DRIC01 — 2.14 INTERTASK COMMUNICATION — DRIC01

General information : This driver handles communication between tasks in the system. This driver has no connections to any peripheral device and therefore has no interrupt handler, or recovery routine.

The driver contains two Device Work Tables (DWTs) per task, one each for input and output, and therefore different file codes must be assigned to input and output. This means that it is possible to configurate a task in one of three ways, as regards Intertask Communication:

1. Only input(read) possible - only input file code assigned.
2. Only output (write) possible - only output file code assigned.
3. Both input and output possible - both input and output file codes assigned.

At I/O requests, the task should only use the I/O file codes assigned to it during Monitor generation, and thus not refer to the file codes assigned to other tasks. The user is strongly recommended to assign the same file codes for Intertask Communication (IC) to all tasks, according to the Single Terminal Interface principle.

By using the ordinary I/O interface, this driver makes it possible for one task to receive/transmit data from/to another task in the system, providing both have the appropriate Intertask Communication file codes assigned to them. The communication may be in addressed or unaddressed mode. No requests are completed until there are two complementary requests (i.e. one read and one write). This means that two complementary requests must be issued by different tasks before any data transfer takes place and the requests are completed.

When a task issues an IC request, and no complementary request exists, the issued request is put into one of four IC queues, depending on whether the request was a read or a write, and whether it was addressed to another task or unaddressed.

Two queues exist in the driver for unaddressed requests. Only one of these queues can have an entry at any one time, since, as soon as they both contain an entry, the requests are matched, communication takes place, and both requests are completed.

In the case where a task issues a request addressed to another task, and no complementary request exists, the issued request is queued on the complementary DWT i.e. a read request is queued on the write DWT of the addressed task, and vice versa. When the complementary request is issued, the request is completed and the DWT removed from the queue.

The queueing principle for all IC requests is on the FIFO (first in, first out) principle. This means that if a task issues e.g. an unaddressed read request, it will be queued until any task issues an unaddressed write request, or a write addressed to this task, and then the matching is carried out and the request completed.
In the case of an addressed request, naturally the first queued request may not be the matching one, i.e. it may be addressed to another task than the one which issued the current request. In this case the first request in the queue which is addressed to the current task is matched, and the communication takes place.

Timeout supervision is necessary, to prevent deadlock situations developing, and this is provided within the driver.

Calling sequence : Normal I/O

```
LDK  A7,code
LDKL A8,ecb-address
LKM
DATA 1
```

I/O and Activate:

```
LDKL A1,parameter
LDK  A7,code
LDKL A8,ecb-address
LKM
DATA -1
DATA start-address
```

Order codes : The following order codes may be used:
/02 - read
/06 - write
/39 - set timeout value

Buffer address : Significant for all orders except /39.
Requested length : The number of characters that will be transferred by
Effective length : the driver is determined by the smallest requested length of the two complimentary requests, and this value will be set in the effective length at completion of the request. If the requested length of the read request is less than that of the complementary write request, the request is completed with bit 12 set in the return code.

In the case where MMU is used, no move is performed if the requested length exceeds the size of the driver buffer, which is specified during Monitor generation. In that case, bits 0 and 12 will be set in the return code.

Note than only one buffer is required, regardless of the number of tasks.

Return code : The following bits may be set by this driver:

		Order		
Bit	Meaning	/02	/06	/39
0	Illegal request	x	x	x
9	Timeout	x	x	
12	Incorrect length	x	x	

Control word :

For orders /02 and /06 the control word must contain the task identification of the task to which the request is addressed, when addressed read/write are requested. For unaddressed read/write, the control word must be zero.
For order /39, the control word must contain the timeout value required, in multiples of 100 ms.

Order : /02 - read
Read Unaddressed, control word = 0
If there is a queue on the input DWT of the task that issued the request, the first DWT in this queue is removed from the queue, the retransfer of data carried out, and the request is completed. If not, the queue of unaddressed write requests is searched, and if there exists a request, they are matched, the transfer of data takes place, the DWT is removed from the queue of unaddressed writes, and the request is completed. If neither of these situations exists, the request is queued on the queue of unaddressed reads, for later matching to a write request.

When the request is completed, the control word will contain the task id of the task that issued the Write request.

Read Addressed, control word = task id of addressed task.
If the addressed task has not issued a write request, the request will be queued on the output DWT of the addressed task.
If the output DWT of the addressed task is queued on the DWT of another task, the request will be queued on the output DWT of the addressed task.
Otherwise the request will be completed, and the DWT that was found to match will be removed from the queue.
When the request is completed, the control word will contain the task id of the task that issued the Write request.

Order : /06 - write
Write Unaddressed, control word = 0
If there is a queue on the output DWT of the task that issues the request, the first DWT in this queue is removed from the queue, the transfer of data takes place, and the request is completed. If not, the queue of unaddressed read requests is checked, and if there exists a request, the two are matched, the DWT removed from the queue of unaddressed reads, the data transfer takes place and the request is completed. If neither of these situations exist, the request is queued on the queue of unaddressed writes, for later matching to a read request.
When the request is completed, the control word will contain the task id of the task that issued the Read request.

Write Addressed, control word = task id of the addressed task.
If the addressed task has not issued a read request, the request will be queued on the input DWT of the addressed task.
If the input DWT of the addressed task is queued on the DWT of another task, the request will be queued on the input DWT of the addressed task.
Otherwise the request will be completed, and the DWT that was found to match will be removed from the queue.

When the request is completed, the control word will contain the task id of the task that issued the Read request.

Order : /39 - set timeout value
This request is used to set a timeout value used by the Monitor to supervise the read and write requests. If the request has not been completed within the time specified, it will be completed with bit 9 set in the return code.

Different timeout values may be set before for each read or write, and these values are unique for the task issuing the request.
The input file code must be used to set timeout values for read requests, and the output file code for write requests. The control word must contain the timeout value required in multiples of 100 ms.

If no timeout supervision is required, the control word value must be set to a negative value.

If the value in the control word is set to zero, the request is completed immediately, regardless of whether the matching DWT exists. No queueing is performed.
If the matching DWT is found, the request is completed normally, but if not, the request is completed with bit 9 set in the return code.

The timeout value is zero at system start, and remains so unless changed by this order. The value specified then remains constant until another order /39 is issued.
In the case of Read/Write and activate, the activation will always be carried out, after removal of the DWT from the queue.

DRKB04 — 2.15 KEYBOARD — DRKB04

General information : This driver handles input from the keyboards PTS6231, 6232, 6233, 6234, 6236, 6331, 6342 and PTS6271, 6272, and from the PTS6261 Badge Card Reader with PIN keyboard PTS6291. Keyboard PTS8071 and PTS8072 with V24 interface, physically connected to the Video Display PTS8046 are also handled by this driver.

Only input from keyboards is handled by this driver; output to signal indicators and commands to the BCR is handled by the Signal Display driver DRDI01. For each keyboard in the system there is a circular input buffer, where data is stored when no read request is running. The size of this buffer must be specified during Monitor generation. For keyboards 6236, 6271 and 6272, this length must be at least 8 bytes. When a read request is issued, the data is transferred from this buffer to the user buffer.

For systems with MMU, the driver also includes an MMU buffer, and the size of this buffer must also be specified during Monitor generation.

An echo device may be attached to each keyboard, to echo input characters. If required, this function must be specified during Monitor generation.

As the keyboard hardware gives only one code for each key pressed, the driver contains a number of code conversion options, to adapt the codes to normal ISO-7 tables and national keyboard layouts.

Changes of key-locks, SHIFT and CTRL positions on keyboards PTS6236, 6271 and 6272 are also handled as input codes. The actual key-lock position must be maintained within the application program; SHIFT and CTRL functions are achieved via code conversion in the driver.

For the other keyboards the shift key results in a different code being generated by the key.

Appendix A gives keyboard layouts, and examples on the use of conversion tables.

Calling sequence : Normal I/O:

```
LDK  A7,code
LDK  A8,ecb-address
LKM
DATA 1
```

I/O and Activate:

```
LDKL A1,parameter
LDK  A7,code
LDK  A8,ecb-address
LKM
DATA -1
DATA start-address
```

Order codes : The following order codes may be used:
/01 - basic read
/02 - standard read
/03 - numeric read
/31 - skip circular input buffer

Buffer address
Requested length
Effective length
: Significant for all orders except /31. The end-of-record key is included in the length, for standard and numeric read. At the start of each request the whole buffer will be set to /00 before any character is stored.

Return code : The following bits may be set by this driver:

bit		order in which bit set			
		/01	/02	/03	/31
0	Illegal request	x	x	x	x
9	Timeout	x	x	x	
12	Incorrect length		x	x	
13	Undefined key		x	x	
14	Throughput error	x	x	x	

Control word : Significant for orders /02 and /03 only. For these orders the control word may contain the address of a keytable, containing a list of end-of-record keys. If the application uses the predefined end of record key (/0D) and no key table, the control word must contain zero.

At completion of the request the control word contains zero if a power failure has occurred, or a negative value if a key-lock code has been received.
The format of the keytable is as follows:

byte		
0	No. of EOR keys	KEY1
2	KEY2	KEY3
4	KEY4	KEY5

Note that a key-lock cannot be specified as an EOR key.

For systems with MMU, the driver includes an MMU key-table, which is a duplicate of the application keytable. The size of this table must be specified during Monitor generation.

Order : /01 - basic read
The requested number of characters are read and stored in the user buffer without any checks being carried out. Code conversion is performed according to the table (see below). If overflow has occurred in the circular input buffer at the time of the request, the requestis completed with bit 14 set in the return code.

Characters are stored in the user buffer, including key-lock characters (/70 - /77). The internal status indicator of the key position is also updated.
If a power failure occurs during the request, no action is taken. The request will then be aborted at power on.

Common functions for orders /02,/03 : If no read request is current when data is received, the characters are stored in the circular input buffer. When a read request is issued, the characters are transferred from this buffer to the user buffer, and checked in the following sequence:

- If overflow occurs in the circular buffer, the request is completed with bit 14 set in the return code.
- If the character comes from the numeric part of a PTS6234 keyboard it is checked if it must be converted.
- If the character received is from a key-lock, i.e.in the range /70-/77, the request is completed with a negative value in the control word, and the keylock code is stored in the user buffer. (Keyboards PTS6236, 6271, 6272).
- SHIFT and CTRL keys only change the internal status in the driver, and are not transferred to the user buffer
- Each character received is code converted according to the appropriate table before any further check.
- If the character is found in the table of EOR keys, the character is stored in the user buffer, and the request is immediately completed. The EOR key is also converted and stored in the control word, such that KEY1 gives a value of 1, KEY2 a value of 2, and so on to enable indexing to be performed. If the standard EOR key is used, this value will be 1.
- Code limits (/20 - /5F, /20 - /7F or /30 - /39) are checked and the character is saved in the user buffer if it is legal.
- Special characters are checked (e.g. backspace, clear key, etc.), and the corresponding functions are carried out.

- Alphanumeric characters within the range /20 - /7F, (or /30 - /39 for numeric read), after conversion, are stored in the user buffer.
- If overflow occurs in the user buffer, the request is completed with bit 12 set in the return code.
- If the last key depressed was the multiple zero key, the remaining zeroes are stored in the circular input buffer.
- If overflow occurs in the circular input buffer and the user buffer, the request is completed with both bits 12 and 14 set in the return code.
- If the character cannot be identified by the above checks, it is treated as undefined. The undefined key is stored in the user buffer, and the request is completed with bit 13 set in the return code.

If a power failure occurs during the request, or has occurred since the last read request, the request is completed with zero in the control word.

Order : /02 - standard read
Alphanumeric characters in the range /20 - /7F after conversion are accepted and stored in the user buffer.

Characters are stored in the user buffer, including key-lock characters (/70 - /77). The internal status indicator of the key position is also updated.

Order : /03 - numeric read
Numeric characters in the range /30 - /39 are accepted and stored in the user buffer. Characters in the range /70 - /79 from PTS6232 or PTS6234 with keyswitch in position 2, if specified during Monitor generation, are accepted and converted to /30 - /39.

Characters are stored in the user buffer, including key-lock characters (/70 - /77). The internal status indicator of the key position is also updated.

Order : /31 - skip circular input buffer
The information in the circular input buffer is deleted and the request is completed.

Key-lock handling on PTS6236,6271, and PTS6272. : If the keyboard does not have a keylock, or if it is required to accept input from a keyboard with the lock in position zero, this must be specified during Monitor generation. Otherwise, the following rules apply: Changed key-lock position will be received as input characters. This always causes a completion of the current Standard or Numeric read, with a negative value in the control word.

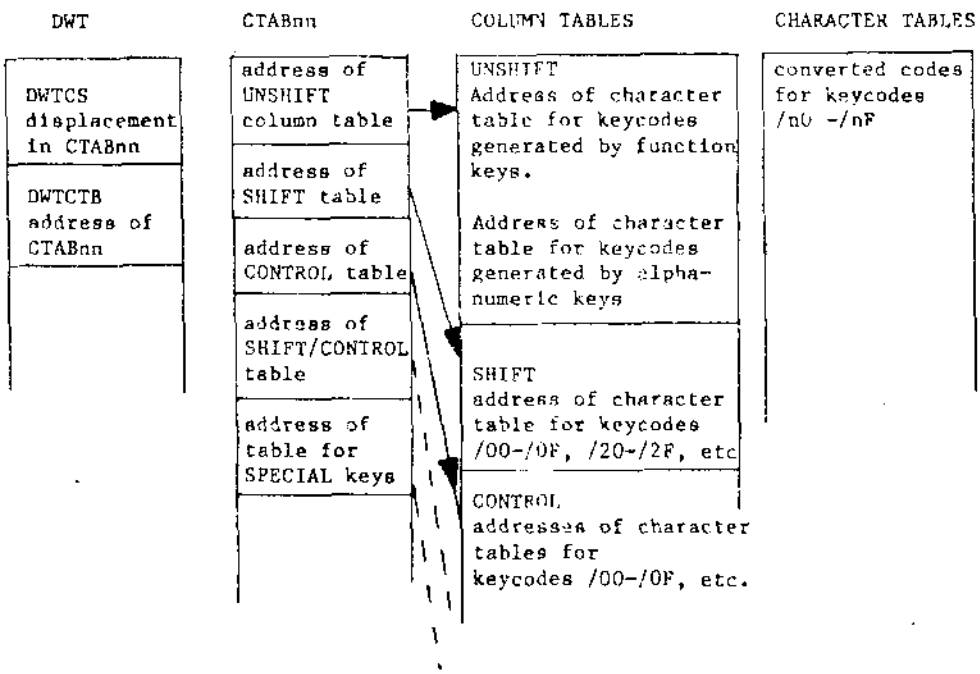
If a request is not running, the completion described above will be carried out on the next request issued. If more than one key-lock has been changed, only one change is reported at a time.
The possible negative values in the control word are:

-1 : Key-lock no. 4 turned OFF
-2 : Key-lock no. 3 turned OFF
-3 : Key-lock no. 2 turned OFF
-4 : Key-lock no. 1 turned OFF
-5 : Key-lock no. 4 turned ON
-6 : Key-lock no. 3 turned ON
-7 : Key-lock no. 2 turned ON
-8 : Key-lock no. 1 turned ON

For basic read only, the code received is stored in the user buffer, and the request is not completed.
If all keys are OFF, the keyboard is considered to be inactive, unless No is specified for `Keyboard locked if no keylock on' during Monitor generation. Note that `No' must be specified for this feature if a BCR is included.

