by the Supervisor because of faults in the program or data.

Supervisor Fault Monitoring begins with the reason for termination, e.g. ILLEGAL FUNCTION. (A full list will be found in the ABL Programming Manual, CS 348A). This is followed by some standard printing, and possibly some private monitoring if the program has arranged for any. This printing is described in the Programming Manual. If the program is rejected before the end of compiling, the last two figures in line 6 of the logging (total instruction count, and compilation instruction count) will be identical.

It should be noted that compilers also use Output Stream 0 for monitor printing. This printing is described in the various compiler manuals.

8. THE LOG TAPE

Punch 0 (Punch 1 on MUSE) is reserved for the log tape. This may be printed out for inspection and/or processed by a program to give statistical records and accounting information.

8.1 Paper Tape Format

There are three main types of record produced by the Supervisor and punched on the log tape.

(i) Normal records

One record is produced for each job which has passed through the system. The information is mainly the same as that given in the Output 0 logging for each program (see sec. 7) but the format is different. A typical record is given below; the lines have been numbered here for reference.

```
++                                  1
15.20.49  04.06.67                  2
F1234, BEETLE SURVEY                3
  2D   3A    1F                     4
  80 RC                             5
9441212                             6
96000 3874  3651                    7
90  82 90  74                       8
2  121 35  0   0                    9
3953  8  118                        10
3   9 5 155  150  0                 11
598  2738  30335                    12
15.21.36                            13
T P1234                             14
T P9876                             15
- -                                 16
```

The record is preceded by six upper-case characters followed immediately by two 'plus' signs, and it is terminated by a line of two 'minus' signs.

Line 2: the time and date at which the job entered execution.

Line 3: the title of the job.

Line 4: input for the job. In each number/letter combination, the number gives the amount of blocks of input in an input document, and the letter indicates which peripheral read the document (see 8.2 below).

Line 5: output from the job. In each number/letter combination, the number gives the amount of output in an output stream, and the letters indicate the type of output peripheral, (see 8.2 below).

Line 6: serial number of the job, usually of no interest to the operator.

Line 7: Instruction Count (Interrupts) - requested
Instruction Count (Interrupts) - total used
Instruction Count (Interrupts) - used during compiling

Line 8: Compile Store (blocks) requested
Compile Store (blocks) used
Execution Store (blocks) requested
Execution Store (blocks) used.

Line 9: Number of mag. tape decks used
Number of blocks transferred to or from tape
Tape waiting time (seconds)
Number of half-inch mag. tape decks used.
Number of records transferred to/from $\frac{1}{2}$" tape.

Line 10: Store time
Drum time
Deck time
(See sec.7 above for details)

Line 11: Compiler number (see 8.3 below).
Fault number (if program was faulty).

The remaining four numbers on this line are used differently at the various Atlas 1 installations. If a number is unused, it has the value 0.

Line 12: Number of drum transfers during program.
Instruction Count Interrupts clocked up by Supervisor since last logging output.
Instruction Count Interrupts clocked up in idling since last logging output.

Line 13: Time at which the job finished execution.

Line 14 and 15: Titles of magnetic tapes used by the program. (This logging does not appear on MUSE).

(ii) Restarts

At London and Chilton, the format is:

```
RESTART  a    b
c    d
```

where a and b are the time and date of the restart; c and d are the time and date at which the current Supervisor was defined.

At MUSE, the format is:

```
RESTART
a      b
c      d
```

where a is a checksum; b is the time of restart; c and d are respectively the first and second settings of the handswitches used in the course of the restart. (These four quantities are printed in octal form).

(iii) Fault Monitoring

This is diagnostic information output by the Machine Monitor. It is described in sec. 3 above. Every line of this monitoring is preceded on the log tape by the character α (alpha).

(iv) Rejects

The log tape may also contain mispunched or spurious records.

8.2 Input/Output Device Code Letters

These are referred to in lines 4 and 5 of a normal job record (see 8.1 above).

(i) Input device code letters

A	Private input
B	TR5 0
C	TR5 1
D	TR5 2
E	TR5 3 (London and MUSE) IBM Typewriter (Chilton)
F	CR 0
G	CR 1 (London and Chilton) TR7 (MUSE)
H	TR5 4 (London) Datalink (MUSE)
J	Datalink
K	Datalink

(ii) Output device code letters

A	Any	Records
B	7-hole punch	Blocks
C	Line printer	Records
D	5-hole punch	Blocks
E	Card punch	Records
F		
G	Private tape	Records
H		
I		
J		
K	Special stationery	Records
L		
M	Special cards	Records

This letter will be preceded by "R" for records, or "B" for blocks, depending on the type of output peripheral.

Some of the items in these lists will not be applicable to particular installations. Local variations may occur.

8.3 List of Compilers

The numbers given do not indicate the order in which the compilers are held on the Supervisor tape. This list includes only the compilers commonly used.

1	IIC
2	ABL
3	EMA, MAC
4	FOR2 (at MUSE)
	AA (at London and Chilton)
5	Service (at MUSE)
6	CC
7	TAD
8	BINARY
9	HARTRAN
10	HAR2
11	AA (at MUSE)
12	Algol
18	LOG
29	Special
31	CHLF3, EXCHLF
34	Fortran

9. PERIPHERAL IDENTIFIERS

Each peripheral has an identifier, consisting of 3 octal digits. This is in fact the V-store address of it (less a constant), and is used when the peripheral is referred to by the Supervisor when printing error messages etc.

160	TR5 0	
161	TR5 1	
162	TR5 2	
163	TR5 3	
200	Teletype 0	
201	Teletype 1	
202	Teletype 2	
203	Teletype 3	
100	Line Printer 0	
101	Line Printer 1	
040	TR7 0	(Muse only)
140	Creed 3000 0	(Muse only)
000	CR 0	
001	CR 1	(London and Chilton only)
220	CP 0	
260	Teleprinter 0	
261	Teleprinter 1	
262	Teleprinter 2	(London and Chilton only)
164	Data link input	(Muse only)
164	8-track TR5	(London only)
166	Data link input 0	(London only)
167	Data link input 1	
204	Data link output	(Muse only)
206	Data link output 0	(London only)
207	Data link output 1	

It should be noted that the three teleprinters are intended for messages to the chief operator, tape-room operators, and engineers. However, it is possible to have alternative arrangements as to which teleprinter is used for various types of message, and local systems prevail.

10. OPERATOR REQUESTS

10.1 Introduction

The facilities described in this section enable an operator to 'communicate' with the Supervisor. The operator may interrogate the Supervisor in order to obtain certain information pertaining to the system as a whole or to a particular job in the system, or he may inform the Supervisor of changes that may have happened to the peripheral system, about which the Supervisor would otherwise have no knowledge, or he may pass on other information usually of a temporary nature which could cause a certain amount of disrupting to the normal flow of the Supervisory system.

10.2 Conventions and Headings

As mentioned in Section 9, teleprinters are used for messages to operators. If a fault condition arises on any of these output devices, the Supervisor makes no attempt to take over another output peripheral for operators use, but disengages the faulty device every 1 second; it is the operators responsibility to notice this and to take the necessary action. There are requests available to redefine the operators output media.

All requests must begin with the letter **X**. At Manchester this is followed by R or T together with two octal digits which together identify the request. At the London and Chilton installations, the letter X is followed by the request name, only the first three letters of which need be specified. Throughout the following description, numbered identifiers will be used. The corresponding alphabetic identifiers are listed in section 10.7. Each request has a unique type, this type being cross-checked against a list kept by the Supervisor, and if a discrepancy is found then the request is faulted.

All action taken by the Supervisor as the result of an operators request initiates some output on the main operators output; a request should not be assumed to have been completed until this output has appeared and has been checked (the output may be fault printing). For the majority of requests this output is immediate, but in some cases, especially those which involve tape transfers, this output may be delayed.

All requests must be terminated by ***Z, or if a string of requests is being input then each may be terminated by ***C and the final one only by ***Z.

