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Identification

Interface Specifications for the Tape Controller Interface Module

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Purpose

The tape controller interface module (TCIM) is a module of the hardcore supervisor and is designed to handle input/output requests for the GE 7/9 channel ASA Compatible Magnetic Tape Subsystem (PPS 43A143085). This module provides the standard software interface to all tape handlers (and their controllers) available to the Multics system. The TCIM accepts calls requesting input/output activity on the various tape handlers. Upon completion of these requests, the TCIM issues wakeup signals to the requesting processes and provides the corresponding status information upon request.

Introduction

The primary functions of the TCIM are 1) to insure that each tape handler is accessible only to the process to which it is assigned, 2) to assign the tape channel to be used for each I/O request, and 3) to process all tape channel interrupts and direct the status information to the appropriate processes. It is not the function of the TCIM to conceal or to extend the capabilities of the tape subsystem. As a result, the TCIM does not attempt any form of error recovery but merely returns the status information to its caller.

The TCIM provides a number of entries through which input/output activities may be requested. As each input/output request is received, the request is placed on a request queue for subsequent processing and control is immediately returned to the caller. Upon completion of a request, a wakeup signal is sent to the requesting process and status information is stored with the completed request. This status information is obtained by means of the request_tape_status call (described below) at which time the request is deleted from the queue.

Up to 50 requests for a single tape handler may be stacked in the request queue before the calling procedure must block itself until some of the requests have been processed. In general, the caller must ultimately issue a call to request_tape_status for each request generated. If, however,

the TCIM encounters an error in the processing of a request by some tape handler, any unprocessed requests remaining for that tape handler are deleted from the request queue. Once an error is encountered, the TCIM will reject all requests for the tape handler causing the error, until all status information for that tape has been returned via the `request_tape_status` call. If any of the requests deleted from the queue are to be reissued, they must be regenerated by the caller.

Whenever a new request is placed on the request queue, the TCIM marks the request with a 4-bit major status expected from the tape subsystem upon normal completion of the request. If, when the request is processed, the major status provided by the tape subsystem does not match the expected major status, the TCIM assumes that the request was processed in error.

Data Requests

All calls to the TCIM which generate tape requests involving the transfer of data to and from core memory have the following form.

```
call tcim$entry (device, wakeup, retstat, mode, offset,
                list1, list);
```

The parameters used in this call are declared in the following PL/I statement.

```
dc1 device fixed bin (17),
    wakeup bit (1),
    retstat bit (36),
    mode bit (2),
    offset fixed bin (17),
    list1 fixed bin (17),
    1 list (*),
    2 address ptr,
    2 count fixed bin (17);
```

In the above call, entry is used to denote one of the following TCIM entry points.

read - This entry is used to initiate the reading of data from the specified tape handler.

write - This entry is used to initiate the writing of data from core memory to the specified tape handler.

The parameters used in calling these entries are described as follows.

device - This parameter specifies the device index (see BD.8.3) which defines both the desired device (tape handler) and the event cell to be set if and when a wakeup signal is generated by this request.

wakeup - If this switch is ON, a wakeup signal will be sent to the requesting process upon completion of the request. If the switch is OFF, no wakeup signal will be sent to the requesting process unless an error condition is encountered in the processing of the request.

retstat - This parameter specifies a bit string in which the TCIM records any errors encountered in processing the call. Specific bits in this string are set to "1"b whenever certain specified error conditions occur (see below). The string is set to all zeros if the call is processed without error.

mode - This parameter specifies the mode of the read or write operation and must have one of the following values.

"00"b - read/write tape binary
 "01"b - read/write tape nine
 "01"b - read/write tape bcd

offset - This parameter specifies the bit position (0-35) within the first 36-bit word of core memory at which the tape subsystem will begin to transmit data to or from the physical tape record. (The present hardware requires that this quantity be a multiple of six.)

list1 - This parameter specifies the number of address/word-count pairs which describe the core memory to be involved in the data transfer.

list - This parameter specifies an array of address/word-count pairs. Each element in the array consists of a pointer (ITS pair) and a word count which describe a single block of core memory to be involved in the data transfer. If the pointer is null, the specified number of words will be skipped (on a read operation) or written with zeros (on a write operation).

In all requests involving data transfer, the major status expected of the tape subsystem is "device ready". If any other status is encountered, the TCIM will delete any unprocessed requests for the tape handler generating the error.