Code conversion : To adapt the keyboards to different national layouts, the driver includes code conversion facilities. If code conversion is required, it must be specified during Monitor generation.

The conversion is achieved via a table structure, as follows:



The 25th word in the Device work Table (DWT) if no MMU is in the system, or the 27th word if MMU is used, is DWTCS and contains the value which is the displacement to the correct entry in CTABnn. The next word DWTCB holds the address of the relevant conversion table (CTABnn). The name of the conversion table is determined by the terminal device class in which it is used. In T01, the conversion table is named CTAB01, in T02, it is CTAB02. It is of course possible to specify the entries to the same column tables in these CTABs, if the same conversion is required in the device classes.

This table contains 5 one-word entries, one each for Unshift mode, Shift mode, Control mode, Control/Shift mode, and the "Special" which is only used by the numeric cluster of PTS6234.
Each entry is the address of a column table.
Each column table can contain up to 8 addresses of character tables.
The character tables contain the converted character codes.

Any time the keyboard mode changes, the driver sets DWTCS to a certain value corresponding to Unshift, Shift, Control, Shift/Control, or `Special´.
This is the displacement in CTAB, to the pointer to the relevant column table. The first digit of the keycode is the displacement in the column table to the correct character table. The second digit of the keycode is the displacement within the character table, to the converted character code required.

A value of zero in DWTCTB indicates that no conversion at all is required.
A value of zero in CTAB indicates that keys entered in this mode need not be converted. The corresponding column table need not be supplied.
A zero entry in a column table indicates that keycodes in this range need not be converted, and the corresponding character table is not supplied.
For each character table, all 16 character codes must be supplied, regardless of how many keys in this range must be actually converted.

All keyboards can include conversion tables for the Unshift part. Shift, Control and Shift/Control mode are only implemented on keyboards PTS6236, 6271 and 6272. The `Special´ mode is only used by PTS6234 when it is strapped with two device addresses, and special conversion of the keys from the numeric cluster is wanted.

Any key converted to code /FF will be ignored, and nothing will be stored in the user buffer.

Keyboard code conversion tables, and some examples of code conversions, are supplied in Appendix A.

Special characters : There are five keys with a special meaning to the driver. By code conversion these functions may be assigned to any key. In the standard version, without conversion by the user, these codes are:

- /18 - Clear key. The user buffer is cleared, but the request is not completed.
- /08 - Backspace key. The last character received in the user buffer is cleared, but the request is not completed.
- /0D - End of Record key, when no keytable has been defined.
- /1A - Double zero key. Two zeroes are stored in the user buffer.
- /1B - Triple zero key. Three zeroes are stored in the user buffer.

If these special characters are not wanted, they can be excluded by not generating them in the code conversion, or including them in the End of Record keytable.

Special characters from PIN keyboard and Badge Card Reader : Numeric keys on the PIN keyboard send normal codes /30 to /39. The leftmost function key sends code /18, and the rightmost function key sends /0D. The Badge Card Reader sends normal alphanumeric codes /30 to /3E. The end of record character is /3F. In additon, when the card is removed, code /0E (document out) is sent. If the card is read correctly, and then immediately removed, both codes /3F and /0E are sent. If a read error occurs, code /09 is sent.

Echo function : Input characters are echoed if the E-bit is set in register A7 during the LKM request, and if an echo device is specified for the keyboard during Monitor generation.

Note that the resulting characters are echoed after conversion.
The read request is only accepted if the echo device is free, otherwise it is queued. The device-dependent echo function is described in the relevant output device driver description.

The following information is transferred to the echo device from the keyboard driver:
Basic read:
All characters except Key-lock, SHIFT and CTRL.
Standard read:
Characters within the range /20 - /7F.
Numeric read:
Characters within the range /30 - /39.
Special characters (standard and numeric read):

/18	Clear key.
/08	Backspace key.
/30, /30	Double zero key.
/30, /30, /30	Triple zero key.

Double keyboard handling:

If two keyboards, one alphanumeric and one numeric, are used at the same terminal, or if the PTS6234 keyboard is included, these keyboards may be treated as one device, and have one Device work Table, but each will have its own device address.
The driver will convert the keys from the first device address via the Special table. If the same conversion is wanted for both keyboards, the same column table may be specified in the first and the fifth position of CTABnn.

Timeout : It is possible to include the timeout function for each keyboard in the system. This means that if a key has not been pressed within a certain time after the read request was issued, the request is completed with bit 9 set in the return code.
The timer is restarted for each key that is pressed.
The timeout is 30 seconds for all keyboards, in the system, and can be included during Monitor generation.

Recovery at power on : If completion of read request at power on is specified during Monitor generation, and if there is a standard or numeric read request current at power on, this is completed with zero in the control word. If not, a power on flag is set in the driver, causing the first standard or numeric read request after power on to be completed with the control word set to zero.
If one or more key-locks have changed their position this will be indicated in the normal way by a negative value in the control word, on the next read request.

DRLP01 — 2.16 LINE PRINTER — DRLP01

General information : This driver handles one line printer PTS6881 connected to the CPU on a multiplex or programmed channel.
The type of channel must be specified during Monitor generation.
If a Memory Management Unit is included in the system, an MMU buffer is included in the driver, and the size of this buffer must be specified during Monitor generation.

Calling sequence :

Normal I/O:

```
LDK  A7,code
LDKL A8,ecb-address
LKM
DATA 1
```

I/O and Activate:

```
LDKL A1,parameter
LDK  A7,code
LDKL A8,ecb-address
LKM
DATA -1
DATA start address
```

Order codes : The following order codes may be used:

/00 - test status
/05 - basic write
/06 - standard write

Buffer address :
Requested length :
Effective length :
Only significant for orders /05 and /06. For order /06 the first word and last character of the buffer are reserved for control information. For order /05 these parts of the buffer are occupied by normal data.

Return code : The following bits may be set by this driver:

bit	Meaning	Order /00	Order /05	Order /06
0	Illegal request	x	x	x
15	Not operable	x	x	x

Control word : Not significant

Order : /00 - test status
The printer status is tested and bit 15 set in the return code if the device is not operable.

Order : /05 - basic write
The requested number of characters is sent to the printer without any check. If the buffer of the lineprinter is full (132 characters), or if a format control character is received, the buffer is printed. The following format control characters are available:

/0A : Advances the paper one line and sets the device at the leftmost print position (CR/LF).
/0C : Advances the paper to the top of the form and sets the device at the leftmost print position (FF/CR).
/0D : Sets the device at the leftmost print position (CR).

Order : /06 - standard write
The first word in the buffer is reserved for control information. It can contain one of the following codes in the right byte:

/2B : Print the line without advancing the paper.
/30 : Advance two lines before printing.
/31 : Skip to top of form before printing.

All other control codes will advance the paper one line before printing. At the end of the user buffer one character must be reserved for the system, in which a print code is stored by the driver. This character must not be included in the requested length. All other characters in the user buffer should be in the range /20 - /5F, but this is not checked by the driver.

Recovery at power on : No recovery is carried out by the driver. If power failure occurs, and there is a print request current, the request is completed with bit 15 "Not operable" set in the return code.

DRMD01 — 2.17 MINI FIXED DISK — DRMD01

General information : This driver handles up to four daisy chained mini fixed disk drives (MFD) of the type PTS8863, connected to the CPU via MUX and MDCUZ on a multiplex channel. A disk drive contains a single fixed disk. In systems with more than one drive, the disks are logically independent, but may be operated physically only one at a time. Each disk has its own unique File Code, user supplied at Monitor generation. The recommended codes are /F4, /F5, /F6, and /F7. When certain system software is generated, such as File Management, the recommended codes are automatically assigned.

It is possible to IPL from a PTS8863 disk. The physical sector length, and the logical sector length for TOSS discs, is 256 bytes. The total capacity of a disk is 5.99 Mbyte, split up as follows:

225 cylinders, each of 2 tracks;
= 450 tracks, each of 52 sectors;
= 23,400 sectors, each of 256 bytes.

Each sector is given a number from 0 thru 23,399 when reading or writing. Because this driver can handle multiple-sector I/O, it is possible to read or write more than one sector during a single LKM request.

Calling sequence : Normal I/O:

```
LDK  A7, code
LDKL A8, ecb-address
LKM
DATA 1
```

I/O and Activate:

```
LDKL A1,parameter
LDK   A7,code
LDKL A8,ecb-address
LKM
DATA -1
DATA start address
```

Order Codes : The following orders may be used:

/00	-	test status
/01	-	basic read
/05	-	basic write
/11	-	physical read
/15	-	physical write
/1F	-	format volume

Buffer address : This must be an even number. Not significant for order /1F.

Requested length : This must be a multiple of the logical sector length (256), minimum 256, maximum 65,280. Not significant for order /1F.

Return Code : Bits may be set as follows by this driver:

bit	Meaning	Order /00	/01	/05	/11	/15	/1F
0	Illegal request	x	x	x	x	x	x
7	Retries performed		x	x	x	x	
12	Incorrect length		x	x	x	x	
13	Code check error		x	x	x	x	
14	Throughput/seek error		x	x	x	x	x
15	Disk not operable	x	x	x	x	x	x

Control word : Control Word 2 must contain the number of the first sector to be transferred. Control Word 1 must be set to zero.

Order : /00 - test status
The status of the drive is checked and bit 15 of the Return Code is set if it is not operable. If the drive is operable, then the volume name is copied to the Device Work Table. If the requested length is set to 6, the volume name is transferred to the buffer specified in the ECB.

Order : /01 - basic read
This order is identical to order /11, physical read.

Order : /05 - basic write
One or more sectors are transferred to the disk from the user buffer. Read-after-write is not carried out.

Order : /11 - physical read
One or more sectors are transferred from the disk to the user buffer. Order /01 is identical.

Order : /15 - physical write
One or more sectors are transferred to the disk from the user buffer. A read-after-write may be performed to verify that the operation was successful. If this check is required it must be requested during Monitor generation.

Order : /1F - format volume
One disk volume is formatted. The formatted sectors will contain binary zeroes.

Recovery at power on : A disk drive is restarted automatically at power on if it was running when the system powered off. At power on the drive is set busy for 2 minutes in order to allow it to become operable. During this time any requests are placed in the device queue. When 2 minutes have expired the drive is set free and any request which was running at power off is repeated.

If a power failure occurs affecting devices other than the drive, and the drive is fully operable, then the timer is not set, and the current request is repeated immediately.

DRMS02

2.18 MAGNETIC STRIPE UNIT

DRMS02

General information : This driver handles input and output on the PTS6266 Magnetic Stripe Unit (MSU), connected to the CPU via CHLT or CHRT, and input from the Personal Identificaion Number (PIN) keyboard PTS6291.
The MSU is used with the PTS6000 Teller Terminals and works in conjunction with printer, display and keyboard The MSU reads and writes on magnetic stripes on credit cards and passbooks.
Tracks 2 and 3 on stripes can be read, and track 3 can be written.
Each track on credit cards and American passbooks consists of a start character /3B, 1-104 data characters, end character /3F, and a Longditudinal Redundancy Check (LRC) character /30-/3F.
Each track on German passbooks consists of two copies of a data block. Each block contains a start character /3D, 1-45 data characters, and end character /3F, and an LRC character /30-/3F.

The start, end and LRC characters are added by the driver as appropriate.

Calling sequence :

Normal I/O

```
LDK  A7,code
LDKL A8 ecb-address
LKM
DATA 1
```

I/O and activate:

```
LDKL A1,parameter
LDK  A7,code
LDKL A8,code
LKM
DATA -1
DATA start-address
```

Order codes : The following order codes may be used:

- /02 - read PIN keyboard
- /06 - write card
- /0A - read card
- /21 - open
- /26 - end of operation
- /31 - skip circular input buffer
- /37 - insert card

Buffer address :
Requested length :
Effective length :
} Only significant for orders /02, /06 and /0A.

Return code : The following bits may be set by this driver:

bit	Meaning	Order in which bit is set /02	/06	/0A	/21	/26	/31	/37
0	Illegal request	x	x	x	x	x	x	x
2	Card missing		x	x				
10	Read/write warning		x	x				
12	Incorrect length	x		x				
13	Negative acknowledgement	x	x	x				
14	Throughput error	x	x	x		x		x
15	Not operable	x	x	x	x	x	x	x

Bit 2 - Card missing, is set when a Read or Write order is issued while there is no card in the BCR, or when a card is removed while the request was running.

Bit 13 - Negative acknowledgement is returned when a read- or write error persists after recovery.

Bit 14 - Throughput error: missing or undefined messages from MSU, o power failure on running request. Also set when illegal characters are detected during a Read or Write.

Note:
Bit 10 - Read/write warning only applies to German passbooks, and is set if one of the two blocks was read or written incorrectly.

Control word : Significant for orders /02, /0A and /21. For order /02 Read PIN Keyboard, the control word must contain the address to a keytable with user-defined codes for End of Record keys, or zero if no keytable is used.