All requests normally consist of 3 records. The first record consists of the request identifier as explained above, and it may also contain a comment. There is no need for an introductory warning character before this comment. The Supervisor takes no notice of this comment, and it is purely for the convenience of the operator. The second record is called the information line. This varies for each request and full details are listed below. The third record is the terminator, usually ***Z.

Note that it is not possible to include a comment in the information line.

The total number of characters in any operators request must not exceed 512. Spurious run out characters are included in this total but these, together with all shift, set change, layout, backspace and erase characters, are ignored by the decoding routine.

10.3 Identification of Peripherals

Peripherals referred to in requests are identified as in Section 9.

10.4 Faults

Whenever a fault is detected in an operator request, information is printed out on the operators output to enable the operator to detect the error. Fault printing consists of not more than 3 lines. The first line is always of the form 'operator request f n' where n is the fault number and lies in the range (0,7). The second line consists of the request identifier with a space character inserted between the request type and the request number. The third line is the information line of the request printed out in its unreconstructed form, but this line is only printed out if the detected fault lies within the line itself. Multiple faults are not detected, fault printing being activated as soon as the first fault has been found.

A detailed description of the faults detected, and the monitor information given, is given in section 10.6.

10.5 Description and Action of Available Requests

Out of a possible total of 64 requests only about 40 have so far been defined. The requests are divided into groups of 8 (corresponding to the first octal digit in the identifier) and there are 8 groups in all. Groups or requests not mentioned are not used. The name of the request is given below in capital letters, following the request identifier.

10.5.1 Group 0 Requests

This group of requests is concerned with changing the priorities of jobs within the machine or with finding out the state of a particular job.

The information line of the request is the title of the job concerned and must be punched obeying the same rules that apply to job titles in ordinary job descriptions, viz. backspace is ignored, all erases are ignored, multiple spaces or tab are all treated as a single space unless they occur at the end of the title in which case they are ignored altogether. A single space at the end of a title is also ignored and a title must not contain more than 80 useful characters.

Alternatively, the information line may consist of a full stop followed by the identifier of the job concerned. This identifier may be obtained by use of the requests XR50 and XR51, (q.v.). In this case no magnetic tape searches are performed by the request, since the job information can be located in main store.

XR00: TOP PRIORITY JOB. The specified job is dealt with as soon as possible, and any programs currently under execution are suspended if necessary to make room for it. The only exceptions to this are (a) if the specified job needs more store or tape decks than are currently available or (b) if all suitable output peripherals are engaged in long sets of output. However, when the store and peripheral requirements of the job can be met, it will be immediately executed.

XR01: HIGH PRIORITY JOB. The specified job is put at the head of the queue of the jobs waiting to go to the active list; if it is already on the active list then it will be put to the head of that list. The job will then be put onto the execute list in the normal manner.

XR02: CLEAR JOB PRIORITY. No exceptional treatment will be accorded this program; this request will only be used for a job which has previously been accorded some other priority. However, it is not necessary to use this request first when changing a job to another level of priority.

XR03: LOW PRIORITY JOB. The specified job is treated as a normal job until it reaches the execution stage when it is always placed at the bottom of the execute list. The job will only be executed when all other jobs on the execute list are halted.

For requests 00 - 03 two lines of printing are printed on the operators output. The first line is the job title, and the second is

JOB GIVEN (-) PRIORITY

where (-) may be TOP, HIGH, NORMAL or LOW.

XR04: JOB STATE. This request will normally only be used to find the state of long computing jobs. The response consists of a maximum of 3 lines. The first line is the job title and the second is of the form

JOB ON (a) LIST. (b) PRIORITY

where (a) is JOB, ACTIVE or EXECUTE and (b) is TOP, NORMAL or LOW. Alternatively, the second line of output may be

JOB COMPLETED

or INPUT INCOMPLETE

In this case the job has not been found on any of the job, active or execute lists. The fact that the job has been completed should be obvious to the operator (bearing in mind that this request is only intended for use on long computing jobs). The alternative statement will only apply if the job is a multi-document job and the missing document(s) do not include the job description document. Note that JOB COMPLETED will appear if the job has never been in the machine, or if a title is wrongly quoted. No information as to where the ouput was sent is given if the job has been completed.

If the job is on the execute list then a third line of the form

INSTRUCTIONS OBEYED n

is printed where n is a decimal number indicating

the number of instruction count interrupts so far logged against the program.

XR05: KILL JOB. This causes cessation of all activity on the specified job, provided it is on any of the job, active or execute lists, except that any output generated at the time of the request will appear. The response consists of two lines. The first is the job title and the second is:

JOB KILLED

The log output will relate to the work done on the job up to termination, and on Output Stream 0 will be recorded:

JOB KILLED

10.5.2 Group 1 Requests

This group of requests deals with operations in which it is necessary to specify a particular magnetic tape deck. So far there are only two requests of this type.

XR10: DISENGAGE DECK. The information line here is the number of the deck to be disengaged.

The response printed is: DECK n DISENGAGED, where n is the deck number.

(Note: The tape addressing program may be terminated by a request to disengage deck 7, if deck 7 is currently in use for tape addressing.)

XR11: RENAME TAPE. The first information line is the number of the deck on which the tape to be renamed is mounted, and the second line is the new name to be written in place of the tape title recorded in main store. Note that the title is not written to the tape itself.

The response printed is: TAPE ON DECK n RENAMED, where n is the deck number.

It is only possible to rename a pre-mounted tape; the request will be faulted if no tape is mounted or if the tape is in use by Supervisor or object program.

10.5.3 Group 2 Requests

This group of requests is used to remove peripherals from the Supervisor system, to put them back into the system again, and also to redefine the operators input and output media. The information line of the request is the peripheral identifier.

XT20: TRANSFER OPERATORS INPUT. This request is now no longer necessary, since all operators' requests may be input on any peripheral. If this request is used it is ignored and no response is printed.

XR21: OPERATORS OUTPUT. This request will be used when the operator's output breaks down, but it does not check this. The response to this request is

OPERATORS OUTPUT TRANSFERRED TO (-)

Note that the response will be put out on the new device. If the specified peripheral is already being used by the Supervisor to output documents for a job then this output together with any backlog of output will be completed before the response to this request is given.

XR22: TAPE OPERATORS OUTPUT. This request is identical to XR21 except that it operates on the tape operators output. The response is

TAPE OPERATORS OUTPUT TRANSFERRED TO (-)

It is not permissible for the main operators output and the tape operators output to be defined as the same peripheral.

XR23: FREE PERIPHERAL. This request is to tell the Supervisor that a certain peripheral is to be unavailable to the system for a considerable period of time.

Freeing an input device has the effect of immediately disengaging the device and setting a disabled marker in the peripheral table in the working store. No attempt is made to complete the reading in of any current document. For an output device however, the output of the current document is completed and then the device is disengaged and taken out of the system. Further output is diverted to another (if possible, similar) peripheral.

The response printed for this request is

(-) FREED

XR24: STOP AND TRANSFER PERIPHERAL. This request permits a peripheral to become vacant almost immediately either because there appears to be something wrong with it or because it is urgently wanted for a high priority job and would otherwise

not become available for a long time. This request has the same effect as XR23 except that for an output device, the current document is abandoned at the point reached. The document is re-output, from the beginning, on another, (if possible similar) peripheral.

The response printed for this request is

(-) STOPPED AND TRANSFERRED

XR25: RECONNECT PERIPHERAL. This request is the complement of XR23 and XR24. Normally a peripheral will be assumed to be available whenever its engaged button is pressed, but if an XR23 or XR24 request has been made on the peripheral, then it will be treated by the Supervisor as if it were non-available until this request has been made. The response printed for this request is

(-) RECONNECTED

XR26: DELETE CURRENT OUTPUT. Causes termination of output of a document currently coming out on a specified peripheral. The second line of the request is the peripheral identifier. The response is

(-) OUTPUT DELETED

You are recommended to disengage the peripheral while using the request.

If you cannot input the request due to shortage of store, engage the peripheral for a while. This may clear enough store to activate the request.

