Chapter 2

DRIVER REFERENCE

DRCD01 — 2.1 80Mb DISK — DRCD01

General information:

This driver handles one or two 80Mb disk drives of the type PTS6877, connected to the CPU via an integral DMA channel. Drives of this type may be used in systems with a memory cycle time no greater than 0.7 microseconds.

A single drive unit holds one removable cartridge. The disks in a two-drive system are logically independent, but may be operated physically only one at a time.

Each drive has its own File Code, user supplied at Monitor generation time. The recommended codes are /FC and /FD. When certain system software is generated, such as File Management, the recommended codes are automatically assigned.

IPL (Initial Program Load) from a PTS6877 disk is also possible.

The total capacity of a disk pack is 72.6MB, split up as follows:

822 cylinders, each of 5 tracks;
= 4,110 tracks, each of 23 physical sectors;
= 94,530 physical sectors, each of 3 logical sectors;
= 283,590 logical sectors, each of 256 bytes.

Each logical sector is given a number from 0 thru 283,589 when reading or writing.

The driver contains an intermediate buffer of 512 bytes. A physical sector image is built by storing 1 logical sector in the user buffer and 2 logical sectors in the intermediate buffer and then it is written to the disk.

Multiple sector I/O:

More than one logical sector can be read or written during a single LKM request.
Read:
At least one physical sector is read at a time. The logical sector requested by the application is transferred to the user buffer. The logical sectors that were not required are stored in the intermediate buffer and passed to the application at subsequent requests. In this way, for Sequential Read orders a disk access need only be done for every 3rd requested logical sector.

Write : Multiple sector I/O can reduce access times when the requested number of logical sectors to be written is a multiple of 3, and the sector number of the first sector to be written is also a multiple of 3. In thisway, complete physical sectors are passed to the driver to be written, and no editing of logical sectors into physical sectors with the aid of the intermediate buffer is needed.

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 65280. Not significant for order /1F.

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

		Order					
bit	Meaning	/00	/01	/05	/11	/15	/1F
0	Illegal request	x	x	x	x	x	x
7	Retries performed		x	x	x	x	
10	New volume loaded	x	x	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

The return codes of which the meaning is not obvious, are explained below:

Bit 0, Request error — This may indicate: illegal file code, illegal order, illegal requested lenght, illegal sector number.

Bit 7, Retries performed — If the I/O fails, the driver performs 27 retries. If the error persists, the request is completed with bit 7 and one of the bits 12 - 15 set in the return code.

Bit 10, New volume loaded: — This bit is set by the first disk access after a system restart, when the volume name read from the disk is different from the volume name that is already stored in the disk Device Work Table. No I/O is performed. The file must be closed, this is the only order that will be accepted. To access the file after that it must be opened again.Bit 10 is only used for removable disks. It will not be set after sytem initialisation (IPL).

Bit 13, data error — The `bad track' flag is set, or a CRC error has occurred.
Bit 15, not operable:The addressed disk unit is not present or not connected, or power is off for the disk or the disk is not yet ready.

Control words : These words must contain the number of the first sector to be transferred. Control Word 1 is the more significant. Bit 0 of control word 2 is not used and must be zero.

Order : /00 - Test Status.
The status of the disk 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 disk Device Work Table. If the requested length is 6, the volume name is read into the user buffer.

DRCD01 — Continued — DRCD01

Order : /01 - Basic Read
One or more sectors are transferred from the disk tothe user buffer. 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 complete disk is formatted. The formatted sectors will contain binary zeroes. If the control word in the ECB contains zero, all Bad Track flags will be reset. If the control word is 1, the Bad Track flags will be unchanged.

Recovery at Power On : If a drive was running when the system powered off, then it is automatically restarted at power on. 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 there was a power failure 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.

DRCD02 — 2.2 16Mb DISK — DRCD02

eral information: This driver handles one or two 16Mb disk drives of the type PTS6877, connected to the CPU via an integral DMA channel.
A disk drive unit holds one removable cartridge disk and one fixed disk. The disks are logically independent, but may be operated physically only one at a time.

Each drive has its own File Code, user supplied at Monitor generation time. The recommended codes are /FC and /FD. When one of the data management packages or File Management is included, the recommended codes are automatically assigned.

IPL (Initial Program Load) from a PTS-CMD disk is also possible.

Sector length is 256 bytes both for logical and physical sectors.

822 cylinders, each of 1 tracks;
= 822 tracks, each of 47 physical sectors;
= 38634 sectors, each of 256 bytes
= 9679872 bytes.

Tracks 0 - 807 are used as primary tracks, tracks 808 - 822 are alternate tracks.

