15.1 GENERAL

TOSS Monitor Tables exist in a variety of shapes and sizes and are created or deleted under various circumstances. The tables can be divided into three main groups depending on the time of their creation, i.e. tables that are created at:-

* linking time
* loading time
* run time

The tables can also be considered as two other types:-

* Read-only tables (type R).
* Modifiable tables (type M).

Below is a list of some monitor tables and their types:-

* Created at linking time.
  - Device Address Block (DAB), type R.
  - Task Tables (TTAB's) for Monitor Clock task, Load task, File Management Task, and Power failure task; type M.

* Created at loading time.
  - System Control Table (SCT), type R.
  - Task Control Table (TCTAB), type R.
  - Task Table (TTAB), type M.
  - Common Device Table (CDTAB), type R.
  - Device Work Table (DWT), type M.
  - Segment Block Table (SEGTAB), type M.
  - Page Block Table (PAGTAB), type M.
  - Swappable Workblock Table (SWBTAB), type R.

These tables are created by the System loading program, SYSLOD, but for some of the tables prototypes are created at linking time.

* Created at run time.
  - File Descriptor Block (FDB), type M.

This table is created by Data Management at file assignment time and dissolved when the file is closed.

All tables described above, except for the FDB, are tables existing from the time of activation of the first task, and then never dissolved during program execution.

Two tables are created by File Management when a file is opened and dissolved when it is closed. These are the File Work Table (FWT, type M) and the Extent Work Table (EWT, type R). The area used by EWT's can be used for other purposes after it has been released, whereas the FWT areas may only be used for FWT's.

Monitor blocks (3-word size) used dynamically by, for example, the timer routine, could also be regarded as tables created at run time.

There is a pool of monitor blocks from which the different monitor processors can get blocks when they need to save some information temporarily. This could be, for example, when a requested system resource is busy and the request has to be put in a queue.

The requesting task's calling parameters are saved in such a block, from which they can be retrieved when the queued request is taken into execution. The blocks are released and returned to the block pool when the parameters have been taken care of by the resource.

The pointers in TCTAB occur in the order in which tasks were defined during task definition.

There is normally one DWT for each physical device in the system. Device Work Tables are also used for Intertask Communication although they are not in this case related to any physical device.

Each logical device has a file code which is used to select the device for I/O requests. A DWT is assigned to each file code.

For this reason, a table of file codes are included in the TTAB. This table is referred to as the Task Configuration Table and is only accessible from its own task.

Identical terminal devices should preferably have the same file codes.

Some devices are, however, common to all tasks, e.g. discs and cassette drives. These common devices are listed in the Common Device Table, CDTAB, which has the same organization as the configuration table in TTAB.

The file codes for common devices should be different from each other, and from other device file codes.

CDTAB is referenced when a file code is not found in the configuration table of TTAB.

There is no restriction on sharing one device among several tasks, and one device may also be referenced by several file codes.

15.2 SYSTEM TABLE

The monitor module SYSTAB holds the interrupt vectors, the system control table (SCT), the system stack, and the idle loop.

The interrupt vectors are stored from address X'0000' to X'007E'. The corresponding interrupts are defined in the standard interrupt level table in Chapter 7.

15.3 SYSTEM CONTROL TABLE (SCT)

The SCT is the central table in the TOSS monitor (figure 15.1).

byte		
/9E	SCTMSZ	memory size (kB)
/A0	SCTSFA	start of free area (2 words)
/A4	SCTEFA	end of free area (2 words)
/A8	SCTIPL	program loading device (C0,C1,F0,F1,F4,F5,F8,F9) cassette, flex-disk, or disk.
/AA	SCTANO	application number
/AC	SCTADA	application disk sector address (2 words)
/B0	SCTIOE	application restart address
/B2	SCTTCT	TCTAB address
/B4	SCTCDT	CDTAB address
/B6	SCTPAG	PAGTAB address
/B8	SCTSWB	SWBTAB address
/BA	SCTNOP	number of pages
/BC	SCTPSZ	page size (bytes)
/BE	SCTMMC	MMU-table common part entry (index rel.TTAB entry)
/C0	SCTLAC	logical address of common part
/C2	SCTMMP	MMU-table page entry (index rel. to TTAB entry)
/C4	SCTLAP	logical address of pages

SCT (cont)