10.5.4: Group 3 Requests

This is a group of miscellaneous requests, three in number at present:

XR30: OCTAL INPUT. This enables specified words in the Supervisor to be changed by operator request. The words are specified by writing, as the first line of the request, the symbol * followed by a half-word octal transfer address in the range *3420 to *3664, and then following it by a list of Consecutive octal half-words to be input. All these half words must be separated

by space, tab or new line, and all eight digits must be present. This format may then be repeated as many times as one wishes.

When the transfer of information has been effected, the words OCTAL INPUT ACCEPTED are printed.

Great care must be exercised in the use of this request, which should only be used under the direction of the Supervisor programmers.

XR31: CURTAIL CURRENT JOB. This request kills the job currently using main control; no information line is needed. If the request is successful, JOB LOST is printed on the operators' output, and JOB KILLED appears on output 0 of the job. If there is no such job, no action is taken and NO JOB LOST is printed.

XR32: IBM DECK INTERCHANGE. This causes the numbers of the two IBM decks to be interchanged. No information line is necessary. The words IBM DECK m INTERCHANGED WITH n are printed on both operators and tape operators output.

This request is only applicable at London.

10.5.5 Group 4 Requests

This group of requests is mainly concerned with the linking of input and output channels. There are five distinct types of linking available which give the operator varying degrees of control over the destination of output documents. Within the private stores of all peripherals (working space used by the Supervisor) are certain digits which indicate whether the peripheral is in a REMOTE or SEMI-REMOTE state. Combinations of these digits determine the nature of the linking.

At present the linking of peripherals is strictly (1,1) but this may be changed at a later date.

The information line of requests XR40 - XR45 consists of two peripheral numbers separated by an oblique stroke (solidus); magnetic tape decks cannot be specified as either input or output peripherals. The two peripheral numbers are written in the order input/output.

If either or both of the peripherals to be linked is in a freed state (see XR23), then the peripheral(s) must first be reconnected by XR25 before linking is attempted.

XR40: PERMANENTLY LOCK PERIPHERALS. (input A remote, output B remote).

Irrespective of the type of device requested in the job description all jobs read in on A (more specifically, jobs whose job description document is read in on A) will have all their output streams put out on B. No other output will appear on B.

XR41: LINK PERIPHERALS. (A remote, B semi-remote)

Provided the job description is compatible (i.e. specifies the same peripheral type) all output for jobs read in A will appear on B. Other output documents may also appear on B.

XR42: LOCK PERIPHERALS. (A remote, B remote).

Provided the job description is compatible all output for jobs read in A will appear on B. No other output will appear on B.

XR43: MAKE PERIPHERALS SEMI-REMOTE. (A semi-remote, B semi-remote).

Provided the job description is compatible output will probably appear on B. Output for other jobs may also appear on B. (Probably here means in effect, if the peripheral is not already in actual use).

XR44: ASSOCIATE PERIPHERALS. (A semi-remote, B remote).

Provided the job description is compatible output may appear on B but it may also appear elsewhere. Output from other jobs will not appear on B.

The responses printed for requests XR40 - 44 are of the form

(a) AND (B) (c)

where (a) and (b) are the peripheral identifiers and (c) is appropriately PERMANENTLY LOCKED
LOCKED
LINKED
ASSOCIATED
MADE SEMI REMOTE

All of these requests can be countermanded by an XR45 request (see below) but note also that due to the linking being strictly (1,1) if a is linked to b, c to d and a request is used to link a to d, then peripherals b and c are both made normal. These requests are not countermanded by any in Group 2.

XR45: NORMALISE PERIPHERALS.

Normally used to countermand a request in the XR40 to XR44 range.

The response printed is (a) AND (b) NORMALIZED

XR46: GIVE STATE OF PERIPHERALS

This request needs no information line. The amount of output depends on the state of the peripheral system, but the response always begins with the following two lines:

STATE OF PERIPHERALS

OPERATORS INPUT AND OUTPUT ARE ANY
(b) (c)

where ANY is the operators input, (b) the operators output and (c) the tape operators output. Next, each disabled peripheral is listed

(a) DISABLED

Following this any linked peripherals are listed

(a) AND (b) (c)

where (c) may be PERMANENTLY LOCKED
LOCKED
LINKED
ASSOCIATED
or SEMI REMOTE

The final line to be printed is

REMAINING PERIPHERALS NORMAL

and this is printed even if all the peripherals in the system have been mentioned in the preceding lines of output. No information on the state of magnetic tape decks is given.

XR47: UNUSABLE MAIN STORE AREAS

Like XR46 this request needs no information line. The parameters printed are only those concerned with the amount of core store and drum store available. The response to this request lists the areas of main store that are not available to the main programmer. Initially the line

STATE OF SUPERVISOR PARAMETERS

is printed. Next, lines of the form CORE PAGES a b c d... are printed, where a b c etc. are absolute page numbers of the parts of core not available. A maximum of 16 page numbers is printed on each line so that for a 32K core store machine 4 such lines could be printed. The heading CORE PAGES is always printed even if there are no available pages in a section of 16, so that for example MUSE with 16K of store available will have this heading printed

twice.

Unavailable areas of drum store are printed out as follows

DRUM n

b i

b j s k b j s l

where n is the drum number and band i and sectors k and l on band j are unavailable. The heading DRUM n is always printed, and any unavailable areas on that drum are listed below it.

Finally, the total number of blocks available is printed

TOTAL STORE AVAILABLE n BLOCKS

This gives all blocks which can be used by Supervisor and ordinary programs. The number used by the Supervisor is not fixed, varying with the workload, but is about 50. Thus approximately n-50 blocks are available for programs, including compilers. Full details are in Section 20.

10.5.6 Group 5 Requests

This group consists of requests to print lists of jobs currently in the system.

XR50: ACTIVE LIST. For each job on the active list, the title is printed, followed on the next line by the identifier of the job as an octal number, preceded by a full stop; (the identifier is not printed if it is greater than 4096).

The list is preceded by

STATE OF ACTIVE LIST

XR51: EXECUTE LIST. As for XR50, but for the execute list.

XR52: LOSE JOB IN TAPE ASSEMBLY. The job which is in tape assembly will be lost, and all tape requests for it will be removed. If a bypass job (q.v., section 13) is in tape assembly, this will be the job lost. Any tapes already mounted for the job will be unloaded.

No information is needed for this request. The words JOB LOST, followed by the job title

on a new line, will be printed. If no jobs are in tape assembly, NO JOB LOST will be printed.

XR53: UNMOUNTED TAPES. No information line is required. A list of all tapes requested but not mounted, together with their corresponding jobs, is printed on the operators' output.

XR54: BYPASS JOB IN TAPE ASSEMBLY. No information line is required. If a job is in tape assembly, the next job will be selected for further processing.

The request will lapse as soon as all tapes requested are engaged. This request is useful if there is a long wait for tapes to be mounted for a job.

The words JOB BYPASSED, followed by the title of the job on a new line will be printed.

If there are no jobs in tape assembly, or the request has already been used and has not lapsed, JOB NOT BYPASSED will be printed. This implies that only one job may be bypassed at any one time.

10.5.7 Group 6 Requests

This group consists of miscellaneous requests, and the information line is dependent on the request number.

XR60: REMOVE CORE STORE

XR62: REPLACE CORE STORE

The purpose of these requests is to change the amount of core store available at any time.

The information line of these requests consists of two absolute page numbers P_1 and P_2 separated by an oblique stroke (solidus). If only a single page is affected then the information line need only be that single page number. Note that e.g. 20/16 is the same as 16/20.

If a page specified is locked down (this is the case if the contents are involved in a peripheral, drum or tape transfer) then no attempt is made to remove it.

If it is wished to attempt to remove it again (in the expectation that it is now no longer locked down), the request must be re-input.

The response printed for both requests is

SUPERVISOR PARAMETERS ACCEPTED

followed by the same printing as for request XR47.