The driver handles logical multiple sector I/O requests. this means that it is possible to read or write more than one logical sector during one LKM request. the number of the first sector to be transferred should be supplied in the Control Words of the ECB, and the Requested Length must be set to a multiple of 256. The maximum number of sectors transferred at one LKM request is 255. Thus the maximum requested length is 65280.

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
```

DRCD02 — 2.2 16Mb DISK — DRCD02

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 addresss : 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 65280. Not significant for order /1F.

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

		Order					
bit	Meaning	/00	/01	/05	/11	/15	/1F
0	Illegal request	x	x	x	x	x	x
7	Retries performed		x	x	x	x	
10	New volume loaded	x	x	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

The return codes of which the meaning is not obvious, are explained below:

Bit 0, Request error — This may indicate: illegal file code, illegal order, illegal requested length, illegal sector number.

Bit 7, Retries performed — If the I/O fails, the driver performs 3 retriesor a Write request, and 33 for a Read request. If the error persists, the request is completed with bit 7 and one of the bits 12 - 15 set in the return code.

Bit 10, New volume loaded: This bit is set by the first disk access after a system restart, when the volume name read from the disk is different from the volume name that is already stored in the disk Device Work Table. No I/O is performed. The file must be closed, this is the only order that will be accepted. To access the file after that it must be opened again.
Bit 10 is only used for removable disks. It will not be set after sytem initialisation (IPL).

Bit 13, data error This may indicate:
- data part timeout. The data part is not found after the identifier within the time limit.
- read data error (CRC error)
- flag error (bad track flag set)
- identifier error

Bit 14, throughput error/seek error
- Identifier not found
- incorrect head- or cylinder number
- incorrect sector number
- throughput error

Bit 15, not operable: The addressed disk unit is not present or not connected, or power is off for the disk or the disk is not yet ready.

Control words : These words must contain the number of the first sector to be transferred. Control Word 1 is the more significant. Bit 0 of control word 2 is not used and must be zero.

Order : /00 - Test Status.
The status of the disk 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 disk Device Work Table. If the requested length is 6, the volume name is read into the user buffer.

Order : /01 - Basic Read
One or more sectors are transferred from the disk to the user buffer. 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 complete disk is formatted. The formatted sectors will contain binary zeroes.

Recovery at Power On : If a drive was running when the system powered off, then it is automatically restarted at power on. 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 there was a power failure 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.

DRCR01 — 2.3 CARD READER — DRCR01

General Information : This driver handles one PTS6885 Card Reader connected to the CPU via CHCD and MUX on programmed or multiplex channel. The channel to be used must be specified during Monitor generation.
If a Memory Management Unit is included in the system, an MMU buffer will be 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 code : The following order code may be used:
/02 - standard read

Buffer address :
Requested length :
Effective length :
} All significant for order /02. The requested length must be in the range 0 - 80. The effective length is the number of characters read up to the first space character, but not including the space.

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

Bit	Meaning
0	Illegal request
2	Input hopper empty or output stacker full
3	EOF detected
12	Incorrect length
13	Data fault
14	Throughput error
15	Not operable

Control word : Not significant

Order : /02 - standard read
The LKM request must be issued for each card to be read.
The cards are read in Hollerith code on 12 bits, converted into 8-bit ISO-7 code, and stored in the user buffer until the requested length is reached.
If the requested length is greater than 80, or if there is more information on the card than has been specified by the requested length, the request is completed with bit 12 set in the return code.
If a character is read that cannot be converted, the character is replaced with a ? (/3F), and the request is completed with bit 13 set in the return code.
If the card reader offers a new character before the previous one has been taken care of by the driver, the request is completed with bit 14 set in the return code
If the card reader is not operable (e.g. power off), bit 15 is set in the return code.

Recovery at power on : If there is a request current when the power failure occurs, the request is completed with bit 14 set in the return code. To ensure that no data is lost, the card must be moved from the output stacker to the input hopper and read again.

DRDIO1 — 2.4 SIGNAL DISPLAYS AND LAMPS ON KEYBOARDS — DRDIO1