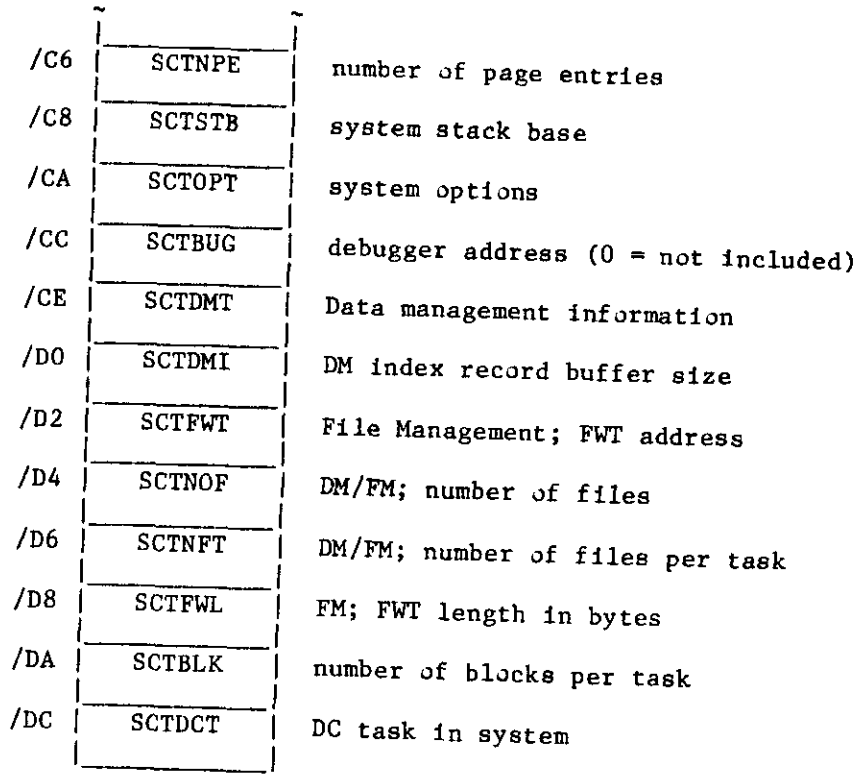


Figure 15.1. System Control Table.

SCTMSZ Memory size.
This word contains the memory size in kB, in Hex format.

SCTSFA Start/end free area.

SCTEFA Two words are used to contain the start address of the free area in memory. Word /A0 contains the most significant part of the memory address, and word /A2 the least significant. Two words at address /A4 contain the end address of the free area. This is the part of memory which is used neither by the application nor by the TOSS monitor.

SCTIPL Program loading device.
Contains the codes X'00C0', X'00C1', X'00F0', X'00F1', X'00F4', X'00F5', X'00F8', or X'00F9' for loading from cassette, 6875/6876 disk, 8863 disk, or flexible disk respectively.

SCTANO Application number.
Number as present on the disk when a create file utility was run to create the load file for this application.

SCTADA Application disk sector address.
Physical sector number at which the application file starts.

SCTIOE Application restart address.

SCTTCT TCTAB address.
This word contains a pointer to the Task Control Table.

SCTCDT CDTAB address.
This word contains a pointer to the Common Device Table.

SCTPAG PAGTAB address.
Contains a pointer to the page table, or is zero when paging is not used.

SCTSWB SWBTAB address.
Contains a pointer to the swappable workblock table, or is zero when no swappable workblocks are used.

SCTNOP Number of pages.
The number of pages reserved in memory.

SCTPSZ Page size.
The size of a page in bytes.

SCTMMC MMU table common part entry (index relative to TTAB entry).
This word contains a negative displacement relative to the TTAB entry. It points to a word in the MMU table which precedes TTAB. The entry in the MMU table to which it points contains the start address of the common data area (common to all tasks in the system).

SCTLAC Logical address of common part.
This word points to the logical start address of the common area (code part) in segment zero. This common area starts with the table P:MTAB, followed by P:PIL, etc.

SCTMMP MMU table page entry (index relative to TTAB entry).
This word contains a negative displacement relative to the TTAB entry. It points to a word in the MMU table which precedes TTAB. The entry in the MMU table to which it points contains the start address of the code page.

SCTLAP Logical address of page.
This word contains the logical start address of a code page.

SCTNPE Number of page entries.
This word indicates how many entries in the MMU table are used for a code page.

SCTSTB System stack base.
This word contains the physical start address of the A15 stack.

SCTOPT System options.
Indicates which options are present in this TOSS Monitor.
The list below indicates the meanings of bits when set:-
No bits set = Standard (No MMU, no disk paging).
15 = MMUPAG (MMU used, no disk paging).
14 = DSKPAG (Disk paging and no MMU).
13 = File Management.
12 = Swappable Workblocks.
11 = LKM Load Program included.
10 = LKM Get/Release/Attach page included.