XR61: OMIT DRUM STORE

XR63: INCLUDE DRUM STORE

This pair of requests is very similar in nature to the XR60 and XR62 requests, except that they deal with the drum store. The information line of both requests is of the form

$$d / b / S_0\ S_1\ S_2\ S_3\ S_4\ S_5$$

where d, b, and all the S_i are all single digit numbers.

d is the drum number (0 to 3)
b is the band number (0 to 7)
and S are sector numbers (0 to 5)

Alternative permissible formats are

i) d
ii) d/b

where i) a complete drum is required to be removed or replaced and ii) where a complete band is similarly to have its state changed. Not all S_0 - S_5 need be specified so a permissible format would be 0 / 1 / 234.

The response printed for both these requests is the same as that for the preceding pair of requests, but if the band specified, or in the alternative case (i) one of the implied bands, has been reserved by a main program, then for the XR61 request the following is printed and that particular band is <u>not</u> removed from the system

REMOVE DRUM STORAGE

Dd Bb RESERVED

where d and b are respectively the drum and band numbers.

XR64: BATCH COMPILE

This request tells the Supervisor that a number of jobs are expected using a specified compiler, and that once it has been called into main store from tape it should be kept there until further notice.

The information line of this request consists of the compiler name punched exactly as it would be in a job description document.

The response printed is

COMPILER (n) AVAILABLE

where (n) is the compiler name.

XR65: CEASE BATCH COMPILE

This countermands XR64. The information line is the same as for XR64 but the response is of the form

COMPILER (n) DELETED FROM STORE

where (n) is the compiler name.

The effect of this request is immediate. The job list is not scanned to see whether any of the uncompiled programs need the specified compiler.

When batch compiling is in operation the amount of store available is reduced by the amount of space that the compiler itself occupies, so that batch compiling with large compilers and certainly with more than one compiler is not to be recommended. What will probably happen is that the Supervisor will reject jobs on the grounds that no space is available.

XR66: ACCEPT EXTRACODE PROGRAM This sets the process switch to indicate that the next program input on the same device as that which read the request may use extracode control.

No information line is needed.

The response EXTRACODE PROGRAM WILL BE ACCEPTED ON n , where n is the peripheral identifier , will be printed.

XR67: CHANGE ON-LINE TESTS

The information line in this request consists of one of the command words listed below:-

KILL: Terminates current on-line test.

NO READ : Cancels check facility on reader tests, i.e. reader will accept any information presented to it, but will not test it, thus enabling an engineer to scope a regular continuous pattern.

NO PUNCH: Cancels the character to be output, i.e. punch, blank tapes, blank cards, etc. or print spaces.

NO MONITOR: Suppresses monitor printing on the operators output. Again useful when engineers are examining the device without requiring faults to be reported.

CHANGE : Followed by 8 octal ditits. Changes the pattern of testing - precise details depend on the peripheral in use.

10.6 Operator Request Fault Printing

10.6.1 Introduction

Whenever a fault is detected in an operator request the heading

OPERATOR REQUEST F n

is printed, where n is the fault number. If the fault has occurred in the first line of the request this line is then printed direct from the input buffer; the fault itself will lie in the request identifier, but if the operator has put any comment after the identifier then this will also be printed. If the fault has occurred in the information line of the request then after the heading has been printed the request identifier is printed in its reconstructed form on a new line and this will then be followed on a new line by the faulty second line printed directly from the input buffer.

Throughout this document all responses have been printed in upper case characters, but in actual fact all printing is in lower case characters. Certain characters that are available in the Flexowriter code are not printable on the teleprinter. However, all the information necessary to implement any request is available both in Flexowriter and teleprinter character codes. All run-out (upper case) characters are ignored provided they are introduced and terminated by a newline character. If a fault occurs in a line containing spurious run-out characters then these will appear on the teleprinter as square brackets.

Multiple faults in a request are not detected, i.e. once a fault has been found fault printing is initiated and any further faults that may be present are ignored.

Faults common to all requests are as follows:

f0 Buffer exceeded. All requests must contain not more than 512 characters; this includes shift, set change and spurious run-out characters. This fault is never likely to arise unless the operator has punched 10 ft. of run-out in the middle of the request. (!)

f1 character missing in first line of request, e.g. only one octal digit in the request number. The complete unreconstructed first line (together with any comment that may be present) of the request is printed.

f2 unassigned request; or, XR or XT followed by the wrong request number.

The printing for faults 0 - 2 consists of a heading and then the unreconstructed first line of the request.

The meanings of the remaining fault numbers 3 - 7 are dependent on the request number. The printing for these faults consists of 3 lines, the first is the heading, the second the reconstructed request identifier, and the third is the unreconstructed information line.

10.6.2 Group 0 Requests

f3 title of job too long. A title must not contain more than 80 characters.

If the job is not found when searched for, the packed request identifier is printed, followed on a new line by the packed job title in the request, followed by the words JOB NOT RECOGNISED on a new line.

If the input tape is not present, the request is ignored and no response printed.

10.6.3 Group 1 Requests

f3 illegal deck number

f4 deck does not hold a premounted tape

10.6.4 Group 2 Requests

f1 may mean that the peripheral to be reconnected is on test (XR25 only).

f2 may mean that request XR24 has been used with no system output tape in use.

f3 format

f4 unassigned peripheral (or input device for XR26).

f5 device out of use (does not apply to XR25).

f6 wrong type of device, or not in correct state.

f7 new device same as current one (XT20 to XR22 only)

10.6.5 Group 4 Requests

f3 format error

f4 unassigned peripheral

f5 peripheral freed

f6 both input or both output devices

f7 output device given first, or already waiting to be linked

10.6.6 Group 6 Requests, XR60 to XR63

f4 format error

f5 drum or page number out of range

10.6.7 Group 6 Requests, XR64 and XR65

f3 format error

f4 more than eight characters in compiler name; and if the compiler title is not recognised, the following is printed:

XR64 (or XR65)
COMPILER (n) NOT RECOGNISED

where (n) is the compiler name.

10.6.8 Group 6 Request XR67

f1 may mean illegal command word.

Note: No fault printing (other than f0, 1 or 2) can arise from the requests XR30 - 32, XR46 - 47, XR50 - 54, XR66 - 67).

10.6.7 Examples

Below is a list of examples, which if punched as printed would be accepted as valid requests.

```
XR01              Give job high priority
F1234, SQRT OF 2M NUMBERS
***Z

XR21    Transfer operators output to anelex 0
100
***Z

XR25    Reconnect punch 203
203
***Z

XR40    Permanently lock 161 to 101
161/101
***Z

XR11    Rename tape on deck 6 as F23: SOURCE
6
F23: SOURCE
***Z
```

```
XR46    Give state of peripherals
***Z

XR60    Remove core pages 26-31 from system
26/31
***Z

XR62    Replace page 29
29
***Z

XR61    Remove band 3 drum 2 from system
2/3
***Z

XR63    Replace sectors 3 and 5 band 7 drum 0
0/7/35
***Z

XR64    Batch compile with ABL
ABL
***Z
```

10.7 Differences in the form of Operator Input Messages for the London and Chilton Atlas installations

The differences between Manchester and London/Chilton are all concerned with the format of the requests; namely, instead of a symbolic request identifier such as XR43, the request name is used, immediately preceded by an X. Only the first three letters of the request name need be specified.

There is no need to include the type of request with the request identifier.

Whenever fault printing occurs an English request identifier is printed rather than a symbolic one.

These differences should be made clear by the examples at the end of this section.

It is still necessary to be able to distinguish requests from ordinary main programs input, so for this reason an X is still needed before all requests.

Below is a list of the MUSE identifiers and the corresponding identifiers that must be used on the London and Chilton machines, in both maximum and minimum forms.