General information : This driver handles output to Signal Displays PTS6241 and 6242, lamps on keyboards PTS6232, 6233,6234, 6236,6271, 6272, the FT80, and the lamp function of the PIN keyboard PTS6291 when connected to the Badge Card Reader PTS6261 or PTS6262.

If a Memory Management Unit is included in the system and order /06 is included (see below), an MMU buffer will be reserved in 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:
/06 - write program display (PTS6241 only)
/37 - set lamps on
/38 - set lamps off
/39 - flash lamps

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

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

		order in which bit is set			
bit	Meaning	/06	/37	/38	/39
0	Illegal request	x	x	x	x
13	Code check error	x			
15	Not operable	x	x	x	x

Control word:

For all orders, the control word specifies the lamps that will be affected. The bit pattern has a different meaning for each device, and is given below. Lamp L1 is the leftmost lamp on each device, or the bottom lamp when the lamps are in a vertical line.

Control word for keyboards PTS6241 and 6242:

bit	0 7	8	9	10	11	12	13	14	15
	0	L1	L2	L3	L4	L5	L6	L7	L8

Control word for keyboards PTS6232 and 6234:

bit	0 11	12	13	14	15
	0	L4	L3	L2	L1

Control word for keyboard PTS6233:

bit	0	1 7	8	9	10	11	12	13	14	15
	B	0	L8	L7	L6	L5	L4	L3	L2	L1

B = Bell; if this bit is set to 1, the bell is sounded at the keyboard. This only applies to orders /37 and /38.

Control word for keyboard PTS6331:

bit	0 12	13	14	15
	0	L3	L2	L1

Control word for keyboard PTS6236, 6271 and 6272:

bit	0	1 11	10	11	12	13	14	15
	B	0	L1	L2	L3	L4	L5	L6

B = Bell; if this bit is set to 1, the bell is sounded at the keyboard. This only applies to orders /37 and /38.

Control word for FT80 keyboard and cashboxes:
(cashboxes are optional hardware on FT80)

bit	0	1	2	3 11	12	13	14	15
	B	C2	C1	0	L1	L2	L3	L4

B = Bell, C1 = Cash box 1, C2 = Cash box 2.
If C1 or C2 = 1, the corresponding cash box is opened.

Control word for PTS6291 PIN keyboard PK75 when it is connected to the FT80:

bit	0 10	11	12	13	14	15
	0	L				

Control word for PTS6292 Customer Display:

bit	0 11	12	13	14	15
	0	L1	L2	L3	L4

When Customer Display PTS6292 and PIN keyboard PK75 are connected on the same device address, the two control words can be combined:

bit	0	11	12	13	14	15
	0	L	L1	L2	L3	L4

Order : /37 - set lamps on.
Lights corresponding to bits set in the control word are turned on. Other lights are not altered.

Order : /38 - set lamps off.
Lights corresponding to bits set in the control word are turned off. Other lights are not altered.

Order : /06 - write program display - PTS6241 only.
With these orders the program display on PTS6241 can be controlled. 1 to 4 characters are sent to the display from the user buffer. Character codes must be in the range /30 - /6F, where:

/30-/3F are sent to the first position
/40-/4F are sent to the second position
/50-/5F are sent to the third position
/60-/6F are sent to the fourth position

The first position corresponds to the leftmost display tube on the indicator unit. Illegal character codes are ignored and bit 13 is set in the return code. If order /06 for PTS6241 is required, it must be specified during Monitor generation.

Order : /39 - flash lamps
Lights corresponding to '1' bits in the control word are lit once a second. Other lights are not altered. If order /39 is required, it must be specified during Monitor generation.

Output to PIN keyboard connected to BCR : The same order codes are used for the BCR lamp as given above, but the control word bits have a special meaning to the driver, as follows:

Control word bit

0	14	15
0	L2	L1

Input from PIN keyboard connected to BCR

If a PIN keyboard is connected to the BCR PTS6271, input from the BCR or the PIN keyboard is controlled via this driver. The setting of the indicator lamps determines from which device the input is read, as follows:

If the lamp is ON, input is from the PIN keyboard.
If the lamp is OFF, input is from the BCR.
If the lamp is flashing, input is from the PIN keyboard.

The tables below show how different codes in the control word are used to control the lamp functions.

Order /37 - set lamp on

L1	L2	Effect
0	0	No action
0	1	Lamp is turned on
1	0	Not valid
1	1	Flash Lamp

Order /38 - set lamp off

L1	L2	Effect
0	0	No action
0	1	If lamp on, turn lamp off If lamp flashing, not valid If lamp off, no action
1	0	If lamp on, no action If lamp flashing, turn lamp on If lamp off, no action
1	1	If lamp on, turn lamp off If lamp flashing, turn lamp off If lamp off, no action

Recovery at power on : At power on, all lamps are fed with the value that existed at power failure time. The information on the program display is also restored.

Note: If an attempt is made to send characters to a device that is not active (power off), the request is completed immediately with bit 15 set in the return code. Thus, to test a terminal line, order /37 or /38 with the control word set to 1 can be used.

DRDN01 — 2.5 NUMERIC DISPLAY — DRDN01

General information : This driver handles the numeric display indicator on the PTS6241. The display may be used as an ordinary output device, where numeric information is displayed from the user program. It may also be used as an echo device, to any keyboard operating under the general keyboard driver DRKB04.

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:
/06 - write numeric display
/31 - erase numeric display

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

