

Subject: MCR10071, tape_mult_read_\$get_chars
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The `iox_$get_chars` subroutine description outlines how a stream I/O module's `get_chars` entrypoint should operate. The defect is in the `tape_mult_` I/O module. For an `iox_$get_chars` call where the switch is attached to `tape_mult_`, `n_read` is not set to 0 when the next byte position is set beyond the end of file. It contains whatever value the argument passed to the `n_read` parameter held before the call to `iox_$get_chars`.

Entry: `iox_$get_chars`

This entry point reads 9-bit bytes from the unstructured file or device to which an I/O switch is attached. The switch must be open for `stream_input` or `stream_input_output`. The desired number of bytes, `N`, is specified in the call. Some I/O modules may actually read fewer than `N` bytes into the buffer, even though `N` bytes are available from the file or device. In this case the code error table `$_short_record` is returned. When this code is returned, the caller may again call the `iox_$get_chars` entry point to get more bytes. The contents of the buffer beyond the last byte read are undefined.

If the switch is attached to a file, bytes are read beginning with the next byte, and the next byte position designator is advanced by the number of bytes read. If fewer than `N` bytes remain in the file, the code error table `$_short_record` is returned, and the next byte position is set to end of file. If the next byte position is already at end of file, the code error table `$_end_of_info` is returned.

It is possible to write a program which takes certain actions if a call to `iox_` takes longer than a certain amount of time. See the `timed_io_$get_chars` entry point.

USAGE

declare `iox_$get_chars` entry (ptr, ptr, fixed bin(21), fixed bin(21), fixed bin (35)) ;

call `iox_$get_chars` (iocb_ptr, buff_ptr, n, n_read, code);

ARGUMENTS

`iocb_ptr`
 points to the switch's control block. (Input)
`buff_ptr`
 points to the byte-aligned buffer into which bytes are to be read. (Input)
`n`
 is the number of bytes to be read where `n >= 0`. (Input)
`n_read`
 is the number of bytes actually read. (Output) If code is 0, `n_read` equals `n`.
`code`
 is an I/O system status code. (Output)

The highlighted text in this description pertains to one of the problems reported in Multics Change Ticket: [#195](#).

In that ticket, an `exec_com` uses `io_call` to demonstrate that the `tape_mult_` I/O module does not handle the `iox_$get_chars` call correctly when returning with `code = error_table_$end_of_file`. If a final successful read returns a partial record (`n_read < n`) and `code = error_table_$end_of_file`, any subsequent read returns `error_table_$end_of_file`, but does not set its `n_read` parameter.

While the correct error code is being returned for reading when positioned beyond the end-of-tape mark, a potentially non-zero value in `n_read` makes it appear that some data was also returned. In such cases, the buffer pointed to by the `buff_ptr` parameter is unchanged.

Proposed Change

When `tape_mult_read_$get_chars` is first entered, place zero in the `n_read` parameter.

The green highlight shows the line being added:

```
pr tape_mult_read.pl1 -from 183 -for 12 -nb
183  get_chars: entry (Piocb,
184                    Pcallers_buffer,
185                    number_of_chars_requested,
186                    Lcallers_buffer,
187                    code);
188
189  /* ***** */
190
191  Lcallers_buffer = 0;
192  code = 0;
193  Sentry_was_at_get_chars = "1"b;
194  call get_number_of_chars_requested (Sentry_was_at_get_chars, code);
```

`mbuild: print -save`

Description:

`tape_mult_read_$get_chars` fails to set `Lcallers_buffer` (number of chars read) when called while positioned beyond EOT (end-of-tape) marker. [Bug:195]

Installation_directory: `>udd>m>gd>w>tm;`

Build_script: `tm.mb;`

Bound_obj: `bound_tape_mult_ IN: hard UPDATE;`
 source: `tape_mult_read.pl1 REPLACE compiler: pl1 -ot;`

`mbuild: compare`

----- `tape_mult_read.pl1`

`compare_ascii`

`>ldd>hard>source>bound_tape_mult.s.archive::tape_mult_read.pl1 ==`

. . . [Changed date format in earlier history comments omitted.]

```
A69      16) change(87-07-07,GWMay), approve(87-07-17,MCR7747),
A70      audit(87-07-07,Beattie), install(87-07-17,MR12.1-1043):
A71      Changed to return immediately when records are out of sequence.
Changed by B to:
B69      16) change(1987-07-07,GWMay), approve(1987-07-17,MCR7747),
B70      audit(1987-07-07,Beattie), install(1987-07-17,MR12.1-1043):
B71      Changed to return immediately when records are out of sequence.
B72      17) change(2020-01-22,GDixon), approve(2020-01-22,MCR10071):
B73      tape_mult_read_$get_chars fails to set Lcallers_buffer when called
B74      while positioned beyond EOT (end-of-tape). [Bug:195]
```