XR00	XTOP PRIORITY JOB	XTOP
XR01	XHIGH PRIORITY JOB	XHIG
XR02	XCLEAR JOB PRIORITY	XCLE
XR03	XLOW PRIORITY JOB	XLOW
XR04	XJOB STATE	XJOB
XR05	XKILL JOB	XKIL
XR10	XDISENGAGE DECK	XDIS
XR11	XRENAME TAPE	XREN
XR20	XTRANSFER OPERATORS INPUT	XTRA
XR21	XOPERATORS OUTPUT	XOPE
XR22	XTAPE OPERATORS OUTPUT	XTAP
XR23	XFREE PERIPHERAL	XFRE
XR24	XSTOP AND TRANSFER PERIPHERAL	XSTO
XR25	XRECONNECT PERIPHERAL	XREC
XR26	XDELETE CURRENT OUTPUT	XDEL
XR30	XOCTAL INPUT	XOCT
XR31	XCURTAIL CURRENT JOB	XCUR
XR32	XIBM DECK INTERCHANGE	XIBM
XR40	XPERMANENTLY LOCK PERIPHERALS	XPER
XR41	XLINK PERIPHERALS	XLIN
XR42	XLOCK PERIPHERALS	XLOC
XR43	XMAKE PERIPHERALS SEMI-REMOTE	XMAK
XR44	XASSOCIATE PERIPHERALS	XASS
XR45	XNORMALIZE PERIPHERALS	XNOR
XR46	XGIVE STATE OF PERIPHERALS	XGIV
XR47	XUNUSABLE MAIN STORE AREAS	XUNU
XR50	XACTIVE LIST	XACT
XR51	XEXECUTE LIST	XEXE
XR52	XLOSE JOB IN TAPE ASSEMBLY	XLOS
XR53	XUNMOUNTED TAPES	XUNM
XR54	XBYPASS JOB IN TAPE ASSEMBLY	XBYP
XR60	XREMOVE CORE STORE	XREM
XR61	XREPLACE CORE STORE	XREP
XR62	XOMIT DRUM STORE	XOMI
XR63	XINCLUDE DRUM STORE	XINC
XR64	XBATCH COMPILE	XBAT
XR65	XCEASE BATCH COMPILE	XCEA
XR66	XACCEPT EXTRACODE PROGRAM	XACC
XR67	XCHANGE ON-LINE TESTS	XCHA

Examples

```
XTOP PRIORITY JOB
F1234, SQRT OF 2M NUMBERS
***Z

XREM
19
***Z

XFORMALISE PERIPHERALS
163/101
***Z
```

This request would produce the following fault printing, since the first three letters of 'NORMALISE' are spelt incorrectly:

```
OPERATOR REQUEST F2
XFORMALISE PERIPHERALS
```

Since only the first three letters are checked, either 'NORMALISE' or 'NORMALIZE' would be accepted.

11. THE "SPRING CLEANING" ROUTINE

It is often useful to obtain a report on the state of documents associated with incomplete jobs currently within the machine. This is done by reading in a short program known as "Spring Cleaning".

There will then be printed on the line printer two lists of document titles. The first list is headed by

SPARE DOCUMENTS

and gives the title of each document currently in the system for which no call by a job description yet exists. The second list is headed by

DOCUMENTS NOT HERE

In this list each document title is followed by

REQUIRED BY JOB

and the job name.

These lists are followed by a list of all jobs in the machine, headed by

COMPLETE LIST OF JOBS

12. CONSOLE OPERATION

The Atlas console is normally used by the engineers. Once the Supervisor is running and jobs flowing through the system, no console operation is required. However, it is necessary to start the system off from the console and similar actions are necessary for restarting after various incidents.

Most of the actions on starts or restarts are determined by the number set up on the 8-bit register on the console labelled "Operand". The bits are numbered 7 down to 0, from the most significant end, and the contents of the register are often expressed as an octal number in the range 0.0 to 31.7.

The normal course of events on starting, assuming that Supervisor and System tape(s) are loaded and on "Auto", is as follows.

1. Set "Manual Rate"
2. Set the Operand Register to read 6.0, 6.2, 6.4 or 6.6, depending on the type of restart required. At London and Chilton, 6.6 is normally set.
3. Set "Auto Order" and "Auto Rate".
4. Press "Engineers Interrupt" button.
5. Press "Single" button (if "Prepulses" light is off).
6. Engage Supervisor tape and all Supervisor output devices.
7. Set value of Mode in Operand Register; bit 0 (least significant bit) last. See below for Modes.
8. Engage system tape(s).

Notes

a) "Reset" disengages all tape decks, and stops prepulses.

b) The setting of the Operand Register is read by a fixed store program entered by the Engineers Interrupt. Values of the operand not specified above are used by the engineers only.

c) Once "single" has been prssed, the fixed store program assumes the highest number engaged deck holds the Supervisor. If no decks are engaged (as will be the case following the above procedure), it waits until one becomes engaged.

d) The pressing of Bit 0 in Stage 7 above for normal modes of operations, causes the Supervisor idling loop to be entered. Any tapes then engaged are detected as system tapes if they are so labelled in their block 0. The Supervisor will not accept input (input devices engaged will immediately be disengaged) until a Systems Input tape has been engaged or until Bit 0 is changed back to 0. If Bit 0 is changed to 0 before either systems tape (input or output) has been engaged, the Supervisor will work without the missing tape(s), but of course at much reduced efficiency for most work. Once Bit 0 has been set to 0, the Supervisor will not recognise further System tapes.

The beginning of input must await nor merely the engagement of the system tapes, but a correct report on this on the magnetic tape teleprinter.

e) For restarting, the procedure above can be simplified if the Supervisor tape is already engaged. "Reset" should be omitted and it will not be necessary to re-engage any device. "Single" should be pressed if and only if there are no prepulses. The Supervisor tape must be on the highest numbered engaged deck.

f) The normal modes of operation are as follows:

(i) Start Clear Mode 16.1

This assumes no jobs in the machine

(ii) Normal Restart Mode 0.1

Complete jobs on the system tape will be run, provided the system deck(s) are unchanged. Note that complete documents associated with incomplete jobs are lost, and so must be read again. All partially executed jobs are started from the beginning. Thus some output may appear twice.

(iii) Restart after Deck Change Mode 8.1

As (ii), but system tape decks changed.

With any of the above, bit 5 may be set and from then on one job at a time will be run. This bit may be changed (either to or from the one-job-at-a-time mode) at any time. The precise effect of setting bit 5 to 1 is to prevent new jobs entering the execute list until that list is empty, but jobs already time sharing continue to do so. Clearing bit 5 takes effect either from the end of a job or on a new job being added to the job list.

The type of job to be executed in this mode can be specified by setting Handswitch 4,3 and 2 to form an octal digit corresponding to a job type as follows:

0	Top Priority Job
1	Tape Job
2	Anelex Job
3	7-hole Job
4	5-hole Job
5	Card Job
6	Long Job

This selection is only operative if handswitch 0 is set to 0. If there are no jobs in the selected queue, a job will be chosen from another queue, with preference given to jobs of highest priority.

g) Other special modes of operation are as follows:-

(iv) Restart and await modifications

Use any combination above, but also set bit 1 (giving modes 16.3, 0.3, 8.3, 16.7, 0.7 and 8.7). This is for use by Supervisor Programmers only.

(v) Store Restart Information Mode 2.1

This entry is used as an alternative to running down the system by ceasing input and waiting for all jobs to be finished. Its effect is to transfer enough information on current jobs to the system input tape (or combined input/output tape) to permit restart later with this tape.

On entering in this manner there will be a loop until the system input tape is engaged, then the "restart block" will be transferred to the system input (or combined) tape . Then a further loop stop with tape faults (if any) displayed in B120. Thus provided B120 is clear, the tape may be unloaded for use later.

(vi) Recover Restart Information Mode 10.1

This is associated with (v). On entry there will be a loop until some tape other than the Supervisor is engaged. It will then assume the restart block is on this tape, recover it, disengage this tape and enter the idling loop. Re-engagement of the system tape will then permit restart as in (iii).

h) It should be noted that in item 6 "all Supervisor output devices" must include the log tape and the teleprinter. No start is possible on any work until these are engaged.

13. THE JOB QUEUES, SCHEDULING AND THE SUPERVISOR DISPLAY

In principle any set of jobs may be presented to the system in any order, and all will be executed. However, operation will be more efficient if the "mix" of jobs is planned to exploit the scheduling features, and this section is intended to give enough information to permit operators and others to understand the way in which jobs flow through the system.

13.1 Supervisor Lists

There are three fundamental lists to consider:

The Job List
The Active List
The Execute List

When all the documents belonging to a job are in the machine, a job entry is made in the Job List.