SCTBUG Assembler debugger.
When zero, the assembler debugger is not included in the system, otherwise it contains the address of the start point of the debugger.

SCTDMT Data management.
Bits 15, 14, 13, and 12 of this word are used to indicate which DM tasks are included in this TOSS monitor.
The list below indicates the meanings of bits when set:-
No bits set = DM not included.
15 = DM Task #D.
14 = DM Task #E.
13 = DM Task #F.
12 = DM Task #G.

SCTDMI DM, index record buffer size.
This word contains a value indicating the maximum size of an index record.

SCTFWT FM, pointer to File Work Table (FWT).

SCTNOF DM/FM, number of files.
This word contains a number indicating the maximum number of files present.

SCTNFT DM/FM, number of files per task.
This word contains a number indicating the maximum number of files allowed for a task.

SCTFWL FM, length in bytes of the File Work Table (FWT).

SCTBLK Number of blocks per task.
This word contains a number indicating the number of blocks per task reserved in the monitor blockpool. No blocks are reserved for the load and power failure tasks.

SCTDCT DC task in system.
When zero no DC task is included in the system, otherwise one.

15.4 TASK CONTROL TABLE (TCTAB)

This table, pointed to by SCTTCT in the System Control Table, holds pointers to all Task Tables (TTAB's) in the system, see figure 15.3.

The first word, TABLEN, contains the length of TCTAB in bytes, including the table length word.

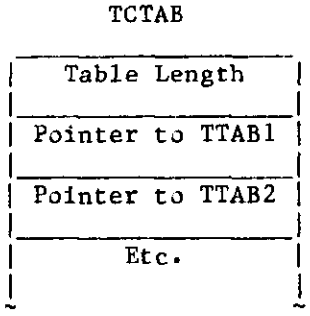


Figure 15.2. Task Control Table.

15.5 TASK TABLE (TTAB)

A set of instructions shared by a number of tasks, together with a task table (TTAB), is unique to a task and completely defines it.

The TTAB is used to describe the task configuration and task status, and also as a save area for registers.