The format of the keytable must be:

byte		
0	no. of EOR keys	KEY 1
2	KEY 2	KEY 3
4	KEY 4	KEY 5

For order /0A Read Card, the track number 2 or 3 must be set in the control word. For order /21 Open, the status must be given in the control word. The status can be:

0 - Credit cards and American passbooks
1 - German passbooks

Order : /02 - read PIN keyboard
The requested number of characters are read and stored in the application buffer. The requested length must include the EOR key. The characters are checked in the following sequence:
If overflow has occurred in the circular input buffer, the request is completed with bit 14 set in the return code.
If the character is an EOR key as defined in the keytable, the character is stored in the application buffer and the request is immediately completed. The position of the EOR character in the keytable is returned in the control word of the ECB as an index value, such that key 1 gives a value of 1, key 2 gives a value of 2, and so on.

Order : /06 - write card

Credit card or American passbook
The requested number of characters (1-104) are written from the user buffer to the MSU. The start character, end character and the LRC character are added by the driver. Valid data characters are in the range /30 - /39, and /3A (Account separator), and /3D (Field separator).

If an invalid character is present in the buffer, it is skipped, and the request is completed with bit 14 set in the return code.

If the card is missing, the request is completed with bit 2 set in the return code.

If a write error occurs, the driver attempts the write operation again; if the error still occurs after two tries, the request is completed with bit 13 set in the return code.
If the MSU is not operable (power off), the request is completed with bit 15 set in the return code.

German passbook
The requested number of characters (1-45) are written from the user buffer to the MSU. The start character, end character, and the LRC character are added by the driver. Valid data characters are in the range /30 - /39, and /3E (Field separator).
The entire block is then written twice on track 3. If an invalid character is present in the buffer, it is skipped, and the request is completed with bit 14 set in the return code.
If the card is missing, the request is completed with bit 2 set in the return code.
If a write error occurs, the driver attempts the write operation again; if the error still occurs after two tries, the request is completed with bit 13 set in the return code.
If one block is written correctly, but not the second, the request is completed with bit 10 set in the return code.
If the MSU is not operable (power off), the request is completed with bit 15 set in the return code.

Order

/0A - read card

Credit card or American passbook
The driver initiates the Read Card order by sending a command to the MSU to read track 2 or 3, as specified in the control word. The data is read and transferred to the buffer. The maximum number of characters that can be read is 104.
Valid characters are those in the range /30 - /39, plus /3A (Account separator) and /3D (Field separator). If a character is detected outside this range, the request is completed with bit 14 set in the return code.
If a read error occurs, the driver attempts the read operation again; if the error still occurs after two tries, the request is completed with bit 13 set in the return code.
If the card is missing, the request is completed with bit 2 set in the return code. In this case order /37 must be issued before the read operation can be retried.
If the number of characters read is greater than the requested length, the request is completed with bit 12 set in the return code.

If the MSU is not operable (power off), the request is completed with bit 15 set in the return code.

German passbook
The driver initiates the Read Card order by sending a Read command to the MSU to read track 3.
The data is read and both blocks are transferred to the buffer. The maximum number of data characters that can be read is 45. Thus the buffer length must be 90, and the requested length set to 2 x the number of characters required.
If only one block is successfully read, the request is completed with bit 10 set in the return code.
Valid characters are those in the range /30 - /39, plus /3E (Field separator). If a character is detected that is outside this range, the character is still stored in the buffer, and the request is completed with bit 14 set in the return code.
If a read error occurs, the driver attempts the read operation again; if the error still occurs after two tries, the request is completed with bit 13 set in the return code.
If the card is missing, the request is completed with bit 2 set in the return code. In this case order /37 must be issued before the read operation can be retried.
If the number of characters read is greater than the requested length, the request is completed with bit 12 set in the return code.
If the MSU is not operable (power off), the request is completed with bit 15 set in the return code.

Order : /21 - open
The open order is used to set the driver status to accept credit cards and American passbooks or German passbooks. Note that the status only affects the task that issues this request. The status must be specified in the control word as
0 - credit cards and American passbooks
1 - German passbooks
If this order is not used, the driver defaults to status 0, credit cards and American passbooks.

Order : /26 - end of operation
After a complete Read or Write operation this order must be used. It switches off the Busy lamp on the MSU and resets the mechanics and electronics. The driver checks that no document is present in the MSU before completing the request. If a document is present, the driver waits for its removal before completing the request.

DRMS02 — Continued — DRMS02

Order : /31 - skip circular input buffer
The information in the circular input buffer is deleted and the request is completed.

Order : /37 - insert card
A document indicator in the bottom of the slot senses that the operator has inserted a document. When the document indicator changes status, a message is sent to the CPU, and this message is always taken care of by the driver.
When the order /37 is initiated, the driver checks if a document is inserted in the reader, and if so the request is completed. If not, the driver waits until a document is inserted before the request is completed.
If a throughput error occurs, the request is completed with bit 14 set in the return code.
If the MSU is not operable (power off), the request is completed with bit 15 set in the return code.

Recovery at power on : After a power failure on the CPU or the MSU, any current request is completed with bit 14 set in the return code.

DRMT01 — 2.19 MAGNETIC TAPE — DRMT01

General information : This driver handles up to fourt 1/2" magnetic tape recorders, PTS6872 or 6164 or 8873, connected to the CPU via multiplex channel.
The recorders are operated independently of each other, each having its own file code. However, only one can be working at one time, except during unloading.
Data is recorded in blocks with a length of 2 to 4095 characters.

Calling sequence :

Normal I/O:

```
LDK  A7,code
LDKL A8,ecb-address
LKM
DATA 1
```

I/O and Activate:

```
LDK  A1,parameter
LDK  A7,code
LDKL A8,ecb-address
LKM
DATA -1
DATA start address
```

Order codes : The following order codes may be used:

/00 - test status
/02 - read
/05 - write
/06 - write
/22 - write tape mark
/31 - rewind
/33 - step reverse
/34 - step forward
/37 - load
/38 - unload
/3F - recover

Buffer address :
Requested length :
Effective length :

Only significant for orders /02,/05 and /06. The last word in the buffer may be used as a block sequence counter. The length must be from 2 to 4095 bytes, and must exclude the block sequence counter, if used.

Return code : The following bits may be set by this driver:

bit	Meaning	Order in which bit is set										
		/00	/02	/05	/06	/22	/31	/33	/34	/37	/38	/3F
0	Illegal request	x	x	x	x	x	x	x	x	x	x	x
2	BOT / EOT	x	x	x	x	x	x	x	x	x		x
3	Tape mark		x			x		x	x			
6	Write protected	x	x	x	x	x	x	x	x	x		x
9	Hardware error or rewinding	x	x	x	x	x	x	x	x	x	x	x
11	Sequence error		x									
12	Incorrect length		x									
13	Data error or no data		x	x	x	x		x	x			x
14	Throughput error		x	x	x							
15	Not operable	x	x	x	x	x	x	x	x	x	x	x

Control word : Only significant for orders /02,/05,/06,/37 and /3F
The value of the least significant bit (rightmost) when requesting order /37 determines whether block sequence counting will be used, where
0 = sequence counter is required
1 = sequence counter is not required
The setting of the control word for order /37 will affect the operation of later orders /02,/05,/06 and /3F and the recovery procedures at power on.
After a read or write request, the control word contains the number of read or write retries performed (orders /02,/05 and /06).

Order : /00 - test status
The status of the selected recorder is tested and indicated in the return code.

Order : /02 - read
One block is read from the tape and stored in the buffer
If there is a `data error´ or a `throughput error´, a retry is performed, to a maximum of three retries.
If in use, the block sequence counter is checked, and bit 11 set in the return code if not correct. Two characters must be reserved at the end of the block for this counter.
If the requested length was less than the actual length bit 12 is set in the return code.
If data is not found within two seconds, bit 13 is set in the return code.

Order : /05 and /06 - write
One block from the user buffer is written to the tape.
If there is a `data error´ or a `throughput error´, a retry is made, after erasing the tape 10cm from the beginning of the block just written, up to a maximum of three retries.
When a block sequence counter is used, the two characters at the end of the buffer are replaced by the sequence number before the block is written. These two characters must not be included in the requested length.
If the tape is write protected, the request is completed with bit 6 and bit 9 set in the return code.

Order : /22 - write tape mark
One tape mark is written to the tape. Recovery is carried out as in orders /05 and /06. If the order is successful, bit 3 is set in the return code.

Order : /31 - rewind
The tape is rewound to the beginning of tape (BOT). If BOT is not found within 3 minutes, bit 9 is set in the return code.

Order : /33 - step reverse
The tape is reversed one block (see also order /34).

Order : /34 - step forward
The tape is moved forward one block.
It is recommended that this order (or /33) is used when searching for a tape mark, since the operation does not delay the CPU.

Order : /37 - load
The recorder is set on-line, and the tape is rewound to BOT. The control word determines whether the block sequence counter will be used for further orders.
If BOT is not found within 3 minutes, bit 9 is set in the return code.

Order : /38 - unload
The tape is rewound and the recorder switched off-line.

Order : /3F - recover
The recorder is set on-line, and the tape is positioned before the block indicated by the block sequence counter If unsuccessful, i.e. incorrect block sequence counters on the tape or block sequence counters not in use, the recorder is set off-line.

Note: The PTS6164 recorder can not be set on-line or off-line by the program, so this must be done by the operator when orders /37, /38 and /3F are issued.

Recovery at power on : After power failure in the computer, a recovery is performed for each recorder that was on-line at the time of the power failure.
The procedure is the same as for the order /3F - recover If the recovery is not successful, due to incorrect block sequence counters, the recorder is set off-line.
If sequence counters are not used, no action is taken.
When a power failure occurs in the recorder, this is indicated by bit 15 being set in the return code. It is then possible to recover by setting the recorder on-line and issueing the recover order /3F.

DRSOP1 — 2.20 SYSTEM OPERATORS PANEL — DRSOP1

General information : The System Operator's Panel (SOP) is connected to the CPU through the channel unit for the cassette recorder (CHCR). The panel facilities include 10 switches and 11 lamps. The switches may be read and the lamps written. To facilitate simultaneous operations on the lamps and switches, they are treated as independent devices, and are therefore assigned different file codes. Moreover, it is possible to have two independent read requests, each with its own file code. If this latter function is required, it must be specified during Monitor generation.

Calling sequence : Normal I/O:

```
LDK  A7,code
LDKL A8,ecb-address
LKM
DATA 1
```

I/O and Activate:

```
LDKL A1,parameter
LDK  A7,code
LDKL A8,ecb-address
LKM
DATA -1
DATA start-address
```

Order codes : The following order codes may be used:
/02 - read switches
/37 - set lamps on
/38 - set lamps off
/39 - flash lamps

Buffer address :
Requested length :
Effective length :
} Not significant.

Return code : Only bit zero of the return code is used, and this is set if any error is detected.

Control word : The control word contains a SOP switch number after a read request, or must be set to a bit pattern before a set-lamps request. The lamps that are affected correspond to the bit pattern.

Order : /02 - read switches
When a switch is pressed, the switch number is stored in the control word, so that switch 1 gives value 1, switch 2 gives value 2, and so on, to enable indexing to be carried out. If power failure occurs, the request is completed with the control word set to zero.
The rightmost switch corresponds to switch 1.

Order : /37 - set lamps on.
The bit pattern in the control word is transferred to the lamps, the rightmost lamp corresponding to bit 15. Lamps with corresponding bits set to 1 are turned on; the remaining lamps are not altered.

Order : /38 - set lamps off.
The bit pattern in the control word is transferred to the lamps, the rightmost lamp corresponding to bit 15. Lamps with corresponding bits set to 1 are turned off; the remaining lamps are not altered.

Order : /39 - flash lamps
The bit pattern in the control word is transferred to the lamps, the rightmost lamp corresponding to bit 15. Lamps with corresponding bits set to 1 are flashed; the remaining lamps are not altered.
Note that if order /39 is to be used, it must be requested during Monitor generation.

Recovery at power on : At power on the following actions are taken:
- The switches are activated.
- The lamps are fed with the value that existed at the time of the power failure.
- If there is a read request current, this is completed with the control word set to zero. If not, a power up flag is set, causing the next read request after power on to be completed with zero in the control word.
- No indication is given in the return code.

Note: Recovery is always carried out after program loading.

DRSU01 — 2.21 LOCAL AND REMOTE TERMINALS — DRSU01

General information : This driver controls the transfer of data from the device driver to the channel units for local and remote terminals. The number of local and remote channel units in the system must be specified during Monitor generation.
There is a special function available to enable the application to obtain information about the status of the remote line. This function is valid for the remote line. The line which connects the channel unit with the selector unit can be tested also.
A remote line can be loop-connected via a switch on a transfer unit (TFU), or sometimes on a modem.
The remote line is tested in the following way:

- The line from the CHRT to the loop connection and the return from the loop connection to the CHRT is used to send a SYNC character, and a check is carried out on the SYNC character received on return. After the SYNC test, an ACK character is sent over the same line, and checked on return in the same way.

- A looped line is not available to any work-station that is connected to it.

- A test remote line must be issued from a local work-station, as a unique task.

- The facility to test the remote line should be included in every application using remote connected terminals. It is recommended that the test line order should be repeated a number of times, before any conclusions are drawn about the state of the line.

  The remote test file-code must be specified during Monitor generation, and the recommended file code is /15.

Calling sequence : Normal I/O:

```
LDK  A7,code
LDKL A8,ecb-address
LKM
DATA 1
```

I/O and Activate:

```
LDKL A1,parameter
LDK  A7,code
LDKL A8,ecb-address
LKM
DATA -1
DATA startaddress
```

Order codes : The following order code may be used:
/00 - test remote line

Buffer address :
Requested length :
Effective length :
} Not used

Return code : The following bits may be set by this driver:

Bit	Meaning
0	Illegal request
9	Channel unit missing or invalid
14	ACK missing
15	SYNC missing

Control word : The control word contains the identification of the line to be tested, and must be filled in by the application program.
The values that can be specified are:

1 = Line of first channel on CHRT1
2 = Line of second channel on CHRT1
3 = Line of first channel on CHRT2
4 = Line of second channel on CHRT2
5 = Line of first channel on CHRT3
6 = Line of second channel on CHRT3
7 = Line of first channel on CHRT4
8 = Line of second channel on CHRT4

Order : /00 - test remote line
This order will test the remote line, if loop connected, by sending a SYNC character every 500 milliseconds to device address 7.
On return of SYNC from the CHRT an ACK character is sent and returned in the same way, and a test is also carried out on receiving the ACK character.
Information about the state of the line, up to the loop connection, is specified for this test in the return code.
If bit 14 is set, the line is bad.
If bit 15 is set the line is not loop connected, the selector unit is inactive.
If bit 15 is set and the line is loop connected, the line is probably broken.
If both bits 14 and 15 are set, the line is probably broken.