When a job is actually being executed, there is a corresponding entry in the Execute List.

Before a job can acquire what it needs from its documents on the system input tape and be presented with its compiler, an Active entry has to be created for this job in the Active List. A tape job (i.e. one which has magnetic tapes specified in its Job Description) cannot ask for its tapes until an Active entry has been created for it. Once a job has its compiler, and as much as it needs of its documents from the input tape to get started, together with any magnetic tapes specified in the Job Description, it is put on the Execute List.

Thus any job on the Execute List must have a corresponding Active entry and Job entry. At first, there is only a Job entry; then an Active entry is added; and finally, the entry in the Execute List.

Each job, once completely input, passes through the following phases in order, not initiating any phase until the previous one is complete.

a) Loading of all magnetic tapes called for. (The end of this phase only comes when all tapes called are recognized from their titles).

b) Assembly of input from system tape (i.e. the loading of all or at least the initial parts of it into main store).

c) Loading of compiler from Supervisor tape.

d) Compilation.

e) Execution.

13.2 Job Queues

As its input is completed, each job is placed in one of several queues depending on certain characteristics as stated in the job description. Within each queue, the jobs are listed in the order in which this input is completed. There are three main queues:-

Tape queue — All jobs specifying the use of tapes.

Long job queue — Jobs not specifying tape, but estimating more than 20,000 instruction counter interrupts.

Short job queue — All other jobs. These jobs are further classified by the type of output equipment specified for the longest output document.

There is also a top priority queue, but this is only called into existence if an operator request nominates a job for it, or if tape addressing is in progress, since this is automatically given top priority.

The display (B120) on the console is set as follows by the Supervisor throughout normal running.

a) Number of jobs completely input, but with execution incomplete is shown modulo 64 in bits 5-0.

b) Number of jobs which have completed execution since last start or restart is shown modulo 64 in bits 11-6.

c) Queues containing one or more jobs with execution incomplete (including those where execution has not begun) are marked by a single digit, as follows:-

Queue	Bit in B120	Number of stream
Top Priority	23	0.0
Tape	22	0.4
Short: Line Printer	21	1.0
7-track punch	20	1.4
5-track punch	19	2.0
Card punch	18	2.4
Long	17	3.0

(Bit 23 is the most significant bit, bit 0 the least significant.)

Jobs in streams 1.0 to 3.0 do not specify magnetic tapes in their Job Descriptions. Jobs in streams 0.4 to 3.0 can be transferred to stream 0.0 (Top Priority).

13.3 Magnetic Tape Jobs

Each tape job has associated with it two markers indicating 'Private tapes needed' and 'Job in Tape Assembly'. After a tape job has been put on the Active List, then provided that sufficient tape decks are available the job passes from the 'Private tapes needed' stage to 'Tape Assembly'. With reference to any job, a tape is said to be mounted if its deck is engaged and the tape has been recognised as required for this job.

Once a job is in Tape Assembly, it calls for any tapes listed in its Job Description to be mounted, unless they are already mounted. When all the Job Description tapes have been mounted, the job may be released from Tape Assembly. When a job has been released from Tape Assembly, the job is then said to be 'Passing Through', i.e. it is on the Execute List or on its way there. From this stage onwards, it is treated in the same way as a non-tape job.

The Tape Assembly stage of a job may be prolonged beyond the time it has all its Job Description magnetic tapes, but once it has these tapes it is not regarded as being in Tape Assembly for the purposes of the three Operator Requests, 'Lose Job in Tape Assembly', 'Bypass Job in Tape Assembly', and 'Unmounted Tape Names in Tape Assembly'.

The following rules govern the passage of a job from Tape Assembly to Passing Through.

- If no unbypassed tape job is Passing Through, a tape job may be released from Tape Assembly.

- If there is a Long or Short job entry, not more than one unbypassed tape job can be Passing Through.

- If there are no Long or Short job entries, a tape job may be released from Tape Assembly even if another tape job is Passing Through.

- Not more than two unbypassed tape jobs can be Passing Through.

13.4 Bypassed Jobs

Normally, only one job is in Tape Assembly at any one time. The operator request "Bypass Job in Tape Assembly" can render this job quiescent, while some of its tapes are not yet mounted, and allow another job into Tape Assembly. However, only one job at most can be bypassed. The bypassed job is ready to proceed into the next stage, following Tape Assembly, when all of its tapes have been mounted.

The logical effect of bypassing a job is similar to removing it from the Active List, although its tapes will not be called for a second time (except in the case of a Restart).

Jobs are unbypassed during the process of selecting jobs for the Active List. At the instant that a job is unbypassed, it is in Tape Assembly. Thus the rules for unbypassing are practically the same as the rules for selecting jobs for the Active List. The only differences are that a job may be unbypassed even though another job needs private tapes or is in Tape Assembly, provided that no tape job is passing through; and before any job can be unbypassed, all its Job Description tapes must have been mounted.

13.5 Job Scheduling

Two rules which override all others are (i) no 'unusual' job (e.g. a job specifying IBM tapes in its Job Description) is allowed on the Active List if there is already an 'unusual' job on the Active List; (ii) in no circumstances are more than two unbypassed jobs, not yet on the Execute List, allowed to be on the Active List.

Within the above limitations, the following rules apply in selecting jobs for the Active List:

As many jobs as possible are selected from any one type of stream (starting from the Top Priority stream) and then, if further selection is allowed, as many jobs as possible are selected from the next highest type of stream. For the purpose of this selection, there are considered to be 4 types of stream, in the following order:

Top Priority; Long; Tape; Short

A long job may only be selected if at most one unbypassed tape job is Passing Through, and no other long job is already on the Active List. A tape job may be selected if no unbypassed job on the Active List 'needs private tapes' or is in Tape Assembly.

A short job can only be selected if no other (unbypassed) job, not on the Execute List, is already on the Active List, unless the latter job 'needs private tapes' or is in Tape Assembly. In choosing a short job for the Active List, an attempt is first made to select a short job in the highest short stream (starting from stream no. 1.0) in which there is no other Active entry, and which is in a state of emergency or semi-emergency on output; this latter situation arises when the output peripherals assigned to this stream have, or soon will have, nothing to do. Failing that, the highest short stream is chosen such that the output accumulating for that peripheral type, from jobs already on the Active List, is below a certain amount.

With the possible exception of an 'unusual' job, or a job whose priority has changed, the job entry selected for the Active List from a given stream is the one that has been longest in the machine without having been selected.

The overlapping of job processing can be suppressed altogether if the "One job at a time" mode of Supervisor control is used. (See section 12.)

As an example, the following is a typical sequence of events.

1) Assemble input for a long job, and request tapes for a tape job.

2) Load compiler for long job (when input ready)

3) Compile long job. If tapes ready, assemble input of tape job, and request tapes for next tape job.

4) Execute long job. Load tape job compiler.

5) When tape job compiler loaded, assemble input for short job. Compile tape job.

6) Execute tape job (long job still in execution). Load compiler, then compile, then execute short job.

And so matters proceed, and clearly the exact sequence of events depends entirely on the times taken by each phase of each job.

14. THE SUPERVISOR AND SYSTEM TAPES

There are two types of tape used by the Supervisor, the Supervisor tape itself and the input/output buffering tapes, usually known as System Tapes. These have titles as follows:

Supervisor Tape	SYSTEM TAPE 5
System Input Tape	SYSTEM TAPE 4
System Output Tape	SYSTEM TAPE 3
Combined Input/Output Tape	SYSTEM TAPE 2

Any of these titles can be written to a free tape by a small program, an example being as follows:

```
JOB
(Any convenient title)
TAPE FREE
1 SYSTEM TAPE 2
COMPILER ABL
1117  0  0  0
EAO
***Z
```

This gives a new tape the title SYSTEM TAPE 2. The Supervisor tape itself is created by copying from a master tape, but the title SYSTEM TAPE 5 must be written first.