Inserted in B:

```
B191      Lcallers_buffer = 0;
```

Preceding:

```
A188      code = 0;
```

Comparison finished: 9 differences, 64 lines.

mbuild:

Testing

This code change was tested by creating a short tape containing 10000 characters of data. The call command is used to read this data from the tape records into a 2900 character buffer. This ensures that the final read will contain fewer than a full buffer of data.

The first three reads each return with parameters: buff_ptr shows the actual characters read from the tape; n_read = 2900 gives number of characters read into buff_ptr; and code = 0.

```
io_call attach S tape_mult_ GCD001
Mounting tape GCD001 for reading
Mounted Multics volume "GCD001" (recorded at 800 BPI), on device tapa_05
io_call open S stream_input
```

```
call iox_$get_chars -in 247|24414
                    -inout "" -id buff_ptr -addr "char(n)"
                    -in 2900 -id n
                    -inout 9999 -id n_read
                    -out -id code -code

-- Return from: iox_$get_chars -----
buff_ptr          417|2140 ->
....|....1....|....2....|....3....|....4....|....5....|....6....|....7....|....8....|....9....|100
....|....1....|....2....|....3....|....4....|....5....|....6....|....7....|....8....|....9....|200
....|....1....|....2....|....3....|....4....|....5....|....6....|....7....|....8....|....9....|300
....|....1....|....2....|....3....|....4....|....5....|....6....|....7....|....8....|....9....|400
....|....1....|....2....|....3....|....4....|....5....|....6....|....7....|....8....|....9....|500
....|....1....|....2....|....3....|....4....|....5....|....6....|....7....|....8....|....9....|600
....|....1....|....2....|....3....|....4....|....5....|....6....|....7....|....8....|....9....|700
....|....1....|....2....|....3....|....4....|....5....|....6....|....7....|....8....|....9....|800
....|....1....|....2....|....3....|....4....|....5....|....6....|....7....|....8....|....9....|900
....|....1....|....2....|....3....|....4....|....5....|....6....|....7....|....8....|....9....|1000
....|....1....|....2....|....3....|....4....|....5....|....6....|....7....|....8....|....9....|1100
....|....1....|....2....|....3....|....4....|....5....|....6....|....7....|....8....|....9....|1200
....|....1....|....2....|....3....|....4....|....5....|....6....|....7....|....8....|....9....|1300
....|....1....|....2....|....3....|....4....|....5....|....6....|....7....|....8....|....9....|1400
....|....1....|....2....|....3....|....4....|....5....|....6....|....7....|....8....|....9....|1500
....|....1....|....2....|....3....|....4....|....5....|....6....|....7....|....8....|....9....|1600
....|....1....|....2....|....3....|....4....|....5....|....6....|....7....|....8....|....9....|1700
....|....1....|....2....|....3....|....4....|....5....|....6....|....7....|....8....|....9....|1800
....|....1....|....2....|....3....|....4....|....5....|....6....|....7....|....8....|....9....|1900
....|....1....|....2....|....3....|....4....|....5....|....6....|....7....|....8....|....9....|2000
....|....1....|....2....|....3....|....4....|....5....|....6....|....7....|....8....|....9....|2100
....|....1....|....2....|....3....|....4....|....5....|....6....|....7....|....8....|....9....|2200
....|....1....|....2....|....3....|....4....|....5....|....6....|....7....|....8....|....9....|2300
....|....1....|....2....|....3....|....4....|....5....|....6....|....7....|....8....|....9....|2400
....|....1....|....2....|....3....|....4....|....5....|....6....|....7....|....8....|....9....|2500
....|....1....|....2....|....3....|....4....|....5....|....6....|....7....|....8....|....9....|2600
....|....1....|....2....|....3....|....4....|....5....|....6....|....7....|....8....|....9....|2700
....|....1....|....2....|....3....|....4....|....5....|....6....|....7....|....8....|....9....|2800
....|....1....|....2....|....3....|....4....|....5....|....6....|....7....|....8....|....9....|2900

n_read            2900
code               OK

call iox_$get_chars -in 247|24414 -inout "" -id buff_ptr -addr "char(n)" -in 2900 -id n -inout 9999 -id n_read
                    -out -id code -code

-- Return from: iox_$get_chars -----
buff_ptr          417|2140 ->
....|....1....|....2....|....3....|....4....|....5....|....6....|....7....|....8....|....9....|3000
. . . (intervening characters read are omitted from this MCR, for brevity)
....|....1....|....2....|....3....|....4....|....5....|....6....|....7....|....8....|....9....|5800

n_read            2900
code               OK

call iox_$get_chars -in 247|24414 -inout "" -id buff_ptr -addr "char(n)" -in 2900 -id n -inout 9999 -id n_read
                    -out -id code -code

-- Return from: iox_$get_chars -----
buff_ptr          417|2140 ->
....|....1....|....2....|....3....|....4....|....5....|....6....|....7....|....8....|....9....|5900
. . . (intervening characters read are omitted from this MCR, for brevity)
....|....1....|....2....|....3....|....4....|....5....|....6....|....7....|....8....|....9....|8700

n_read            2900
code               OK
```