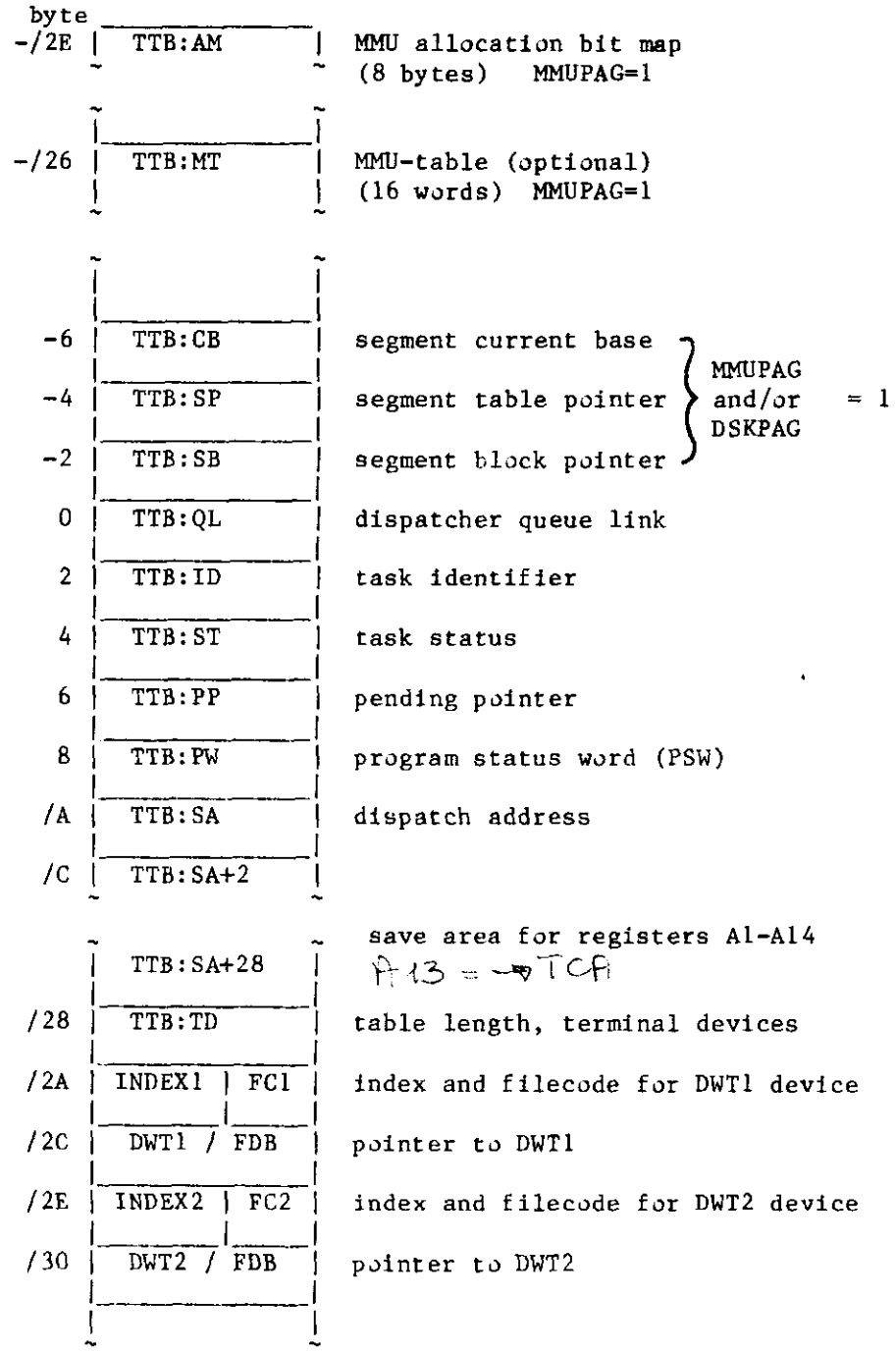


Figure 15.3. Task Table (TTAB).

TTB:AM One bit per kB sub-entry in TTB:MT.
If a bit is set, then the corresponding entry in TTB:MT points to a block of 1kB which is in use.

TTB:MT Included in MMU systems. 16 words holding the task MMU table references to physical core; filled by SYSLOD.

TTB:CB Pointer to a word in the application where the current segment is stored.

TTB:SP Pointer to application's segment table.

TTB:SB Included in MMU and/or disk paging systems. Pointer to the actual segment block in SEGTAB.

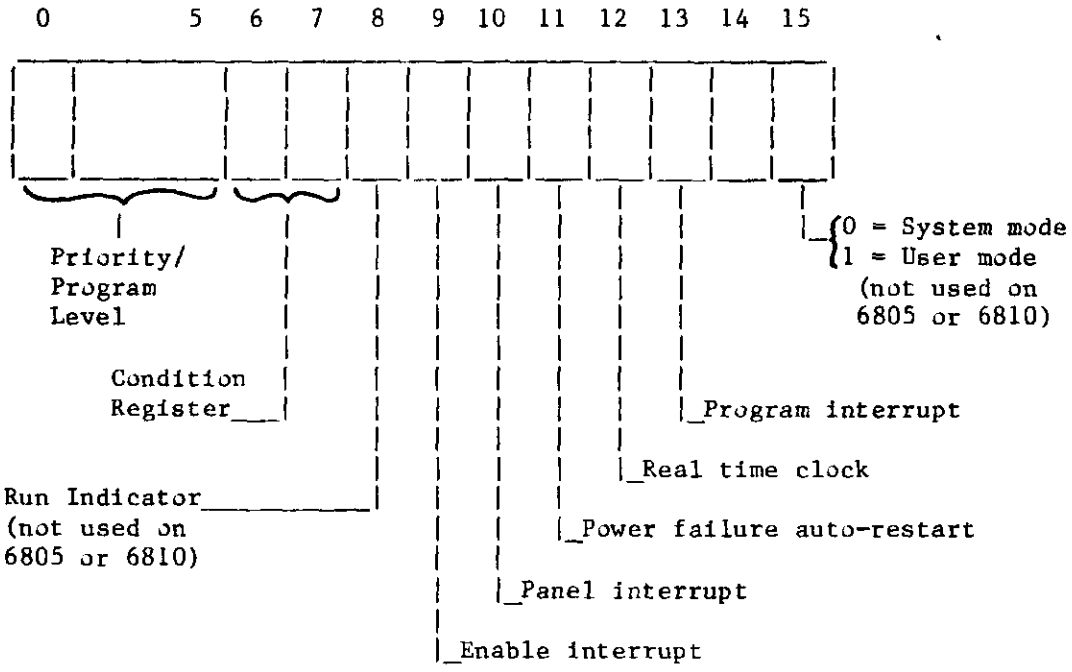
TTB:QL Dispatcher Queue Link.