Monitor generation parameters : In addition to the parameters that must be specified during Monitor generation given above, the following two parameters must also be specified:

- Whether or not a logging function for input/output characters should be included in the driver.
- Whether or not accumulators for NAK, retransmission faults and undefined control characters should be included in the driver.
- Number of local channel units (0-4).
- Number of remote channel units (0-4).

DRTC01 — 2.22 CASSETTE — DRTC01

General information : This driver handles one or two recorders connected to the CPU on a programmed channel. The number of recorders must be specified during Monitor generation. Logically, the recorders are independent of each other, but only one can be operated at a time, except at rewind and unload. Each cassette has its own file code.

If a Memory Management Unit is included in the system, a MMU buffer is included in the driver, and the size of this buffer must be specified during Monitor generation.

Calling sequence :

Normal I/O:

```
LDK  A7,code
LDKL A8,ecb-address
LKM
DATA 1
```

I/O and Activate:

```
LDKL A1,parameter
LDK  A7,code
LDKL A8,ecb-address
LKM
DATA -1
DATA start-address
```

Order codes : The following order codes may be used:

/00 - test status
/02 - read
/05 - basic write
/06 - standard write
/22 - write tape mark
/24 - erase
/26 - lock
/31 - rewind
/33 - reverse
/37 - load
/38 - unload

Buffer address :
Requested length :
Effective length :

Only significant for orders /02, /05 and /06. The last byte in each block may be used as a block sequence counter. The length must be in the range 2-256 bytes if the block sequence counter is not used, or 1-255 if the counter is used. In the latter case, the length must exclude the block sequence counter.

Return code : The following bits may be set by this driver:

		Order in which bit is set										
bit	Meaning	/00	/02	/05	/06	/22	/24	/26	/31	/33	/37	/38
0	Illegal request	x	x	x	x	x	x	x	x	x	x	x
2	BOT / EOT		x	x	x	x	x	*		x	x	*
3	Tape mark		x			x				x		
6	Write protected	x	x	x	x	x	x	x	x	x	x	x
7	B Side	x	x	x	x	x	x	x	x	x	x	x
9	Rewind timeout BOT missing			x	x	x	x		x		x	
11	Sequence error	x	x	x	x	x	x	x	x	x	x	*
12	Incorrect length		x									
13	CRC error or No Data/Erased		x	x	x	x	x			*		
14	Throughput error		x	x	x	x						
15	Not operable	x	x	x	x	x	x	x	x	x	x	

Note: * in table indicates, not relevant.
If an attempt is made to write and the cassette is write protected, bit 6 will be set together with bit 9.
Bit 11, is set after an incorrect recovery after power failure.
Not operable - drive not locked, empty, or an unload command is executed.

Control word : Only significant for orders /02, /05, /06 and /37.
The value of the least significant bit during order /37 determines wether or not a block sequence counter will be used for further orders /02, /05 and /06.
0 - Sequence counter is required.
1 - Sequence counter is not required.
During a write request (orders /05 and /06) the number of retries is returned in the control word.

Order : /00 - test status
The cassette is selected and the status is indicated in the return code as follows:
bit 6 - write protected.
bit 7 - B side of tape
bit 11 - incorrect recovery after power failure.
bit 15 - not operable; the cassette drive is not locked or the cassette is rewinding. If bit 15 is set, the other bits are not significant.

Order : /02 - read
One block is read from the cassette and stored in the user buffer. In the case of incorrect length, a CRC-error, or throughput error, Read Recovery is carried out. At read recovery the tape is backspaced one block and the block is read again. The driver peforms up to 2 retries.
The Read request will be completed with bit 3 set in the return code if the block read is a tape mark.
If used, the block sequence counter is checked and the bit 11 set if the block is not in sequence.
The sequence counter is not included in the effective length, and is not stored in the user buffer.
Bit 13 is set in the return code if no block is found within 400 mm, or when CRC error remains after read recovery.

Order : /05 - basic write
This order has the same function as /06 - standard write (see below).

Order : /06 - standard write
One block is written from the user buffer to the tape. If incorrect length, CRC-error or throughput error occur, Write Recovery is carried out. At write recovery, the tape is backspaced once if the sequence counter is not in use, or positioned after the last correctly written block. The tape is erased, and the block is written again. If the first recovery is not successful, these actions are repeated. If still not successful, the request is completed with bit 13 set in the return code.
Before writing the first block after BOT, one block is erased to be compatible with ECMA-34 standard.
If the sequence counter is used, this should not be included in the requested length.

The request is completed with bit 11 set in the return code if the tape is not successfully positioned at write recovery, or after power failure when no sequence counter is used.

Order : /22 - write tape mark
A tape mark is written to the tape. Write recovery is carried out as for order /06. Bit 3 is set in the return code if successful.

Order : /24 - erase
The tape is erased about 570mm. Erase should be executed after the last block is written on the tape. Bit 2 will be set in the return code, when EOT is found. If this order is required, it must be specified during Monitor generation.

Order : /26 - lock
The cassette drive is locked. The tape itself is not moved. If this order is required, it must be specified during Monitor generation.

Order : /31 - rewind
The tape is rewound to BOT, and the block sequence counter set to zero.

Order : /33 - reverse
The tape is reversed one block, and the block sequence counter decreased by one. If no data is found within 400mm, bit 13 is set in the return code. Bit 3 will be set if the reversed block is a tape mark. If this order is required, it must be specified during Monitor generation.

Order : /37 - load
The tape is locked and rewound to BOT. The block sequence counter is set to zero.

Order : /38 - unload
The tape is positioned on the leader and the drive unlocked. This operation is carried out by hardware, so that another cassette recorder may be operated at the same time.

Recovery at power on

After power failure on the CPU, recovery action is taken for each recorder.
If the cassette is locked at the time of the failure it will remain locked. If no blocks have been written or read, BOT is searched for, otherwise the tape is positioned. Four blocks are backspaced, and if no data is found, BOT is searched for. A block is read, and if it is a tape mark, another block is backspaced. The number of blocks to go forward is calculated with the help of the sequence counter. The tape is read forward the calculated number of blocks, and the sequence number of the last block thus read is checked. Then any current request is repeated. No information about power failure is given in the return code.

When the recovery is unsuccessful, bit 11 is set in the return code on the current request, or the next request if there was no request current at the time of power failure.
If there is no block sequence counter, the cassette is locked, and bit 11 set as described above.

DRTN01 — 2.23 TELLER NOTE DISPENSER — DRTN01

General information

This driver handles the Teller Note Dispenser PTS6542, used in PTS6000 environment. The Teller Note Dispenser extracts a specified number of banknotes from up to 6 cassettes with banknotes of different denominations. Every casette has a serial number between 0 and 65999. The first digit indicates a denomination, e.g.:-
0-09999 = Denomination 1.
10000-19999 = Denomination 2.
Etc.

Up to 100 banknotes can be dispensed in one order. Incorrect amounts are dumped in the `Dump cassette´. The Teller Note Dispenser can be shared by two tellers. Delivery to the right and to the left teller are indicated by index 1 and 0 respectively, and each has its own file code. The index is set by the SYSGEN program when the questions ´left teller´ and ´right teller´ are answered. The file codes must be specified during Monitor generation.

Calling sequence : Normal I/O:

```
LDK  A7,code
LDKL A8,ecb-address
LKM
DATA 1
```

I/O and Activate:

```
LDKL A1,parameter
LDK  A7,code
LDKL A8,ecb-address
LKM1
DATA -1
DATA start-address
```

Order codes:

The following order codes may be used:
/21 - open
/22 - close
/2A - read control
/2B - dispense and deliver
/2B - dispense
/2C - read device status
/2D - read diagnostics
/31 - dump
/38 - deliver

Buffer address:
Requested length:

Not significant for orders /22, /31 and /38.

Effective length:

Only significant for orders /21, /2A and /2D.

Return code: The following bits may be set by this driver:

bit	Meaning	Order in which bit is set							
		/21	/22	/2A	/2B	/2C	/2D	/31	/38
0	Request error	x	x	x	x	x	x	x	x
1	No cassette				x				
2	Notes in delivery unit				x				x
3	Bad notes	x			x				
4	Dump-cassette full	x			x			x	
5	Cassette low	x			x				
6	Cassette empty	x			x				
7	Jammed notes	x			x				
8	Power failure in TC	x	x	x	x	x	x	x	x
9	Time-out	x	x		x		x	x	x
10	Notes dumped				x				
11	Sequence error				x			x	x
12	Communication error	x	x		x		x	x	x
13	Firmware error in TND	x	x		x		x	x	x
14	Hardware error	x			x			x	x
15	TND not operable	x	x		x		x	x	x

Messages of which the meaning is not obvious, are explained below:

Bit 0, Request error — This bit is set if there is a parameter error in the user buffer, or if the user buffer is too small.

Bit 2, Notes in delivery unit — There are notes in the delivery unit, and an order Dispense or Dump must be issued.

Bit 3, Bad notes — There are notes in the cassette with a size outside the range for which the cassette was set.

DRTN01 — Continued — DRTN01

Bit 5, Cassette low	This is a warning that there are about 150 to 200 notes left in the cassette.
Bit 7, Jammed notes	No further action is possible before maintenance has been done and the TND controller been reset.
Bit 8, Power failure	Any current request is completed immediately with bit 8 set.
Bit 10, Notes dumped	A wrong number of notes has been dispensed and dumped, but after retrying the correct amount has been dispensed and delivered.
Bit 11, Sequence error	A Dispense command is issued before the TND has been opened.
Bit 12, Communication error	This bit is set by any error in the communication between the TC and the TND.
Bit 13, Firmware error	TND firmware error (for example, the status-code from the TND microprocessor is invalid).
Bit 14. Hardware error	Hardware error in the TND.
Bit 15, TND not operable	TND not operable because of power-off or other reason.

Order: /21 - open TND for operation

The lifts are wound up and the TND controller is reset. The order must be issued after the cassettes have been loaded, to make the TND operable. It can also be used to terminate an uncontrolled situation or to get information about the serial numbers of the cassettes. This information is returned in the buffer indicated by `buffer address´ in the ECB. The requested length must be set to 40.

The information in the buffer has the following layout:

The first word in the buffer is not used. Bytes 2-4 contain the number of notes dumped, in ISO-7 characters. Bytes 5 - 9 contain the serial number of the dump cassette in ISO-7 characters, bytes 10 - 14 contain the serial number of cassette 1, and so on. The least significant digit of the serial number is represented by the character in the fifth byte for each cassette.

Order: /22 - close TND
This order must be executed before a cassette can be changed. The lift will be brought down.

Order: /2A - read control information
This order is used to obtain information about the real number of notes dispensed. It is relevant after the orders Dispense or Dispense and Deliver, especially if any of the bits 1, 5, 6, 7 or 10 were set in the return code.

The following information is returned in the buffer:

byte	
0	not used
1	
2	total number
3	of notes
4	delivered
5	not used
6	cassette 1 status
7	number of notes
8	delivered from
9	cassette 1
10	not used
11	cassette 2 status
12	number of notes
13	delivered from cassette 2

Information on cassette 3 - 6 following the same layout. Numbers are represented as ISO-7 characters, the least significant digit being in the last byte of each sequence.

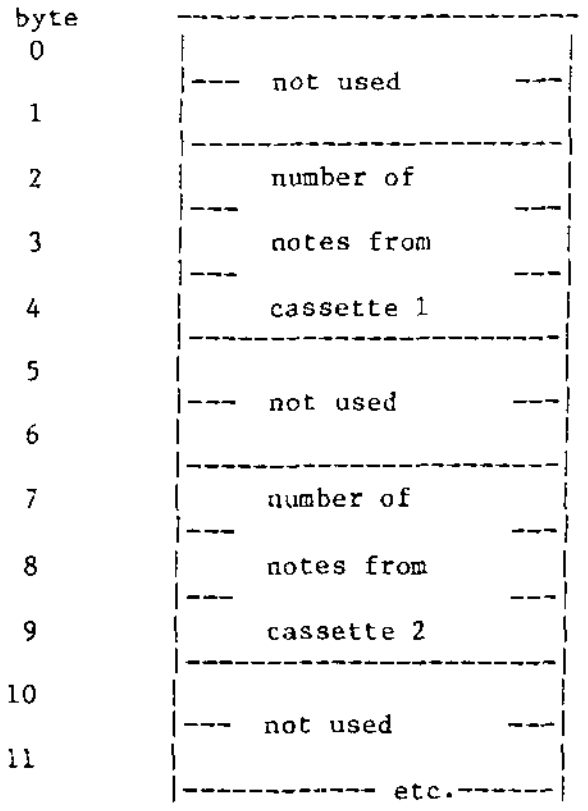
Cassette status:
/30 - cassette containing over 200 notes and properly functioning.
/31 - cassette low, containing about 150 or 200 notes
/32 - cassette empty
/33 - failure to feed notes from cassette
/34 - no cassette present

Order: /2B - dispense
The requested number of notes is dispensed from each cassette. The number of notes required must be specified in the buffer as described below. If the TND is shared by two tellers, the file code will indicate delivery to the right or to the left. If there are already notes in the delivery unit this request is issued, the request is completed with bit 2 set in the return code. An order /38, Deliver, or /31, Dump, must first be issued.

This order is only included when specified during Monitor generation. Default is the function Dispense and Deliver for order /2B.

Order: /2B - dispense and deliver notes.
This order collects the indicated number of notes from each cassette and delivers them to the operator.
If the TND is shared by two tellers, the file code will indicate delivery to the right or to the left. The number of notes to be picked from each cassette must be specified in the buffer as three ISO-7 characters, the least significant digit being represented by the character in the third byte for each cassette.