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

		order	
bit	Meaning	/06	/31
0	Illegal request	x	x
13	Code check error	x	
15	Not operable	x	x

Control word : Not significant

Order : /31 - erase numeric display
The entire display is erased.

Order : /06 - write numeric display
Characters in the user buffer are sent to the display. Only numerics (/30-/39) and spaces (/3F) are accepted. All other codes are ignored and bit 13 is set in the return code.
Order /06 may be excluded during Monitor generation if the device is only to be used as an echo device.

Echo function : The numeric display may be attached to a keyboard as an echo device. Only numeric read should be used when an echo is wanted at the display.
All received numerics are echoed. Clear key (code /18 from the keyboard driver) erases the display. End of record key is echoed if it is a numeric digit. However the end of record key will not erase the display; this must be done by the application with order /31.

Recovery at power on : At power on the display is erased. If the old information is to be restored, it must be done by the application program.

Note: If an attempt is made to send information to a display that is not active (power off), the request is completed immediately with bit 15 set in the return code.

DRDU01 — 2.6 DISK DRIVER — DRDU01

General information:

This driver handles up to two disk drives PTS6875 or PTS6876 or one of each, connected to the CPU via MUX and CHDU on multiplex channel. The number and type of disk drives must be specified during Monitor generation.

Logically the cartridge disk and the fixed disk on one drive are independent of each other; however, only one disk can be operated at one time.
Each disk has its own file code. Recommended file codes are /F0 to /F3 for Fixed disk 1, Cartridge disk 1, Fixed disk 2 and Cartridge disk 2 respectively.
If one of the data management packages or File Management is requested during Monitor generation, these file codes are assigned automatically.

The logical sector length is always 256 bytes.
There are two software options, namely unpacked (A2)and packed (A3). These may both be present in the same configuration. Which version or versions are present in the system, must be specified during Monitor generation.

A2 provides lower average access times (but see below)whereas A3 makes more efficient use of the disk space. A3 makes use of an intermediate buffer during transfers unless both the number of the first sector to be transferred and the number of sectors involved are multiples of 3. In this case the use of the intermediate buffer is avoided, and access times would be less than for A2.

When using A3 for sequential processing, it is recommended that the multiple sector I/O feature be used, as this will also reduce the total access time.

The only time that the software type need be specified is when a disk is formatted. The information is stored in the Volume Label and in the Device Work Table (DWT) so that the system can access it whenever required.

Disk usage : Disk usage for the two software options:

DRIVER OPTION	A2	A3
Bytes per physical sector	258	386
Bytes per logical sector	256	256
Physical sectors/cylinder	32	32
Logical sectors/cylinder	32	48
PTS6875 (204 cyls) No. of logical sectors	6324	9792
PTS6875 Capacity	1,67Mb	2.51Mb
PTS6876 (408 cyls) No. of logical sectors	12648	19584
PTS6876 Capacity	3.34Mb	5.01Mb

DRDU01 — Continued — DRDU01

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

Buffer address : Not significant for order /1F.
The buffer address must be even.

Requested length : Not significant for order /1F.
Effective length : The length must be a multiple of 256, max. 65280.

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

		order in which bit is set					
bit	Meaning	/00	/01	/05	/11	/15	/1F
0	Illegal request	x	x	x	x	x	x
7	Retries performed		x	x	x	x	
10	New volume loaded	x	x	x	x	x	x
12	Incorrect length		x	x	x	x	
13	Data fault		x	x	x	x	
14	Throughput error		x	x	x	x	
15	Not operable	x	x	x	x	x	x

Bit 10, New Volume Loaded:

This bit is set after system restart, when the volume name read from the disk is different from the volume name that is already stored in the disk Device Work Table. No I/O is performed. The file must be closed, this is the only order that will be accepted. To access the file after that it must be opened again.
Bit 10 is only used for removable disks. It will not be set after sytem initialisation (IPL).

DRDU01 — Continued — DRDU01

Control word

Control word 1 must be set to zero. Control word 2 must contain the number of the first sector to be transferred. The control word is not significant for order /00.

Order :/00 - test status.

The status of the disk drive is checked and, if the drive is not operable, bit 15 is set in the return code. If the drive is operable, the volume name and disk versions of both disks on the drive are placed in the DWT. Only file code and return code are significant, unless requested length is set ot 6, in which case the Volume Name is transferred to the buffer specified in the ECB.

Order : /01 - basic read

One or more sectors are transferred from the disk to the user buffer.

Order : /05 - basic write

One or more sectors are transferred from the ECB buffer to the disk. No read-after-write check is carried out by the driver.

Order : /11 - physical read