A fourth read returns with: n_read = 1300, and code = error_table_\$end_of_info.

```
call iox_$get_chars -in 247|24414 -inout "" -id buff_ptr -addr "char(n)" -in 2900 -id n -inout 9999 -id n_read
                    -out -id code -code

-- Return from: iox_$get_chars -----
buff_ptr          417|2140 ->
....|....1....|....2....|....3....|....4....|....5....|....6....|....7....|....8....|....9....|8800
```

```

....|....1....|....2....|....3....|....4....|....5....|....6....|....7....|....8....|....9....|8900
....|....1....|....2....|....3....|....4....|....5....|....6....|....7....|....8....|....9....|9000
....|....1....|....2....|....3....|....4....|....5....|....6....|....7....|....8....|....9....|9100
....|....1....|....2....|....3....|....4....|....5....|....6....|....7....|....8....|....9....|9200
....|....1....|....2....|....3....|....4....|....5....|....6....|....7....|....8....|....9....|9300
....|....1....|....2....|....3....|....4....|....5....|....6....|....7....|....8....|....9....|9400
....|....1....|....2....|....3....|....4....|....5....|....6....|....7....|....8....|....9....|9500
....|....1....|....2....|....3....|....4....|....5....|....6....|....7....|....8....|....9....|9600
....|....1....|....2....|....3....|....4....|....5....|....6....|....7....|....8....|....9....|9700
....|....1....|....2....|....3....|....4....|....5....|....6....|....7....|....8....|....9....|9800
....|....1....|....2....|....3....|....4....|....5....|....6....|....7....|....8....|....9....|9900
....|....1....|....2....|....3....|....4....|....5....|....6....|....7....|....8....|....9....|10000

n_read      1300
code        error_table_$end_of_info  End of information reached.

```

For programs that read data until no further characters are returned, a fifth read should return with: `n_read = 0`, and `code = error_table_$end_of_info`.

- The installed `tape_mult_` never changes the `n_read` parameter from its value prior to the call (9999); but it does set `code` properly.

```

call iox_$get_chars -in 247|24414 -inout "" -id buff_ptr -addr "char(n)" -in 2900 -id n -inout 9999 -id n_read
                        -out -id code -code
-- Return from: iox_$get_chars -----
buff_ptr              417|2140 ->
n_read                9999
code                  error_table_$end_of_info  End of information reached.

```

- The repaired `tape_mult_` sets `n_read = 0`, and also sets `code` properly.

```

call iox_$get_chars -in 247|24414 -inout "" -id buff_ptr -addr "char(n)" -in 2900 -id n -inout 9999 -id n_read
                        -out -id code -code
-- Return from: iox_$get_chars -----
buff_ptr              417|2140 ->
n_read                0
code                  error_table_$end_of_info  End of information reached.

```

Notice that both the installed `tape_mult_` and the repaired program return after the fourth read with the parameter: `code = error_table_$end_of_info`. The documentation for `iox_$get_chars` says this should be: `code = error_table_$short_record`.

This variance from the `iox_$get_chars` documentation is not being changed as part of this repair proposal. Many programs (both installed and privately owned) use `tape_mult_` to read tapes. Changing the code returned with a short record could adversely affect their operation. At this point, it is prudent to ignore non-use of the `error_table_$short_record` return code by `tape_mult_`.

Documentation

The code being changed follows the existing documentation, so no documentation changes are anticipated.

Version History

Date	Revision	Author	Comment
2020-01-22	1.0	Gary Dixon	Initial version of MCR.
2020-01-23	1.1	Gary Dixon	Correct problems found by Eric Swenson during review of the initial MCR.