TTB:ID Task identification.

TTB:ST Bits 0- 7 Reserved.
Bits 8-15 Task priority level.
Level 49-51 = Monitor tasks.
Level 52-62 = Application tasks.
Level 63 = Idle task (wait).

TTB:PP Pointer to pending queue when trying to activate a task which is already active; some parameters have to be saved and the request is inserted in the pending queue. The pending pointer is the queue anchor.

TTB:PW Program Status Word (PSW).



TTB:SA Dispatch address.
This word contains zero if the task is inactive, else the address of the next instruction to be executed for this task. If the task is running it contains the last used dispatch address.

TTB:SA+2 to TTB:SA+28 } Save area.
These words are used to save registers A1 to A14.

In each TTAB a task configuration device table is included, describing the task configuration.
The length of this table is task (configuration) dependent.

TTB:TD Table length; length of the table including this word.

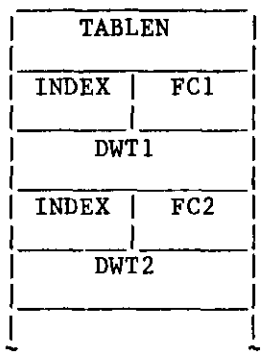
INDEX Used by drivers to select a device dependent part.
Makes it possible for several devices to share the same DWT (e.g. magnetic tapes).

FCx File code of a device.

DWTn Pointer to DWT with file code present in previous word.
Some word pairs are reserved for Data Management when local files are used by this task.
The file code and the FDB pointer are filled by the ASSGN command. One pair per file.

15.6 COMMON DEVICE TABLE

CDTAB



This table is pointed to by SCTCDT in the System Control Table and it contains information about devices which are common to all tasks. It is searched if the filecode is not found in the Terminal Device Table part of TTAB.

TABLEN Table length in bytes, including this word.

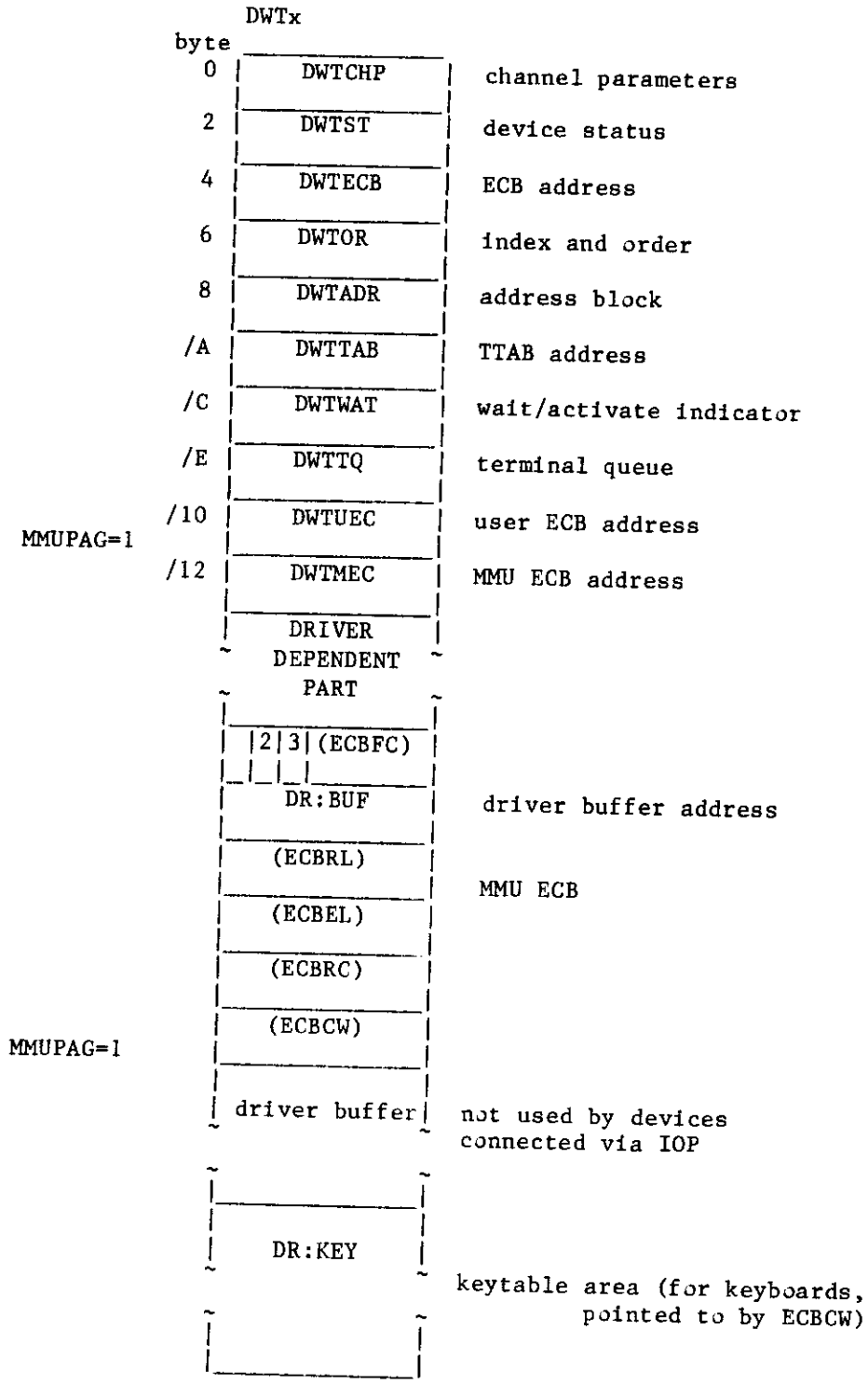
INDEX Used by drivers to select a device. Makes it possible for several devices to share the same DWT (e.g. magnetic tape, flexible disk, etc).