Buffer layout:



Order: /2C - read device status
After this order the buffer contains the hardware order sent to the TND by the CPU, and the hardware status sent from the TND to the CPU, as a result of the last LKM order. The requested length must be set to 4.

Order : /2D - read diagnostics
After this order, the buffer contains information about the reason for the last 15 dumps that have occurred. The requested length must be set to 16.

The information consists of a hexadecimal value in one byte for each dump occasion, indicating the following:

/30 - present point position
/31 - double on sensor A
/32 - double on sensor B
/33 - long on sensor A
/34 - long on sensor B
/35 - short
/36 - wrong number of notes
/37 - adjust servo two times on first dispense

Order: /31 - dump
This order is used to dump the dispensed notes into the dump cassette instead of delivering them to the operator.
If this order must be included in the driver, it must be specified during Monitor generation.

Order: /38 - deliver
This order is used to deliver the notes in the delivery unit to the operator. It must be preceeded by an order /2B, dispense. If the TND is operated by two tellers, the file code supplied with the preceding Dispense order will indicate delivery to the left or to the right, and this need not be supplied again.

If this order is required, it must be specified during Monitor generation.

Recovery at power on: When power failure occurs, any current request is completed with bit 8 set in the return code, and the TND is closed. At power on, the TND controller is cleared, and the notes in the stacker are dumped. A new order /21 Open must be issued before dispensing notes can be continued.

DRTP02 — 2.24 TELLER TERMINAL PRINTER — DRTP02

General information : This driver handles Teller Terminal Printer PTS6221, 6222 or 6223 connected to the CPU via CHLT or CHRT, and may be used for both CREDIT and Assembler applications.

Alphanumeric characters are printed from the user buffer. Only one line is printed with each request, in order to have full control at recovery situations.

The journal, tally roll and document/voucher parts of the printer are regarded as three independent logical devices. Three different file codes are used, one for each device. Recommended file codes are, /30 for journal, /31 for the tally roll and /F32 for the document station.

For systems with MMU, the driver includes an MMU buffer, the size of which must be specified during Monitor generation.

Calling sequence : Normal I/O:

```
LDK  A7,code
LDKL A8,ecb-address
LKM
DATA 1
```

I/O and Activate:

```
LDKL A1,parameter
LDK  A7,code
LDKL A8,ecb-address
LKM
DATA -1
DATA start-address
```

Order codes : The following order codes may be used:

/00 - test status
/06 - write
/0B - position voucher/passbook and print
/22 - cut journal tape
/26 - perforate journal tape
/37 - grasp voucher/passbook
/38 - release voucher/passbook

Buffer address :
Requested length :
Effective length :

Only significant for orders /06 and /0B. The first word of the buffer must be reserved for a control code and is included in the requested length.

Return code : The following bits may be set by this driver:

bit	Meaning	Order in which bit is set /00	/06	/0B	/22	/26	/37	/38
0	Illegal request	x	x	x	x	x	x	x
2	End of journal tape, or voucher out	x	x	x	x	x		x
7	Recovery executed		x	x				
13	Code check error		x	x				
15	Not operable	x	x	x	x	x	x	x

Control word : Only significant for order /0B. The control word is used to specify the lift position, given as a binary value in the rightmost byte. Only absolute positioning is used that is, the value is always considered to be the number of half line steps from the top position of the lift.

Control character : The last character in the first word in the buffer is a control character (only significant for orders /06 when printing voucher/passbook, and /0B). The control character may have one of the following values:

/2B - The print head is not moved nor the paper advanced before the text is printed.

/30 - The paper is advanced two half lines before the text is printed.

/31-/39 The paper is advanced 1 to 9 half lines before the text is printed.

Any other code gives one half line feed before the text is printed.

When printing journal or tally roll, the control character is insignificant and the paper will always be advanced two half lines.

Order : /00 - test status
A dummy character is sent to the printer and the return code set to the appropriate value. Note that bit 2 set may mean either Voucher Out or End of Journal Tape, depending on the type of device being used.

Common functions for all orders except /00 : Continuation of request when the selector unit or printer is inactive may be requested during Monitor generation.

Order : /06 - write
Alphanumeric characters in the range /20 - /5F, in the user buffer, are sent to the printer. There are four characters with special functions, as follows:

/09 : The print head is moved to the rightmost print position of the voucher print station. If used, this character must be in the last position in the user buffer.
/0D : The print head is moved to the rightmost print position of the journal print station. If used, this character must be in the last position in the user buffer.
/11 : Tabulation character. This character must be followed by two ISO-7 digits indicating the tabulation position. The rightmost print position is counted as 1.
/13 : This code is sent directly to the printer. By hardware this causes a special sysmbol to be generated by the selector unit.
/14 : Same as /13 above.
/AE : Point is printed as roomless, that is the digit prior to the code /AE is code converted and printed as a roomless point digit.

If special characters /13 or /14 are to be used, they must be specified during Monitor generation. Non-standard codes for roomless points may be used, but if so, they must be specified during Monitor generation. Leading spaces (/20) in the user buffer are ignored. Illegal characters in the user buffer are ignored, and the request is completed with bit 13 set in the return code.

The following sequence is carried out:

- If printing voucher/passbook, the status of the print object is checked. If the voucher/passbook is out, the lift is sent to the top position and the driver waits for grasp. Then the request is repeated. As an alternative chosen during Monitor generation, the write request is completed if the voucher/passbook is out with bit 2 set in the return code.
- If printing tally roll, the status of the voucher/passbook is checked. If the voucher/passbook is in, a Release Voucher command is sent to the printer and the request is then repeated.
- A dummy character is sent to initiate output.
- Carriage return is sent and the print head attached, unless the requested length is 2 or less, in which case no attach is executed.

- If PTS6223 is being used for passbook/voucher printing, a leading space is sent.
- The control character (last character in the first word of the buffer) is checked, and the appropriate action taken, as described above.
- Characters from the user buffer are sent.
- If a tabulation character (/11) is found, the print head is returned. Spaces are sent until the next tabulation character is encountered, and the print head is then attached again.
- After printing the print head is detached and a carriage return made if one of the two characters /09 or /0D is present as the last character in the buffer.
- Line feed is executed for tally roll printing.
- A dummy character is sent to end output.

Order : /0B - position voucher/passbook
The lift position must be specified in the right byte of the control word as a binary value, and is used to indicate the number of line steps that the lift must be moved from the top position.
Before positioning a check is made that the voucher/passbook is in. If not, a grasp command is sent to the printer. During positioning, a check is made, and if the voucher/passbook is out, a grasp is executed, and the request repeated. As an alternative, chosen during Monitor generation, the request is completed at voucher/passbook out with bit 2 set in the return code.
After positioning of the lift, the Write voucher/passbook is carried out as described above (order /06).

Order : /22 - cut journal tape
The journal tape is cut off (only applies to PTS6223), and one line feed is made. If this facility is required it must be specified during Monitor generation.

Order : /26 - perforate journal tape
The journal tape is perforated (only applies to PTS6223), and one line feed is made. If this facility is required, it must be specified during Monitor generation.

Order : /37 - grasp voucher/passbook
The following sequence is carried out:

- A dummy character is sent to initiate output.
- The lift is sent to the top position.
- A grasp command is sent to the printer.
- A dummy character is sent to the printer. When a data request is returned from the printer, the grasp has been performed, i.e. the voucher/passbook is in and the next character can be sent to the printer.
- The lift is sent to the top position.

Order : /38 - release voucher/passbook
The lift is moved to the top position and a release command is executed. A dummy character is sent to the printer. When a data request is returned from the printer, the command is completed, i.e. the voucher/passbook is out.

Recovery at power on

After power failure on the CPU or the printer, the lift is sent to the top position and any current request is repeated. Normally no indication is given in the return code. There is an option, chosen during Monitor generation, for bit 7 to be set in the return code if recovery has been carried out on a write request (orders /06 and /0B).

DRTP03 — 2.25 TELLER TERMINAL PRINTER — DRTP03

General information : This driver handles the printer part of PTS6371. If a shared operator's panel is included, this is handled by the keyboard driver DRKB04.

The printer may contain two print stations, both logically and physically, one for (optional) journal printing, and one for document printing. Recommended file codes are /30 for journal and /32 for document. If the journal station is included, this must be specified during Monitor generation, together with the journal character pitch required.

The print speed is 120 characters per second, and the print direction is left to right and right to left to give the maximum print speed possible.
The character pitch is controlled by the software, and can easily be changed. The printer also includes an expanded print mode. Together with three character pitches this gives six possibilities of character width.

The character set includes roomless point numerics, OCR-A characters, some special characters, and up to six user-defined logotype characters. The character generator also contains eleven national variations of ten characters. Printing of these characters is software controlled.

Journal station: The journal paper roll has a width of 90 mm. Printing on the journal is right-justified, and the line spacing is fixed at 6 lines to the inch.

Document station: The document station can handle documents from the A4 size (230 mm x 320 mm) down to small bank cheques (100 mm x 75 mm or 110 mm x 50 mm) as well as most kinds of pass books.
The text may be printed either left- or right justified, and the position of the margin may be set anywhere on the document. The line spacing for the document may be from 1/60" up to 15/60", and this is set by the application.

Document parameters, defining layout and size of the document, are held in module DTTP03, which is included in the Monitor. The table contains one set of standard parameters. By means of editing and reassembly prior to running Monitor generation, these can be changed and other sets can be added. Up to 16 sets of document parameters can be specified. These are referenced by an index, with the value zero for the first set, 1 for the second, and so on. For the orders /27 (Set Document Parameters) and /37 (Transfer Document Parameters)- the index values must be specified in the control word. All parameters are specified in ISO-7 code format.

The standard version of DTTP03 is listed at the end of this driver description.

If a Memory Management Unit is included in the system, an MMU buffer is included in the driver, and the size of this buffer must be specified during Monitor generation.

NOTE : the actual printers vary from country to country and if any problems are encountered, it is important to check that the function being requested is one that is acceptable to the particular printer being used. Some functions are not supported by printers with a microprogram rel. 2 or older. This is mentioned in the text where necessary. The release number of the microprogram will be printed when a document is inserted and the "off-line test" switch is activated.

Calling sequence : Normal I/O:

```
LDK  A7, code
LDKL A8, ecb-address
LKM
DATA 1
```

I/O and activate:

```
LDKL A1, parameter
LDK  A7, code
LDKL A8, ecb-address
LKM
DATA -1
DATA start-address
```

Order codes : The following order codes may be used:

- /00 - test status
- /06 - write
- /0B - position document (document station only)
- /24 - set printer parameters
- /27 - set document parameters (document station only)
- /37 - transfer document parameters (document station)
- /38 - release document (document station only)

Buffer address : Only significant for orders /06 and /27.

Requested length : For order /06 the second character in the buffer is a user control character (see under order /06). The requested length includes two control characters for order /06, but must not be greater than 126. For a microprogram rel.2, the requested length must not exceed 95.

Effective length : After a Write order, the effective length is set to the value of the requested length. It can not be used to check if the complete text has been printed.

Return code : The following bits may be set by this driver:

bit	Meaning	order in which bit is set /00	/06	/0B	/24	/27	/37	/38
0	Illegal request		x	x		x	x	
2	End of journal	x	x					
10	Document out	x	x	x				
13	Code check error		x					
15	Not operable	x	x	x	x		x	x

Control word : The use of the control word is explained under each order below. It is not significant for order /38.

Order : /00 - test status
This order is used to test the status of either the journal station or the document station. The return code may have bit 2, 10 or 15 set. Note that if the journal station is addressed, but does not exist, bit 15 will be set in the return code.
If bit 15 is set, further information may be found in the control word, in the form of a binary number, with the following meanings:

/00 - Power off or printer microprogram not working
/11 - RAM corrupted
/12 - Microprogram memory locations /800-/FFF not OK
/13 - Microprogram memory locations /1000-/17FF not OK
/14 - Microprogram memory locations /1800-/1FFF not OK
/16 - 1st character generator not OK
/17 - 2nd character generator not OK
/18 - 3rd character generator not OK
/19 - Timer in 8155 not OK
/30 - Meander counter running wildly
/31 - Meander counter counting incorrectly
/32 - Meander counter not counting
/33 - Page interrupt is not OK
/34 - Head can not find print position
/35 - Column interrupt is not OK
/38 - Head attach motor/driver is not OK
/39 - Head attach stop pulse is not OK
/3A - Carriage motor/drivers are not working
/3C - Journal tabulation position detector not OK
/3E - Journal line feed motor/drivers not OK
/3F - Journal station not implemented

/70 - Grasp motor/drivers not OK, or
grasp position detectors not OK
/79 - Document transport motor/drivers not OK, or
document sensors not OK
/7F - Unknown hardware error

Order : /06 - write
One line is written at the journal or document station. When printing on the document station, the document can first be positioned with an order /0B. When this order is not used, the actual line number is assumed to be zero. The control character in the second byte in the buffer also indicates where the printing must start. Printing will not start before the document is positioned correctly.

Illegal characters in the buffer (/80-/AD or /AF-/FF) are deleted by the driver, and bit 13 will be set in the return code at completion of the request.

Before printing, action is taken on the control character present in the second character of the buffer as follows:

/2B - Printing is carried out from the last position of the previously printed line on this device. However, if the character pitch has been changed, or if the document has been positioned to a new (or to the same) line, after the previous Write request, the printing will be from the tabulation position on the present line.

/30 - The paper is advanced two lines, and the printing carried out from the tabulation position.

/31 - Journal: the paper is advanced three lines and the printing carried out from the tabulation position. This will make the previously written data readable through the window on the journal station. On the newer printers with a large window, this is not necessary, because here the information will always be readable.

/31 - Document: printing is started from the tabulation position on line 1.

Any other value in the control code will cause one line feed before printing from the tabulation position. The requested length must include the two bytes used for the control code, and other function characters.
If requested length is two, only the action specified by the control code is carried out.
The maximum line length on the two print stations is limited to the following, based on normal character width:

	Journal	Document
10 characters/inch	33	80
12 characters/inch	40	96
15 characters/inch	50	120

One expanded character equals two normal characters.

Printing on the document station will not be executed if no document is present in the printer.
Printing on the journal will be executed, even if the end of journal is detected. However, if the journal paper is not transported correctly, or if a journal station is not included, printing will not take place.
When the request is completed, the control word in the ECB will contain the current line number as a binary value.