For system tapes, the title as given above is sufficient to make the tape immediately usable. They are mounted as described in section 12. When recognised by the Supervisor, messages as follows are printed:

OUTPUT TAPE ON DECK n

INPUT TAPE ON DECK m

It is possible to have various combinations of input, output and combined tapes. However, if a combined tape is in use, no other tapes should be provided. It is possible to operate with no system tape at all (with severe restrictions on job size) or with an input tape only or an output tape only. However, there are only two normal modes of operation, a combined tape or an input and an output tape.

The information accumulated on system tapes is not over-written, (except of course when a "clear start" is made) so they slowly move forwards, "swinging" to and fro between information being retrieved and information being recorded. The rate of progression varies, but it is estimated that with separate input and output tapesin use, full-length (5000 block) tapes should last for the order of 8 hours. There is no way of continuing on to another tape, so if the end of a system tape approaches, the system must be allowed to run down until all jobs terminate and complete their output. Then a CLEAR RESTART is necessary.

On an E-type fault on Supervisor and System tapes, a normal report is made, and the system continues. If the fault is or becomes F-type, a display appears in B120, as follows:

Bits 5 - 3	Channel number
Bits 15 - 12	E or F number
Bit 16	0 for E
	1 for F

The display persists until a major Supervisor event, e.g. completion of a job. Thus it may not always be present long enough to be visible.

If the F-type fault involves a faulty block on the System input or output tape, the only action taken is to skip to the next block, and the system continues. On other F-type faults the Supervisor instructs the operators to reload the faulty tape on a new deck, or take other appropriate action; it is important that no action should be taken until this message appears. (This section does not apply to MUSE, where an F-type fault will always involve a restart).

In use, the system tapes must of course have writing permitted. With the Supervisor tape, a write permit ring is normally used, but the deck is switched to writing inhibited. Certain programs (those concerned with developing new compilers) are permitted to write to this tape. These begin by a loop displaying 07070707 in B120. On this occurring, writing should be permitted until the loop occurs again. Writing should then be inhibited again.

15. LOADING AND UNLOADING OF MAGNETIC TAPES

When jobs using tapes are running, operators have the option of mounting tapes they know will be required, or of awaiting instructions from the Supervisor on the tape room teleprinter.

If a tape is mounted and engaged before requested, the following message appears

MOUNTED ON DECK n
(Tape title)

If a titled tape not mounted and engaged is required, the following is printed

MOUNT ON DECK n
(Tape title)

If a NEW tape is requested, the following is printed

MOUNT ON DECK n
NEW TO BE TITLED
(Tape title)

Note that the MOUNT messages are indented on the teleprinter for easy recognition. The tape may in fact be mounted on any available deck.

If mounted on the deck nominated, no further message appears, but if on a different deck, then is printed

MOUNTED ON DECK n
(Tape title)

If a tape not required has been mounted in error, the tape may be unloaded. (But see 10.8) No message will appear until another tape is mounted. If an operator interferes (e.g. opens the door) with a deck in actual use, an F5 fault message appears and the job will have to be run again. If the deck is restored to an engaged state and no F5 appears, then no harm has been done.

On conclusion of a job, private tapes are rewound and the decks disengaged by the Supervisor, and messages as below appear

UNLOAD DECK n
(Tape title)

The title may have been changed by the job, and the new name should be noted.

The message

WRONG TAPE DECK n

is printed if, in response to a request to load a given tape, the operator loads a tape of a different title on the only remaining free tape deck.

Note that at London and Chilton, tape teleprinter messages are printed with the tape title following the message on the same line.

16. TAPE ADDRESSING AND READDRESSING

The tape to be addressed should be mounted on Channel 7 with writing permitted.

A Tape Addressing Parameter tape should be prepared, as follows:

```
JOB
TAPE ADDRESSING
COMPILER TAD
A
n
***Z
```

The title of the job (the second line) is immaterial; it may be used to identify the job in the logging. The fourth line may include the tape reel number, for example:

```
A  E197
```

The tape reel number, if included, can be any sequence of up to eight symbols, and must be written on the same line as the A (or R for re-addressing). In the fifth line, n is an integer giving the number of blocks to be addressed. In practise, slightly more than this are attempted; as some blocks may be bad, and therefore discarded, the number of blocks will usually be slightly different from n. The fifth line (n) may be omitted, in which case the tape is addressed along its entire length.

When the Tape Addressing Parameters are input, on any reader, instructions to the operator will appear on the tape operators' teleprinter. These instructions, which are largely self-explanatory, are listed below.

ENGAGE DECK 7	The deck should be modified (the engineer will show how to do this if necessary) and engaged. If the deck has not been modified on engagement, it will be immediately disengaged, and the next message printed.
MODIFY CHANNEL 7	(Modify and re-engage)

Four passes of the tape now take place, each one being preceded by the comment

ADDRESSING PASS n (with n = 1,2,3 or 4)

The deck is then disengaged, and the next message is

UNMODIFY CHANNEL 7 (Unmodify the deck and re-engage).

At this point is printed

IDENTIFIER XXXXXXXX YYYYYYYY

NUMBER OF BLOCKS n

XXXXXXXX and YYYYYYYY are two octal numbers, being the date and time at which the message is printed. They are not in comprehensible form, being intended to serve only as a unique identifier of the tape. n is the number of blocks actually on the tape.

After the final pass, during which patterns are written to every block, the tape is rewound and then is printed

UNLOAD DECK 7

FREE

The tape may be unloaded, and has the title FREE.

If a failure in the addressing procedure occurs during passes 3 or 4, addressing (or re-addressing) will resume at pass 3; If the failure occurs after pass 4, the job will not be restarted, as all that remains to be done is to check the tape and title it "FREE". Jobs which encounter a failure before pass 2 is completed will be restarted at pass 1 in the case of tape addressing and the job terminated when readdressing. In the latter instance it will not then be possible to readdress the tape. If passes are repeated persistently, there is probably a fault which should be reported.

If a machine failure occurs, followed by a Monitor restart, addressing will be restarted. If the failure occurs during passes 3 or 4, addressing is resumed at pass 3. If the failure occurs after pass 4, there is no need to resume the process; the job should be killed, and then all that remains is to check the tape and title it "FREE".

If too many errors are detected in any one pass, the tape is rewound and the comment below appears.

TOO MANY FAULTS

UNMODIFY CHANNEL 7

When the tape has been rewound and the deck disengaged, unmodify the deck and re-engage. (This is necessary to permit the routine to check the deck has been unmodified.) The deck is then disengaged again the the next comment appears:

DISMOUNT CHANNEL 7

It is then possible to start again with the same or another tape. The current tape has not, of course, been correctly addressed.

In some circumstances

SHORT BLOCKS

is printed. This implies the tape is probably not correctly addressed, and there is a fault in the tape hardware.

Tape Re-addressing is similar to Addressing, but the format of the Steering Tape is different. Suppose that tape E2/18 has identifiers 06210544 and 06032447; it has 480 blocks, and blocks 5, 73, 421 and 537 (octal numbers) are faulty. The job to readdress this tape would be as follows:

```
JOB
TAPE READDRESSING
COMPILER TAD
R  E2/18                    Tape Number
480                         Number of blocks
06210544                    )
06032477                    )Identifiers
5                           )
73                          )Faulty blocks
421                         )to be
537                         )readdressed
***Z                        )(octal numbers)
```

Various miscellaneous facilities are associated with the TAD compiler. The formats of Steering Tapes for these facilities are given below:

(i) Write "FREE" to an identified tape

```
JOB
WRITE FREE
COMPILER TAD
F
480                         Number of blocks
06210544                    )
06032447                    )Identifiers
***Z
```

(ii) Write "FREE" to an unidentified tape

```
JOB
WRITE FREE
COMPILER TAD
Z
***Z
```

(iii) Print the identifiers and other information from block 0

```
JOB
PRINT BLOCK 0
COMPILER TAD
P
***Z
```

(iv) Check a tape by reading from it

```
JOB
CHECK READ
COMPILER TAD
C
R
***Z
```

(v) Check a tape by writing to it

```
JOB
CHECK WRITE
COMPILER TAD
C
W
480                          Number of blocks
06210544
06032447                     } Identifiers
***Z
```

Lines 7 and 8 (identifiers) are optional, and will not normally be included.