FCx File code of a device.

DWTn Pointer to DWT with file code as present in previous word.

Some word pairs may be reserved for data management when common files are used. The file code and FDB pointer (File Descriptor Block) are filled by the ASSGN command. Each file uses one pair.

15.7 DEVICE WORK TABLE



DWTCHP Channel Parameters for CHLT and CHRT.
Some bits have a standard meaning for these channel units.
For other channel units it is channel unit/device dependent.
Bits with standard meanings are as follows:-

```
Bit 0      : Device dependent;
             0 for Displays.
             1 for Signal Displays.
             TTP's; 0 for TP01 & 02.
                    May be 1 for TP03.
Bits 1-3   : Device address.
Bits 4-6   : CHLT; line number 0-7.
             CHRT; bit 4 set = 2nd terminal on channel.
                   bit 6 set = 2nd channel.
             ASCU4Z's; 1/3, 2/4 on lines 0 to 3.
             SALCUZ's; 1 to 4
Bit 7      : Set = input device.
Bits 8,9   : Printers; 8 set = voucher in.
                       9 set = journal paper in.
Bits 10,11: Keyboards; specifies type.
             Displays; bit 10 = 1 for 6385 or 6386.
                       bit 11 = 0 for 6344 or 6346.
                       bit 11 = 1 for 6351 or 6342.
             Signal Displays; bit 10 = 1 for 6241.
                              bit 11 = 1 for 6232, 34, 36, 71,
                                           6272, 6331.
Bits 12-15: Channel indicator.
             /0  CHLT1
             /1  CHLT2
             /2  CHLT3
             /3  CHLT4
             /4  First channel CHRT1
             /5  Second channel CHRT1
             /6  First channel CHRT2
             /7  Second channel CHRT2
             /8  First  channel CHRT3
             /9  Second channel CHRT3
             /A  First  channel CHRT4
             /B  Second channel CHRT4
             /C  ASCU4Z 1/2
             /D  ASCU4Z 3/4
             /E  Reserved
             /F  SALCUZ 1-4
```

DWTST Status Word.

Bit 0 : Set means device not busy. The bit is checked when module TIO is entered. If the device is busy the request is put into the device queue. If it is not busy, the bit is reset by TIO. When I/O is completed it is set again by module TENDIO.

Bit 1 : reserved.

Bit 2 : Set means device in echo mode. When I/O is performed with echo or with exclusive access for data management, this bit is set in the DWTST and in the DWTST of the echo device. Setting is done by module TIO. Completion of the I/O results in the resetting of this bit in both DWT's by module TENDIO.

Bit 3 : Set means recovery trial (LRC, VRC, or parity error).

Bit 4 : Set means device ATTACHed. This bit is set by the ATTACH function and reset by the DETACH function. It is checked by module TIO.

Bit 5 : Line feed control for printers (top of form). Only after a power off/on situation.

Bit 6 : Keyboard; Set means power off before the request. Printers; Set means status change not allowed. (only after power off/on situation).

Bit 7 : Set means interrupt allowed. The channel unit expects an acknowledgement of a character. When ACK is received the bit is reset.

Bits 8-15 : Device dependent information.