If the requested length is less than two, or greater than 126 (or 95), or if the resulting line number is outside the restricted print area, the request is completed with bit 0 set in the return code.

If the journal paper is nearly exhausted, the request is completed with bit 2 set in the return code.
If the printer is not operable, the request is completed with bit 15 set in the return code. Further information can be obtained with the order /00 - test status.

Order : /0B - position document
This order can be used to position the document before the print request is issued. The control word must contain the line number required, as a binary number. The request will wait for the document to be correctly positioned before completing.

If an illegal line number is specified, the request is completed with bit 0 set in the return code.

If the time-out function is used, the request will be completed with bit 10 set in the return code when no document is inserted, or when a too small document is inserted. A too small document is automatically released.

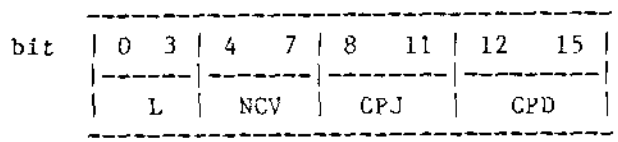
If the time-out function is not used, the printer will wait, and the request will not be completed before a document has been inserted. A too small document must be removed by the operator.

If the order is issued without Wait, it can be aborted. This is however not possible on printers with a microprogram rel 2.

If the printer is not operable for any reason, the request is completed with bit 15 set in the return code. Detailed information can be obtained with the order /00 - test status.

Order : /24 - set printer parameters
This order will not be included in the driver, unless specifically requested during Monitor generation.
With this order it is possible to change one or more of the following parameters;
- Upper/Upper and Lower case character set
- National character variation
- Character pitch for both journal and document station.

The first two parameters are the same for both the journal and the document station, but the character pitch may have different values for the two stations.
All the parameters may be set up in one request issued to only one of the devices.
This order should only be included if it is required to change any of the parameters during the running of the application, since the initial values for each of the parameters can be specified during Monitor generation.
The control word contains the parameter information:



Where:
L determines the character font and may be one of the following:

0 = No change required to character font, or to National Character variation.

8 = Only upper case to be printed. Any character in the range /60 - /7E is printed as the corresponding capital letter (/40 -/5E). The standard numerics and the roomless point numerics are printed with the same font.

9 = Both upper and lower case characters required. The height of the capitals is reduced from 9 to 7 dots (2.7mm to 2.1 mm). The standard numerics and the roomless point numerics are printed with the same font.

10= Only upper case to be printed. Any character in the range /60 - /7E is printed as the corresponding capital letter (/40 -/5E). The standard numerics are printed with the same font as the extra numerics described under "Logotypes and extra characters."

11= Both upper and lower case characters required. The height of the capitals is reduced from 9 to 7 dots (2.7mm to 2.1 mm).
The standard numerics are printed with the same font as the extra numerics shown in the table at the end of the driver description.

The values 10 and 11 will give the same result as the values 8 and 9, on printers with a microprogram rel 2.
NCV is set within the range 0 - A for the national character variations, as shown in the table at the end of this driver description.

CPJ and CPD are the character pitch for the journal and document stations, and may have one of the following values:
0 = No change in character pitch.
4 = 15 characters per inch.
5 = 12 characters per inch.
6 = 10 characters per inch.

If any of the parameters have an illegal value, those that are correct will be set, but the others will be set to unpredictable values.
If the character pitch is changed during the printing the character position is lost, and a new write request will always start from the first position of the line, left to right depending on the margin setting.
If the printer is not operable for any reason, the request is completed with bit 15 set in the return code; in this case the parameters are stored and sent to the printer when power is restored.

If this order is not to be used, and the default values are included during Monitor generation, the following values will be set up:
L = 0, only upper case
NCV = 0, GB national character variation
CPJ = 4, 15 characters/inch at journal station
CPD = 6, 10 characters/inch at document station

Order : /27 - set document parameters
This order may be used, if required, to change the values in the document parameter table during application running. If this order is required, it must be specified during Monitor generation.

The different document parameter sets held in a table in the driver, are referenced by an index with a starting value of zero for the first entry. The index value for the table entry where the parameters must be stored by this order, must be supplied in the control word as a binary value.

The ECB buffer address must contain the address of the set of parameters to be stored in the table.
All parameters must be supplied in ISO -7 code format.

Note that if no document parameters are transferred to the printer (by order /37) the first entry in DTTP03 will be used by default. This means that, if only one document type is used by the application, the first entry in the table can be set up with the correct parameters for this document. This must be done prior to Monitor generation. The orders to Set Document Parameters and Transfer Document Parameters will then not be required.

If any of the parameters are missing, the request is completed with bit zero set in the return code, and the table in the driver is incorrectly updated.

Parameter table entries:

Parameter type	Length in bytes	Range	Unit
DT	1	0-7	
TO	1	0-9	10s
LS	2	01-15	1/60"
NL	2	01-99	
BL	2	14-99	1/60"
MA	2	01-80	1/10"
MF	1	1-7	1/60"
LM	1	0,1	
CM	1	0,1	
HP	1	0,1	
UE	2	15-82	1/5",1/10"
BE	2	00,24-99	1/60"
DW/UL	2	40-97/01-40	1/10" /-
CW	2	00-99	1/60"

If DT = 0 or 4, parameters from UE onwards can be set to zero.
If DT = 1 or 5, parameters from DW onwards can be set to zero.

DT : Document type.
There are eight types of documents. Normally, DT 4 - 7 are used. Document Types 0 - 3 correspond with Document Types 4 - 7 in that order, and are implemented in the driver for compatibility reasons. Document Type 4 - 7 must be specified if logotypes are printed or if the document parameters must be sent to the printer before the document is released (not possible on printers with a microprogram rel 2).

DT 4 - 7 must also be specified if the Abort function for the orders /0B (Position Document) and /38 (Release Document) is required.

4 or 0: Unfolded sheet document with a minimum size of 50x110 mm. If this type of document is used, a simplified method of positioning is carried out, but this is not as accurate as the method used for other types. When using documents with a heigth of less than 75mm, this is the only type allowed.
5 or 1: Unfolded documents in general with a minimum size of 75x100mm. This is the normal type used for unfolded documents.
6 or 2: Vertically folded (passbook).
7 or 3: Horizontally folded (passbook).

Note that it is possible to print folded documents using DT=4 or 5, but in this case the positioning is less accurate, and it is the responsibility of the application to ensure that printing does not take place on the central fold. In the case of vertically folded documents, this means that one complete line must be written by two write orders, to ensure that the print head is lifted over the fold.

TO : Timeout. 0 = No timeout for document insert. The printer will wait till the document has been inserted.
1-9 = The timeout required in multiples of 10 seconds. If used, the order /0B (Position Document) and /06 (Write)will complete with bit 10 set in the return code if no document has been inserted within the specified time.

LS : Line spacing. The distance between two lines, expressed in units of 1/60" (0.423mm).
Any value from 1 up to and including 15 is allowed. 6, 10, 12 and 15 are the values normally used.

06 = 10 lines/inch
10 = 6 lines/inch
12 = 5 lines/inch
15 = 4 lines/inch

NL : Number of lines. The number of evenly spaced lines on the document. Note that, for horizontally folded documents, the area near the fold is treated with the CW parameter. The upper limits of this parameter for different document types and line spacings are as follows:

	Document type		
Line spacing	0,1 4,5	2* 6	3 7
15	44	25	32
12	55	31	40
10	69	37	48
6	99	61	80

* It is possible to have the same maximum limit on type 2 documents as for type 3, providing the document is thin and folds easily; this will have to be tested before deciding on the parameter to be used.

BL : Bottom line. The distance between the bottom of the document and the bottom line, expressed in units of 1/60" (0.423mm). This value must be in the range 14-99 inclusive, which means that the bottom line may be placed between 6 and 42mm from the bottom of the document. See diagrams at the end of this driver description for clarification.

MA : Margin. The width of the margin expressed in units of 1/10".

MF : Margin fine. The width of the fine margin expressed in units of 1/60".
The sum of MA+MF is the distance between the right-hand edge of the document and the margin (left or right). The rightmost position of a right margin is 3mm from the right-hand edge of the document, and this corresponds to the sum MA+MF = 2 (MA = 1, MF = 1).

The leftmost position of a left margin is 206.2mm from the right-hand edge of the document, and this corresponds to MA = 80, MF = 7. The left margin must not, however, be placed closer than 3mm to the left-hand edge of the document.

LM : Left margin.
0 = Print with right margin.
1 = Print with left margin.

CM : Critical margin.
0 = No critical margin.
1 = Critical margin. This must be set if the margin or any text is intended to be positioned closer than 6mm from the edges of the document. In this case, the print speed is reduced near the edges to prevent the head overrunning the document edges. Note that for thin documents, it may not be necessary to set this parameter to 1, even if printing close to the edge; this will have to be tested in each case.

HP : High pressure.
0 = Normal print pressure, for single sheet documents or documents with one extra copy.
1 = High print pressure, primarily intended for printing on multiple sets of forms.

UE : Upper edge; not significant for document type 0 or 4.
For document type 1 or 5, this is the distance between the bottom of the document and the true upper edge, expressed in units of 1/5" (5.08mm). As the limits for this value are 15 - 63, this means that a document with a height of 75mm to 316mm can be used. See also the diagram at the end of this driver description for clarification.
For document type 2 or 6, this is the distance between the bottom of the document and the upper edge of the pages, expressed in units of 1/10" (2.54mm). The normal limits for this value are 25 - 82, but note that the distance between the bottom and upper edge must not be more than 210mm.
For document type 3 or 7, this is the distance between the bottom edge of the document and the upper edge of the pages, expressed in units of 1/10" (2.54mm). The normal limits for this value are 48 - 82, but note that the minimum distance between the bottom and upper edges is 120mm, and the total height of the document must not exceed 210mm.
Horizontally folded documents with a distance of less than 120mm from bottom to upper edge will need to be tested specially, to check that the quality of the print is good enough. The absolute lower limit for this parameter and this document type is 40.

This parameter is required to ensure that the document printing mechanism is lifted, as the physical edges of the pages could otherwise jam in the transport mechanism.

BE : Bottom edge. This parameter is not significant for document type 0 or 4.
For all other document types, this is the distance between the bottom of the document and the bottom edge, expressed in units of 1/60" (0.423mm). See the diagram at the end of this driver description for further clarification.
The limits of this value are 24 - 99 or zero, which means that the bottom edge of the pages must be placed 10-42mm from, or in line with the bottom of the document. This is normally set to zero for document type 1 or 5.
This parameter is required to ensure that the document printing mechanism is lifted, as the physical edges of the pages could otherwise jam in it.

DW : Document width. This parameter is only significant for document type 2 or 6, and is the width of the document in units of 1/10" (2.54mm), in the range 40-96 inclusive.
For printers with a microprogram rel. 2 the value must be even.

UL : Upper lines. This is only significant for document type 3 or 7, and is the number of lines on the upper portion of a horizontally folded document, in the range 1 - 40 inclusive.

CW : Centre width. This is not significant for document types 0 or 4, 1 or 5.
For document type 2 or 6, this is the width across the fold on vertically folded documents, expressed in units of 1/60" (0.423mm), in the range 24 - 99 inclusive. In this area, the print head will be released if there are spaces in the corresponding positions in the print buffer. Non-space characters sent for printing in this area, will be printed.
For printers with a microprogram rel. 2, CW must be an even value, and spaces must be printed in this area. If characters are sent for printing in this area, the request will be completed with bit 0 set in the return code.
For document type 3 or 7, this is the distance from the bottom line on the upper portion of a horizontally folded document to the first line on the lower portion of the document, expressed in units of 1/60" (0.423mm), in the range 54 - 99 inclusive.

Note for document type 7, the position of the Upper Edge and Bottom Edge must be chosen to be symmetrical around the centre fold.

Order : /37 - transfer document parameters.
With this order one of the set of previously defined parameter tables is transferred to the printer, the tables having been set up by order /27 or during Monitor generation (see below).
A set of standard parameters are held in a table DTTP03 automatically included by the driver during Monitor generation. A list of the standard contents of this table is given at the end of this driver description.
When the program is first loaded, the parameters from table entry zero are automatically transferred, and this order is therefore not required if only one document type is to be used, providing the appropriate parameters are contained in the first entry in DTTP03.
The control word must contain the index value pointing to the required entry in the table, where the first entry is Index 0.

For documents type 0 - 3, when the parameters have been transferred and the document has been positioned, new parameters can not be transferred until the old document has been released. In that case bit 0 will be set in the return code.
If the document type is 4 - 7, new document parameters can always be transferred (except on printers with a microprogram rel 2). This allows partial line feed up or down, and redefining the position of the text during a print phase.

If the index value is illegal, the request is completed with bit 0 set in the return code.
If any of the parameters have an illegal value, this will not be detected, and the results can be unpredictable. The parameters are only checked by the order /27, Set Document Parameters.

If the printer is not operable for any reason, the request is completed with bit 15 set in the return code. The parameters are stored and will be sent at power on.
Note that it may not be necessary to use this order at all in the application: see order /27, Set Document Parameters.

Order : /38 - release document
This order is used to release a document when printing is completed, and causes the document to be fed out of the printer. The request will be completed when the document has been withdrawn from the printer by the operator. If the request is issued without Wait, it can be aborted. This is only possible for printers with a microprogram rel. 3.

After abortion, the current print position is not lost and printing can be resumed as if no `release' order had been issued.

If the printer is not operable for any reason, the request is completed with bit 15 set in the return code. More information about the status can be obtained by using order /00 - test status.

Note that the Abort of an order taking effect immediately after Power On, will abort the recovery routine. 4 seconds must be allowed for the printer to recover before an Abort can be correctly executed.

Special characters : The driver allows the user to request the printing of five types of special characters, as follows:
- Roomless point numerics
- Logotypes and extra characters
- OCR-A characters
- Expanded characters
- Underlined characters

For the first two types, each character to be printed as a special character must be preceded in the buffer by the appropriate code, the codes being as follows:
/AE for roomless point characters
/1B for logotypes and extra characters
For printers with a microprogram rel. 2, there is a third code used in this way:
/1A for OCR-A characters.
For the expanded, underlined and OCR-A characters, the string of characters to be expanded, underlined or printed as OCR-A characters must be preceded by a start character and ended with a stop character, as follows:

/19 start or stop expansion
/12 start or stop underlining
/13 start or stop underlining
/1A start or stop OCR-A characters

The codes /12 and /13 are functionally identical.