Non-data Requests

All calls to the TCIM which generate tape requests which do not involve data transfer have the following general form.

```
call tcim$entry (device, wakeup, retstat);
```

The device, wakeup and retstat parameters have been previously defined. In the above call, entry is used to denote any of the following TCIM entry points.

reset status - This entry is used to reset any resettable status in the specified tape handler and store the new status of the device. It is recommended that this request be used initially to determine the status of a tape handler. The major status expected by the TCIM for this request is "device ready".

fwd space record - This entry is used to forward space one record. Expected major status is "device ready".

fwd space file - Used to forward space one file. Expected major status is "end of file".

backspace record - Used to backspace one record. Expected major status is "device ready".

backspace file - Used to backspace one file. Expected major status is "end of file".

erase - Used to write blank tape. Expected major status is "device ready".

write eof - Used to write an end of file record. Expected major status is "device ready".

high density - Used to set tape handler in "high density" mode. Expected major status is "device ready".

low density - Used to set tape handler in "low density" mode. Expected major status is "device ready".

file protect - Used to set tape handler "file protect" mode. Expected major status is "device ready".

rewind - Used to rewind tape to load point. Expected major status is "device ready". Note: The status information provided for this request is the status of the device after the physical rewind is completed.

rewind unload - Used to rewind and unload the tape. Expected major status is "device ready". Note: The status information provided for this request is the status of the device after the physical rewind and unload operation is complete and should be "attention-standby". Since the TCIM expects "device ready", any requests following a rewind and unload will be deleted.

The request tape status Call

To obtain the current status of a tape handler and to obtain status information for completed tape requests, the following call is provided.

```
call request_tape_status (device, stat1, stat, retstat);
```

The device and retstat parameters have been previously defined. The remaining parameters are declared in the following PL/I statement.

```
dcl stat1 fixed bin (17),
    1 stat (0:*)
      2 statsw bit (1),
      2 requests_out bit (1),
      2 opcode bit (6),
      2 status bit (10),
      2 recsize bit (12);
```

The stat1 parameter defines the number of status blocks to be returned in the stat array excluding stat (0) in which the current status of the device is stored. If stat1 is zero, only the current status is stored. If stat1 is non-zero, the specified number of status blocks are stored in the stat array in the same order as the original requests were issued. The items contained in each status block are described below.

statsw - This switch indicates whether (ON) or not (OFF) the next sequential block in the stat array contains meaningful information. This switch is OFF only when there is no more status information yet available for the specified tape handler. If stat(stat1).statsw is ON, the request_tape_status entry must be called again to obtain the remaining status information.

requests_out - This switch indicates whether (ON) or not (OFF) there are any more requests left in the request queue for this tape handler.

opcode - This item contains the tape operation code of the original request. (See PPS 43A143085 for operation code values and assignments.)

status - This item corresponds to the 10-bit major status and sub-status stored by the tape subsystem upon completion of the request. (See PPS 43A143085 for status interpretation.)

recsize - If the original request was a read request, this item contains the number of words actually read from the tape.

Tape Handler Assignment

To assign a tape handler for subsequent use by a process the following call is provided. This call is accessible only to the procedures of the hardcore supervisor and is intended for the use of the I/O device assignment module (see BF.3.10).

```
call assign_tape_handler (dct_index, procid, device,
                          retstat);
```

The device and retstat parameters have been previously defined. However, in this call device is not specified by the caller but is instead returned to the caller by the TCIM. The remaining parameters are declared in the following PL/I statement and are defined below.

```
dcl dct_index fixed bin (17),
     procid bit (70);
```

dct_index - This parameter specifies an index into the device configuration table (DCT) to information defining the desired tape handler. (See MSPM section on the I/O device assignment module for a description of this table.)

procid - This parameter specifies the identifier of the process to which the tape handler specified by dct_index is to be assigned.

When this call is received, any requests outstanding for the specified tape handler are deleted from the request queue.

Error Conditions

The following list provides the bit assignments in the restat parameter for the various error conditions that may be detected by the TCIM.

bit 1 - device does not specify a known tape handler.

bit 2 - device not assigned.

bit 3 - Illegal parameter in call.

bit 4 - Attempt to stack more than 50 requests.

bit 5 - A tape error has occurred (request not entered).