DWTECB ECB Address.
With no MMU present, this word points to the user ECB with which the driver is working.
When MMU is present, two situations are possible:-

* A request is performed in system mode, for example by data management. In this case DWTECB contains the user ECB address (physical).
* A request is performed in user mode. The word DWTUEC contains the user ECB logical address and DWTECB is the same as DWTMEC, which points to the MMU ECB (physical address).

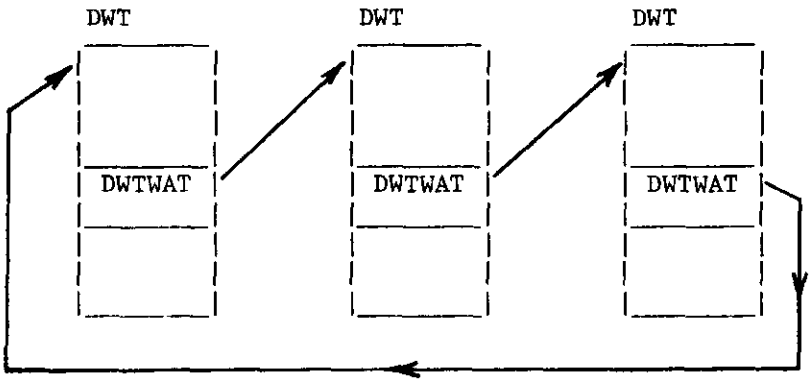
Word DWTECB is also used in recovery procedures to check whether an I/O is running. If no I/O is running the word contains zero.

DWTOR Index and Order.
Holds index and order code. Index is used to process a device dependent part of the driver.

DWTADR Address Block.
Pointer to the device address block (DAB). The DAB contains, among other things, activation, interrupt, and recovery addresses for the driver.

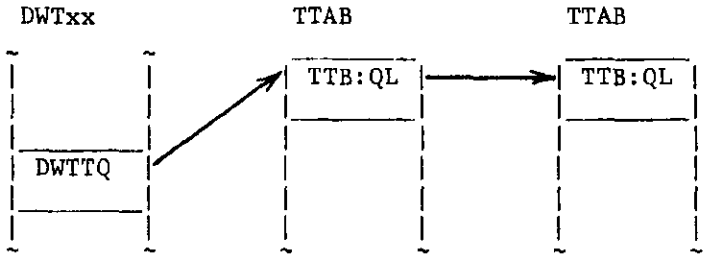
DWTTAB TTAB Address.
Pointer to the task table (TTAB) of the requesting task.

DWTWAT Wait/Activate Indicator.
0 = request in no-wait mode.
1 = request in wait mode.
This word is also used to chain DWT's in case of multiple wait requests or to hold the start address for I/O-and-activate requests. For multiple wait bit 15 is 1, for I/O-and-activate it is zero.



Example of circular DWT chain for multiple wait requests:-
When one I/O is completed, the DWTWAT words are set to zero, the other two I/O's are aborted and another multiple wait request is issued for the other two devices. The chain is then set up for these two devices only.
For CREDIT this is done in the interpreter and is transparent to the user.

DWTTQ Terminal Queue.
When a device is busy, the requesting tasks are queued on the DWT. This queue is the device queue and DWTTQ is the queue anchor. The device busy bit is reset in DWTST.



The word TTB:QL in the TTAB is used for task chaining. The end of the chain is indicated by zeroes in TTB:QL.
The word DWTTQ is also used as a pointer to the output queue. (see section 13.3.5, word CWTEQ in the Channel Work Table).

DWTUEC User ECB Address.
This word contains the logical address of the user ECB when an MMU is configured and the request is done in the user area. (see also DWTECB).

DWTMEC MMU ECB Address.
Contains the physical address of the MMU ECB in the DWT. (see also DWTECB).

ECBFC ECB Filecode.
This word is a copy of the word in the normal ECB, except that bits 2 and 3 are used to form an 18-bit buffer address when I/O is performed via an IOP. This means that devices attached to an IOP need not have an MMU buffer in the system area, since the whole memory can be accessed with an 18-bit address.

DR:BUF Driver Buffer.
This is the MMU buffer in which characters are stored during an I/O operation. Its size is specified at SYSGEN time.

DR:KEY In a keyboard or console typewriter device work table, an area for a keytable is reserved after the MMU ECB. The size of this area (DR:KEY) and the size of the driver buffer (DR:BUF) are specified during system generation (SYSGEN). For a terminal device, the system loading program (SYSLOD) reserves buffers according to the length stated in BUFLEN in the Driver Address Block (DAB).