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Expanded and underlined mode can be combined with other special characters, if required.
Note that each time a buffer is printed, no character mode is assumed, and the application must always set the mode at the time of printing.

The special character types are described below:

Roomless point numerics : Any character in the range /30-/39, which is preceded by code /AE, is printed as a roomless point numeric. Any other legal code, not in the range /30-/39, but preceded by /AE, is printed as a space.

Logotypes and extra characters : Each of the codes described below, which is preceded by code /1B is printed as described. Any other legal code preceded by /1B is printed as a space.

- Codes /20-/2F, /41-/4F : these are special codes for use when the current national version does not contain the character required. The first ten are printed as follows:
Space,§ , @, #, ¢ , £ , Space, ¤ , ~ and . respectively, and the remainder as spaces.

- Codes /30-/39 : these numerics are printed with a greater width than the normal numerics, with much the same size as the alphabetic characters.

- Codes /3A-/3F are the codes for logotype printing. The character generator for logotypes is an option which must available in the hardware of the printer if this feature is to be used. If it does not exist, the codes will be printed as spaces.

Printing logotypes

To print a logotype of more than one line, with vertically alligned characters, a good overlapping of the characters is achieved when:
- The lines are all printed in the same direction.
- A separate set of document parameters gives the printhead a well defined starting point to print the logotype.

Recommended sequence of operations:

1 Position the print head at the right margin, with the tabulation character /11 in a dummy request.
2 Transfer a set of document parameters where:
  the position of the highest character of the logo is defined as line 1.
  The position of the leftmost character of the logo is at the left margin.
  Line spacing is set to 6.
3 Print the characters on the top line of the logotype, from right to left.

4 Print the special spaces (code /1B,/40) in a separate request, on the same line. This will move the print head to the right of the logotype.
5 Print line 2 of the logo. Printing will be from right to left.
6 Repeat steps 4 - 5 for each line to be printed.
7 When the complete logotype has been printed, reset the original parameters for the document, with the order /37 (not possible on printers with a microprogram rel. 2).

If overlapping of the lines is not critical for the logotype, steps 1 and 4 can be omitted to save time.

Note that the change of character pitch, and the use of expanded mode is also applicable for the logotypes. This results in 6 possible layouts of the same logotype. Logotype characters will be exactly square when the character pitch of 10 characters/inch, and normal mode is used.

Space characters - Code /40 : when `printing' this space, the printhead will be moved. Thus it enables the application to control the print direction and print the different lines of a logotype in the same direction.

OCR-A characters : Any character in the range /30-/3C, which is preceded and followed by character /1A as a start- and stop-OCR character, will be printed as an OCR-A character. Codes /30 to /39 are printed as OCR numerics, and codes /3A to /3C as ⌠ , ∀ , ⌡ respectively. Any other legal code that is preceded by /1A will be printed as a space. To print OCR-A characters correctly, the pitch must be set at 10 characters per inch.
Note that on printers with a microprogram rel. 2, each character to be printed as an OCR-A character, must be preceded by code /1A.

Expanded characters : When the first code /19 is detected in the buffer, the printer enters expanded mode. In this mode, every character is printed with double width, so a line printed in this mode will have twice the length of the same line in normal width. The expanded mode is ended when code /19 is next detected in the buffer.

Underlined characters : When the code /12 or /13 is detected in the buffer, the printer enters underlined mode. In this mode, every character is underlined, until the next code /12 or /13 is detected in the buffer. This is normally used only with upper and lower case characters. If only upper case is used, the underline will be printed as part of the characters.

Tabulation code : - Code /11 : When this code is detected in the output buffer, the printhead will be positioned between the journal station and the document station after printing has been completed. This makes it possible for the operator to read the text printed on the journal tape, without additional line feed, on printers with a (redesigned) large glass window. This is not implemented on printers with a microprogram rel. 2.

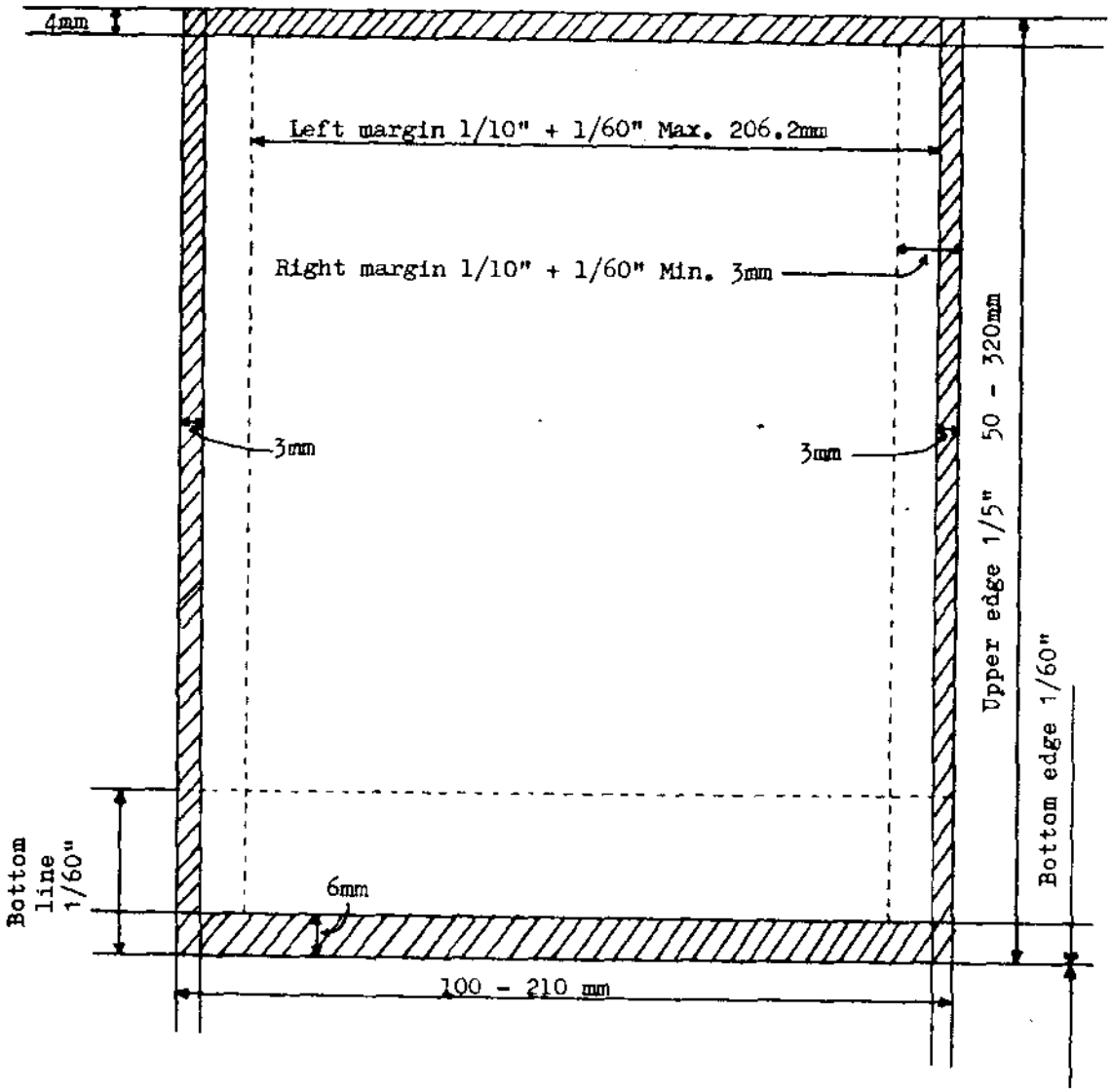
Recovery at power on : After power on the document, if any, is positioned to the current position, the actual parameters are sent to the printer, and any current request repeated.

Table of Standard document Parameters (entry 0 in DTTP03).

Parameter	Value	Description
DT	1	Unfolded document
TO	0	No timeout: the printer will wait until the document is inserted.
LS	10	10/60"=4.16 mm spacing between the printed lines.
NL	68	Number of lines is 68
BL	17	The bottom of the characters on the bottom line (line 68) is 17/60"=7.2mm from the bottom edge of the document.
MA	02	The right margin is set 2/10"+2/60"=5.9mm from the
MF	2	right edge of the document.
LM	0	Print with right margin. The right most character on each line is printed 5.9mm from the right edge of of the document.
CM	0	No critical margin; this gives faster positioning
HP	0	Normal print pressure; this assumes that no multi-part sets of documents are used.
UE	58	Document height is 58/5"=295 mm. (A4 size)
BE	0	No inner pages on the document.
DW	0	Not required for document type 1
CW	0	Not required for document type 1

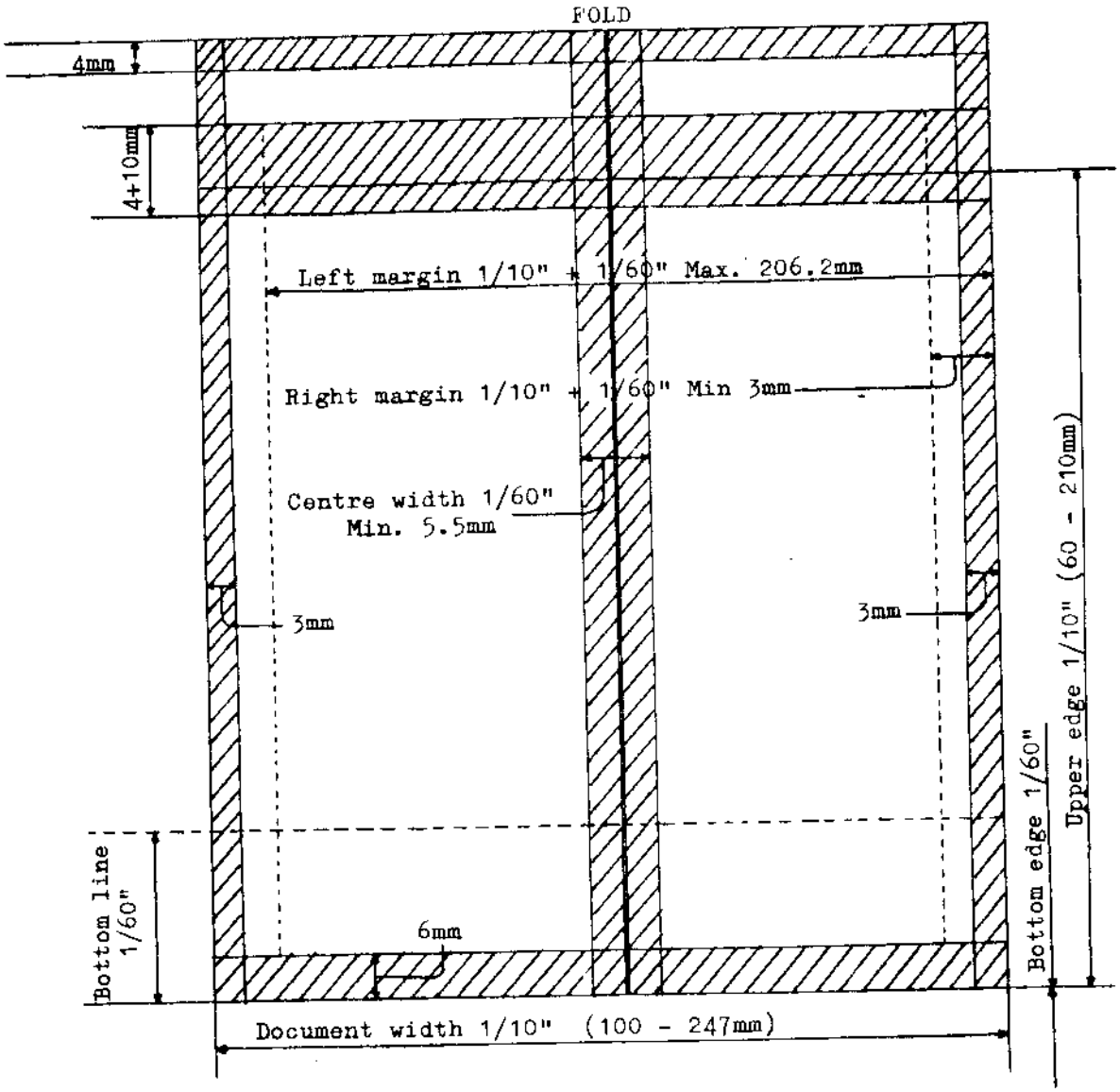
Note: Right margin has been set for this document. If a smaller document must be printed, printing must start at a line number higher than 1 (that is, lower on the page), and if the document is also less wide, not more print positions must be used than will fit on the document. Thus, smaller documents can be printed without the need for changing the document parameters.

Diagram of parameters for document types 0,1, 4 or 5 (unfolded).



Areas in which printing is not possible.

Diagram of parameters for document type 2 or 6 (Vertically folded).



Areas in which printing is not possible.
However, the areas around the edges of the inner pages may be printable if the inner pages are thin.
The bottom line may be defined in non-printable area, but then it can not be printed.