N.B. The output from (iv) and (v) is in the form of a job for re-addressing the tape.

(vi) Copy a tape from block n

```
JOB
COPY TAPE
TAPE 1  (Tape title)
COMPILER TAD
B
n                            Start of copying
***Z                         (block number in
                              octal)
```

The tape title in the Job Description is that of the tape to be copied to.

This copies from block n onwards of the tape on Channel 7 to the nominated tape, from block n onwards. (The purpose of this is for salvaging information from damaged tapes.)

17. SUPERVISOR LOOP STOPS AND IDLING

The following is a list of loop stops which can occur in the Supervisor. It should be noted that the reasons given can never be guaranteed to be correct, as it is always possible for a machine fault to divert the Supervisor from its correct course, and this may lead to a loop stop.

Stops during normal running

1) Extracode control * 4005

Peripheral buffer fault.
Evidence of a hardware error detected within a block currently in use by any peripheral. Fault could be in store or in B-register arithmetic, and is virtually impossible to pin down unless it arises consistently.

2) Interrupt control * 4004777
(Lights showing * 4005)

Interrupt from non-existent peripheral.
The least significant octal digit of I indicates the source of the interrupt:

0	Card reader 2 - 7
0.3	Anelex 2, 3
0.5	Digits 30, 31 of card punch 1.a.m. line * 6004346

The interrupt has not been reset when this loop occurs.

3) Extracode control * 3402277

Waiting for Write Permit or Inhibit on supervisor tape. Display in B120 reads * 70707070, and changes to zero when the Write Permit status of the supervisor tape is changed.

Stops in automatic monitor

4) Interrupt control * 4006562

Too many faults.
This occurs if too many machine faults occur simultaneously to make entry to the automatic monitor worthwhile. The stop is accompanied by a low hoot; the fault record is displayed in B120, as described in chapter 3 above.

5) Extracode control * 4006276

Wait for output.
The Monitor is waiting for teleprinter 0 to be engaged to print the fault record.

6) Extracode control * 4006344

Wait for drum.
The Monitor is trying repeatedly to read a block from the drum to analyse a fault.
The display in B120 reads * 07070707.

7) Interrupt control * 4017557

Post-mortem wait.
The Supervisor is waiting for Anelex 0 to be engaged; this stop can occur only when post-mortems are being taken.

Stops during manual start

N.B. The addresses given here are liable to change.

8) Interrupt control * 4006147

Wait for Supervisor tape to be engaged.

9) Interrupt control * 7000437

Wait for handkey 0 to be set to indicate method of call-down.
(This does not apply to MUSE).

10) Interrupt control * 7000677

Wait for log punch or operators' teleprinter to be engaged.
The display gives the V-store address of the peripheral.

11) Interrupt control * 700011

Deck fail in initial call
Display in B120 reads * 52522525

12) Interrupt control * 7000527

Error in initial call of Supervisor

13) Interrupt control * 70002671

Block address error in initial call

Both of the above 2 stops initiate printing similar to that for a deck fault (see section 5)

14) Interrupt control * 3402621

Wrong stacks omitted; modifications to omit a pair of stacks were included in initial call.

15) Interrupt control * 7000527

Initial call of supervisor finds interrupts which it cannot extinguish.
Display in B120 shows *4 plus the contents of the interrupt line (2*6).

Idling display on B120

(This section does not apply to MUSE)

The display described below is shown in B120 when the computer has been idling continuously for 30 seconds. It is expunged by any event causing another display in B120, i.e. normally any entry to the scheduler. Digit numbering begins from 0 at the less significant (right hand) end.

digit 0	operator's output or log punch disengaged (digit 1 = 0 if log punch)
digit 1	operator's output busy
digit 2	waiting for tape to be mounted
digits 3→ 5	channel number n (with digit 6,7, or 8)
digit 6	fault on system tape on channel n
digit 8	system tape on channel n is busy but has no current order (if not combined with digit 10 indicates a Supervisor fault)
digit 9	full output list
digit 10	low on store
digit 11	not used
digits 12→23	all lit

18. TAPE SWITCHING SYSTEMS

(i) Tape-switching at Chilton

There are sixteen decks and eight channels. Tape operations on a deck are obeyed by coupling the deck to a channel, and hence only eight decks can be transferring simultaneously.

The channels are connected in pairs; each pair can control four decks, coupled as follows:

Decks	0, 1, 8, 9	are	connected	via	channel	0 or 1
	2, 3, 10,11	"	"	"	"	2 or 3
	4, 5, 12,13	"	"	"	"	4 or 5
	6, 7, 14,15	"	"	"	"	6 or 7

When a tape order is given for a deck, it is brought onto channel unless both available channels are already in use, in which case the tape order is held up. When the queue of tape orders for one deck is exhausted, the deck is disconnected, and the channel made available to another deck which has previously been held up.

Supervisor Restrictions

Supervisor and System Tapes must be mounted on decks 0 to 7, not on decks 8 to 15.

Tape-addressing

Tape-addressing requires channel 7, and any one of the decks 6, 7, 14 or 15 might be used. However, at present the standard deck is deck 7, and this is permanently connected to channel 7; thus decks 6, 14 and 15 have access only to channel 6. Modifications are available to permit any one of this group of four decks to be used for tape-addressing.

Advice on Use

Since only two of the four tapes in each group can be transferring or searching simultaneously, it is advisable to mount a maximum of two high-activity tapes on each group of four decks, and one only on the group of decks 6, 14, 15. In this connection, the system input and output tapes should be regarded as high-activity tapes; the supervisor-compiler tape could be regarded as of low activity.

(ii) Tape-switching at London

There are fourteen decks and eight channels. One pair of channels controls eight of the decks; the remaining decks are connected to one channel each, as follows:-

Decks 0, 1, 8, 9, 16, 17, 24, 25		are connected via channel 0 or 1			
Deck	2	is connected via channel			2
"	3	"	"	"	" 3
"	4	"	"	"	" 4
"	5	"	"	"	" 5
"	6	"	"	"	" 6
"	7	"	"	"	" 7

The same restrictions on tape-addressing and supervisor tapes apply as at Chilton; tape addressing is carried out on channel 7, and the Supervisor and Systems tapes may be mounted only on decks 0 to 7.

High-activity tapes may be mounted on any of the decks 2 to 7, and any two of the decks connected to channels 0 and 1.

19 EMERGENCY SHUTDOWN

In certain conditions, the machine will automatically enter a switch-off sequence, and this is signalled by alarm bells. It is normal practice for all tape decks to be switched to "Stand-by" on this occurring, as rapidly as possible, otherwise there may be a risk of tapes being overwritten. Local instruction from the engineers should be sought on this matter.

20. STORE USED BY THE SUPERVISOR

The total store available is different at all installations, and that used by the Supervisor varies dynamically according to conditions. This section gives the present state, but it should be noted that the amounts used by the Supervisor are likely to change as additions are made from time to time. Figures are in blocks of 512 words.

	MUSE	London	Chilton
Maximum Store for users (No tape addressing or operator requests, and no input stream greater than one block)			
Supervisor	48	48	49
Object Programs	176	208	239
Minimum Store for users (Operator requests in use, and input streams of 16 blocks or more)			
Supervisor	72	72	73
Object Programs	152	184	215
(If tape addressing is also in use)			
Supervisor	80	86	87
Object Programs	144	170	201

Notes

1. The store used by the Supervisor includes amongst other items:

   2 blocks of Restart information on the drum
   1 empty page/sector
   6 blocks reserved for possible buffering

2. Should need arise, modifications can be made to increase the maximum limit at (MUSE, London, Chilton) from (176, 208, 239) by 4 blocks to (180, 212, 243) blocks, and to make (176, 208, 239) blocks available to a program with long input streams. More drastic modification could increase these limits to (185, 217, 248) blocks.

3. The above limits are maxima; in order to run jobs whose size approaches them, it is advisable to set Hand Key 5 to 1 to ensure minimum use of buffers by other jobs.

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