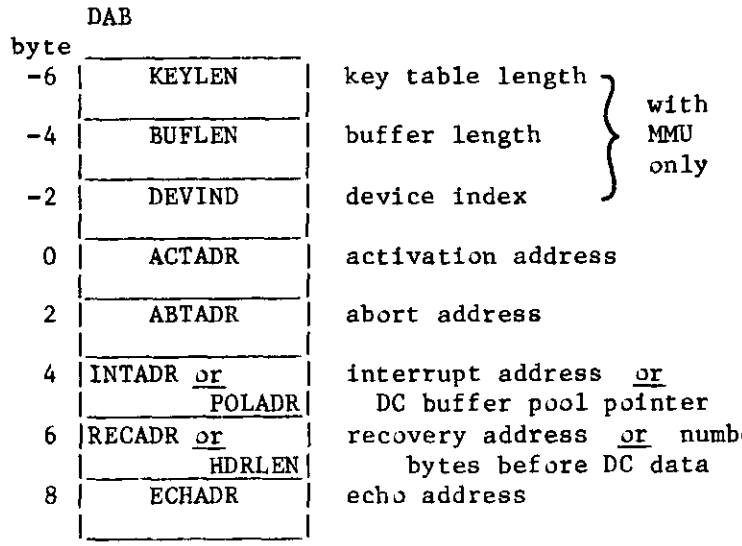
The driver dependent part of the DWT is situated between DWTTQ and the MMU ECB and its length and contents vary from driver to driver. Its contents include timer pointers, special queue anchors, A5 stack, save area for 2 to 3 registers, pointers to echo device DWT (for keyboards), volume name areas (for disks), etc.

Field displacements in the driver defined part are different depending on whether the system is running with MMU or not. SYSGEN performs all necessary updating by setting the conditional assembly parameter MMUPAG to the appropriate value.

15.8 DRIVER ADDRESS BLOCK

The Driver Address Block (pointed to by DWTADR in DWT) has the format shown below.

The three words with negative displacements (KEYLEN, BUFLEN and DEVIND) are used only in systems with MMU.



KEYLEN Keytable Length.
Contains the length of the keytable area (DR:KEY) in bytes.

BUFLEN Buffer Length.
Size of the buffer area (DR:BUF) in bytes. A default value is supplied for each device at SYSGEN if not explicitly defined.

DEVIND Device Index.
Used at I/O requests to select the appropriate routine in TIO or TENDIO for the moving of data and keytables, transferring user buffer address to the IOP, etc. Contents as follows:-

-2 No special action required (e.g. data communications).
0 Data management.
2 Device running on programmed channel.
4 Device running on IOP.
6 Keyboard/Console Typewriter.
8 Intertask communication.
10 Disk Drivers.

When a read or write request has been issued, a check is made that the requested length does not exceed the driver buffer length (BUFLEN). If it does, return code /8008 is set and no I/O is performed. A similar check is performed before transferring the keytable for keyboard/ console requests (KEYLEN).

Three drivers (DRLP01, DRCR01, DRFD01) are given device index 2 when running on an IOP. They have their own buffers in the system area and this thus resembles programmed channel running.

The other five words usually point to special routines in the driver, the names being derived from their functions. Not all drivers have the 5 words, it depends on the driver type. When the address is zero, the routine does not exist.

INTADR and RECADR are renamed POLADR and HDRLEN for DC drivers, and have different functions.

ACTADR Activation Address.
Address of the activation routine in the driver.

ABTADR Abort Address.
Address of the abort routine in the driver (abort is device/ driver dependent).

INTADR Interrupt Address.
Address of the interrupt routine in the driver.

POLADR For DC drivers only, contains a pointer to the driver's internal buffer pool.

RECADR Recovery Address.
Address of the recovery routine in the driver.

HDRLEN For DC drivers only, this contains the number of bytes which preceed the required data in a buffer.

ECHADR Echo Address.
Address of the echo routine in the driver. This is driver dependent.

15.9 MONITOR BLOCKS

At system start all blocks are held in the monitor block pool. Blocks can be obtained from this pool when monitor processors need a temporary save area for information received from tasks requesting service from busy system resources, or when certain other monitor functions are to be executed. When the requested service is completed, the blocks are released and returned to the pool.

The SCT (System Control Table) contains the word SCTBLK, in which is stored a number indicating how many blocks are reserved per task in the monitor blockpool.
The timer, dispatcher, and pending queues, for instance, all use blocks from the monitor blockpool.