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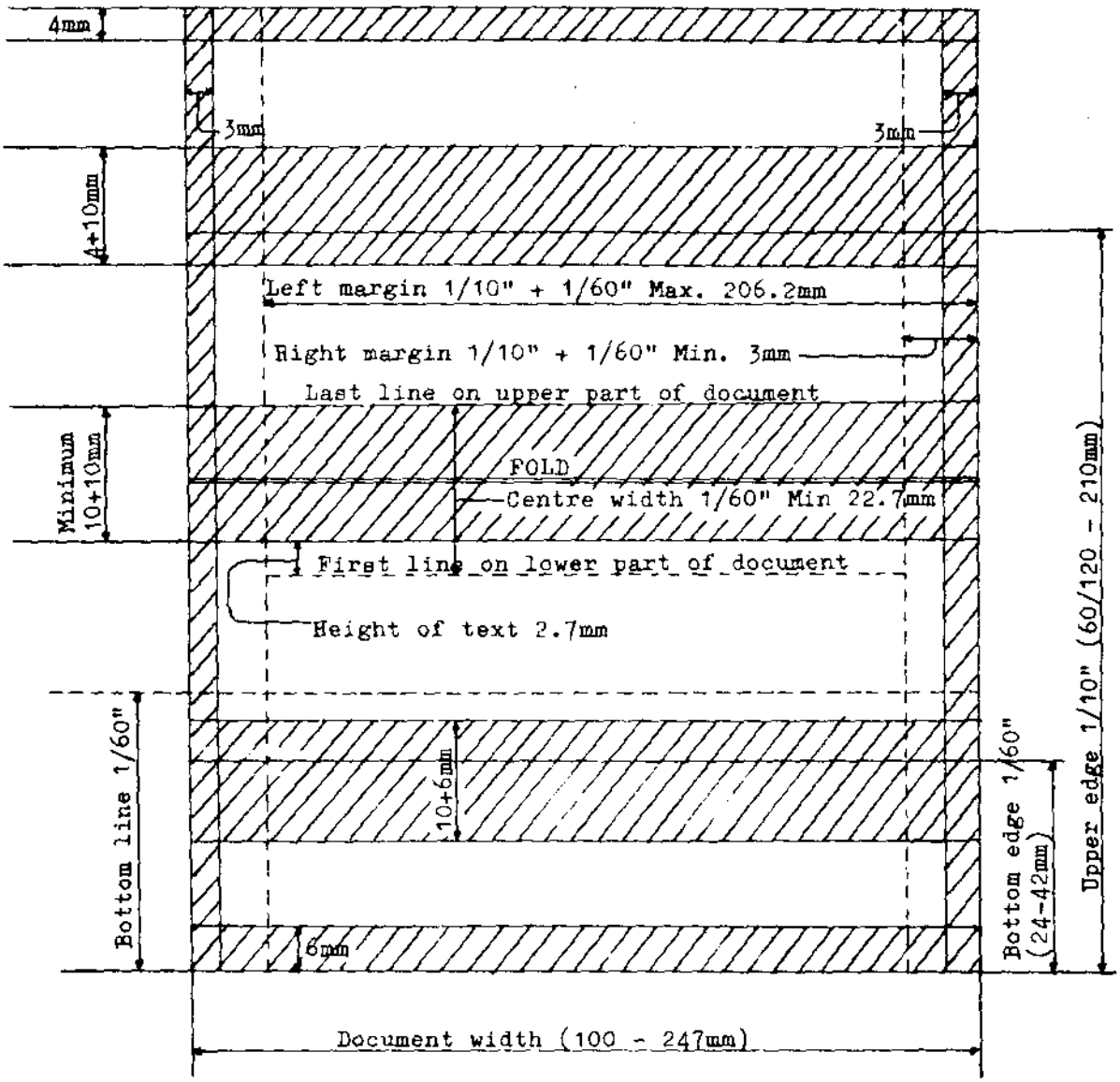
Diagram of parameters for document type 3 or 7 (Horizontally folded).



Areas in which printing is not possible.
However, the areas around the edges of the inner pages may be printable if the inner pages are thin.
The bottom line may be defined in non-printable area, but then it can not be printed.

Table of national character variations.

NCV	Countries	Character code /23	/40	/5B	/5C	/5D	/60	/7B	/7C	/7D	/7E
0	Great Britain, Netherlands, Belgium	£	@	[	\	]	`	{	¦	}	~
1	Germany, Luxembourg, Austria, Switzerland	#	§	Ä	Ö	Ü	`	ä	ö	ü	ß
2	France, Switzerland, Belgium, Luxembourg(1)	£	à	°	ç	§	`	é	ù	è	¨
3	Spain, Argentina, Venezuela	£	@	[	Ñ	]	`	{	ñ	}	~
4	Italy, Switzerland	£	§	°	ç	É	ù	à	ò	è	ì
5	Sweden, Finland	#	É	Ä	Ö	Å	é	ä	ö	å	~
6	Denmark(1) Norway	£	@	Æ	Ø	Å	`	æ	ø	å	~
7	Portugal, Brazil	£	@	Ã	Ç	Õ	`	ã	ç	õ	~
8	France, Switzerland, Belgium, Luxembourg(2)	â	a	ê	ç	î	ô	é	ù	è	û
9	USA, Canada, Australia	#	@	[	\	]	`	{	¦	}	~
10	Denmark(2) Norway	#	É	Æ	Ø	Å	é	æ	o	å	~

DRTP04 — 2.26 FINANCIAL TERMINAL PRINTER `FT80´ — DRTP04

General information:

This driver handles two versions of the printer part of the financial terminal FT80. which versio is present in the system, must be specified during Monitor generation.

The character pitch is 12 character/inch and the print speed is 100 characters/second for both versions. The character set consists of normal capital characters, including nine national character variations.

Both printer versions allow the operator to insert a document in front of the print station(s) and print one line. If this feature is used, the front feed document is seen as a separate logical print station with its own file code.

On most printers there is an edge stop, to indicate to the operator where to position smaller documents. When this is used, it is the programmer's responsibility that the characters printed outside the physical edge of the document, are dummy spaces.

The lower edge of the printed line is 37 -55 mm from the bottom edge of the paper (the printer can be mechanically adjusted to the correct height).

One line is printed per request. The printing is right justified.
Line spacing is 5.4 lines/inch.

Single station version

Version M1 contains a single journal station. It can handle a paper width of maximum 120 mm. The maximum number of characters per line is 51. The right margin is 2,5 mm from the right edge of the document.

Document station: a maximum of 51 characters per line can be printed on the document station. The right margin is 2.5 mm from the right edge of the paper, when no edge stop for small documents is used.

Recommended file codes are, /30 for the journal station and /32 for the front feed document.

Two station version:

Version M2 contains a receipt print station and to the left of it a smaller journal station. A document may be inserted for printing, in front of both print stations together. Recommended file codes are /30 for the journal station, /32 for the front feed document and /34 for the receipt.

Journal station:
The journal paper roll has a width of 44.5mm.
18 characters can be printed on one line. The right margin is 2,5 mm from the right edge of the document.

Receipt station:
The receipt print station can handle a paper width of 67 mm. 28 characters can be printed on one line. The right margin is 6 mm from the right edge of the paper.

Document station:
The document station can print a line of maximum 46 characters, but note that character positions 29-33, corresponding to the area between the two print stations, can not be printed and must contain spaces. The right margin is 2.5 mm from the right edge of the paper.

For systems with MMU, the driver includes an MMU buffer, the size of which must be specified during Monitor generation.

Calling sequence : Normal I/O:

```
LDK  A7,code
LDKL A8,ecb-address
LKM
DATA 1
```

I/O and Activate:

```
LDKL A1,parameter
LDK  A7,code
LDKL A8,ecb-address
LKM
DATA -1
DATA start-address
```

Order codes : The following order codes may be used:
/00 - test status
/06 - write
/22 - cut receipt
/24 - set printer parameters
/26 - perforate receipt

Buffer address :
Requested length :
Effective length :
} Only significant for order /06.

Return code : The following bits may be set by this driver:

bit	Meaning	Order in which bit is set /00	/06	/22	/24	/26
0	Illegal request		x			
2	End of journal tape, or voucher out	x	x	x		x
7	Recovery executed	x	x	x	x	x
10	Document out	x				
13	Code check error		x			
15	Not operable	x	x	x	x	x

Control word : Only significant for order /24, to indicate which National character variation must be set.

Order : /00 - test status
This order is used to test the status of either the journal station or the document station. The return code may have bit 2, 10 or 15 set.

If bit 15 is set, the control word may indicate time-out as follows:
Control word = /12: printer time-out on printer M1
Control word = /13: printer time-out on printer M2.

Order : /06 - write
Alphanumeric characters in the range /20 - /5F, in the user buffer, are sent to the printer. Characters in the range /60 - /7E are converted to /40 - /5E. The code /7F is ignored by the driver.

One line is printed per write order. Before the printing starts, the print head is moved to the right margin for the addressed print station. The last character in the buffer is printed immediately to the left of the right margin, regardless of any previous printing. The number of line feeds is issued as indicated by the control character in the second byte in the buffer.

Control characters:
The right byte in the first word in the buffer is a control character (only significant for order /06). The control character may have one of the following values:

/2B - The paper is not moved after the text is printed. The print head is moved to the right margin and printing will start from there.
/30 - The paper is advanced two lines after the text is printed.
/31 - The paper is advanced 8 lines after the text is printed. (Receipt station only).
/32 - The paper is advanced 5 lines after the text is printed. (Receipt station only).

Any other code gives one line feed after the text is printed.

When printing on the document station, no line feed is issued and the control character is not significant. The printer will wait till a document has been placed in the printer, and the request is not completed until the document has been taken out again.

Note that some of the early delivered M2 printers which do not have the document printing facility, still permit to insert a document and print on it. The request must address the journal or receipt station, and control character /2B must used to avoid line spacing. There is no check if the document is in or not, so the text is printed on the receipt or journal if the operator fails to insert the document.

At return, the effective length will contain the same value as the requested length. The effective length can not be used to check if the correct number of characters has been printed.

The request is completed with bit 0 set in the return code if the requested length is less than 2 or if the request addresses the receipt station on an M1 printer. If this bit is set, no action has been carried out and the status of he printer is the same as before the order was issued.

Illegal characters in the buffer (/80 - /AD or /AF - /FF) will result in bit 13 set in the return code. If this bit is set, the request has been carried out and the illegal characters have been deleted.

Bit 2 set in the return code indicates for the journal station that the journal paper is nearly finished or not present.

Order : /22 - cut receipt
The receipt is cut. The paper is cut just below the last line printed if this line was followed by 8 line feeds.

Order : /24 - set printer parameters
This order is used to select one of the national character variations. The control word contains the information for this order as follows:

Bit 0 must be set to 1 to indicate that national characters must be changed. Bits 4 - 7 contain the value corresponding to the national character variation required. These values are listed in the table at the end of this driver description. The other bits in the control word are not significant.

Order : /26 - perforate receipt
The receipt is perforated. To perforate the receipt just below the last line printed, the line must be followed by 8 line feeds.

Recovery at power on

At power up, the actual printer parameters aresent to the printer and any current request is repeated. If the current request is order /24, Set Printer Parameters, the requested parameters are transferred to the printer.

Bit 7 set in the return code indicates that recovery has taken place.

		Character code									
NCV	Countries	/23	/40	/5B	/5C	/5D	/60	/7B	/7C	/7D	/7E
0	Great Britain, Netherlands, Belgium	£	@	[	\	]	@	[	\	]	^
1	Germany, Luxembourg, Austria, Switzerland	#	§	Ä	Ö	Ü	§	ä	ö	ü	^
2	France, Switzerland, Belgium, Luxembourg	£	à	°	c	§	a	é	c		^
3	Spain, Argentina, Venezuela	£	@	[	Ñ	]	@	[	Ñ	]	^
4	Italy, Switzerland	£	§	°	ç	É	§	é	ç	é	^
5	Sweden, Finland	#	É	Ä	Ö	Å	É	ä	ö	å	^
6	Denmark, Norway	£	@	Æ	ø	Å	@	æ	ø	å	^
7	Portugal, Brazil	£	@	Ã	ç	Õ	@	ã	ç	õ	^
8	Yugoslavia	£	Ž	Ć	Č	Š	Ž	ć	č	š	^
9	USA, Canada, Australia	#	@	[	\	]	@	[	\	]	^
10	Denmark, Norway (2)	#	É	Æ	ø	Å	É	æ	ø	å	^

DRTW01 — 2.27 CONSOLE TYPEWRITER — DRTW01

General information : This driver handles input from and output to the typewriter PTS6862, connected to the CPU via the teletype or V24 interface.

Input and output cannot take place at the same time, since the connection only allows half duplex transmission.

If a Memory Management Unit is included in the system, an MMU buffer is included in the driver, and the size of this buffer must be specified during Monitor generation.

Calling sequence : Normal I/O:

```
LDK  A7,code
LDKL A8,ecb-address
LKM
DATA 1
```

I/O and Activate:

```
LDKL A1,parameter
LDK  A7,code
LDKL A8,ecb-address
LKM
DATA -1
DATA start address
```

Order codes : The following order codes may be used:
/01 - basic read
/02 - standard read
/03 - numeric read
/05 - basic write
/06 - standard write

Buffer address :
Requested length :
Effective length :
Significant for all orders. For orders /02 and /03 the length includes the end-of-record key. For /06 the first word in the buffer is reserved for control information; this word must be included in the requested length.

Return code : The following bits may be set by this driver:

bit	Meaning	Order /01	/02	/03	/05	/06
0	Illegal request	x	x	x	x	x
9	Timeout	x	x	x		
12	Incorrect length		x	x		
13	Code check error		x	x		x
14	Throughput error				x	

Control word : For orders /02 and /03 the control word must contain the address of a keytable containing a list of end-of-record keys. If the address is set to zero, the driver assumes that no table exists and the standard key TWEOR is used as end-of-record key. The format of the table is as follows:

byte		
0	No. of EOR keys	KEY1
2	KEY2	KEY3
4	KEY4	KEY5

Order : /01 - basic read
The requested number of characters are read and stored in the user buffer without any check.

Common functions for orders /02, /03 : Each character received is checked in the following sequence:
If the character is found in the keytable, the key is stored in the user buffer and the request completed. The end-of-record key is also converted and stored in the control word so that KEY1 gives 0, KEY2 gives 2, KEY3 gives 4, and so on. Note that for CREDIT applications KEY1 gives 1, KEY2 gives 2, and so on.
Special characters Clear and Backspace are recognised and the corresponding functions carried out.
Alphanumeric/numeric characters are stored in the user buffer.
If overflow occurs in the user buffer, the request is completed with bit 12 set in the return code.
If the character received cannot be identified by the tests described above, the request is completed with bit 13 set in the return code. The undefined character is stored in the user buffer, and the control word remains unchanged.

Order : /02 - standard read
Alphanumeric characters in the range /20-/5F are accepted and stored in the buffer.

Order : /03 - numeric read
Only numerics in the range /30-/39 are accepted and stored in the buffer.

Order : /05 - basic write
The requested number of characters are sent from the buffer to the printer without any check.