One or more sectors are transferred from the disk to the user buffer. This order is identical to order /01.

Order : /15 - physical write

Before the requested sector N is written, the logical sector N-1 is read to check the cylinder identifier.
One or more sectors are tranferred from the applcation buffer to the disk.
After the sector is written, it is read back to check the CRC character, if read-after-write was requested during Monitor generation.

Order : /1F - format volume

This order is used by the Create Volume utility to transfer the parameter describing which software version is to be used, and to format one complete disk. The parameter is stored in Control word 1, and will be stored in the Volume Label of the disk, and in the disk DWT when the disk is first accessed. The parameter format is as follows: The left byte of the word is 2 or 3 corresponding to software options A2 and A3 described above. The rigth byte is 1 for PTS6875 disks, or 2 for PTS6876 disks.
On Toss-formated disks sector 0 can only be accessed before this parameter has been passed to the driver; this is for security purposes.
After this order is completed, the Create Volume utility goes on to format the sectors and check for badspots.

DRDU01 Continued DRDU01

Recovery at power on : The disk drive is automatically restarted at power on. However, some types of PTS6875 drive will remain inoperable until restarted manually.
After power on the drive is set busy for two minutes, until it becomes operable. During this time all requestes are queued. After two minutes the drive is freed, and any requests that were current at power off or are in the queue are repeated.
If there is a power failure affecting the computer and other devices than the disk drive, the request will be repeated with no timeout, as long as the drive remains fully operational.

DRDY02

2.7 VIDEO AND PLASMA DISPLAYS

DRDY02

General information : This driver handles output to Video Display PTS6342, PTS6344, PTS6346, to Plasma Displays PTS6351 or 6386, or to the alphanumeric display PTS6385.

The driver may be adapted to cater for only PTS6344, PTS 6346, PTS6385 or PTS6386 display being in the system; if required, this must be specified during Monitor generation. In addition, if a PTS6385 or 6386 is included in the system, it is possible to choose whether the cursor is a steady light or a blinking light. This option must be specified during Monitor generation.

If a PTS6385 is included, the country code required (for national characters) must be specified during Monitor generation.

The driver includes device dependent functions making it possible to use the display as an echo device to any keyboard running under the general keyboard driver DRKB04.

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:

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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
/0B - set cursor and write
/31 - erase

Buffer address :
Requested length :
Effective length :

Only significant for orders /05, /06 and /0B. For orders /06 and /0B the first word in the buffer is used for a control code. This word is included in the requested length. For order /05, the first word in the buffer is used for normal data.

DRDY02 Continued DRDY02

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

bit	Meaning	Order in which bit set /00	/05	/06	/0B	/31
0	Illegal request	x	x	x	x	x
13	Code check error			x	x	
14	Throughput error		x			
15	Not operable	x	x	x	x	x

Control word : For order /0B the control word must contain the cursor position with the line number in the left byte and the column number in the right byte. For order /31 it contains the number of characters to be erased as a binary value. At return from other requests it contains the new cursor position, with the line number in the left byte and the column number in the right byte. When the cursor has reached the end of the line, the cursor position is set to the value of the last position on the line + 1.
Note: If Basic Write has been used without being followed by a cursor setting, the returned value will always be /0101, independent of the real cursor position.

Order : /00 - test status
A dummy character is sent to the display and if power is not on the request is completed with bit 15 set in the return code.

DRDY02 Continued DRDY02

Order : /05 - basic write
The requested number of characters are sent to the display. Trailing spaces are suppressed if this is requested during Monitor generation.
If an LRC-error occurs (for remote connected displays) the request is completed with bit 14 set in the return code.
Note: The internal cursor position counter of the driver is not updated to the actual position of the cursor on the screen. Instead it is set to /0101 after each Basic Write, and that value is returned in the control word when the request is completed.
This means that for displays PTS6351 and 6342 the cursor must be sent to the home position 0101 using order code /0B before orders /06 or /0B are used again after Basic Write.
For displays PTS6344, 6385 and 6386 order /0B may be used directly since these displays use absolute cursor addressing.

Twenty-two characters have special meaning to the hardware, as follows:

/07 - Bell is sent to the display (Not PTS6385, 6386)
/08 - Cursor moves one position to the left without destroying the character (backspace).
/0A - Cursor down (line feed).
/0B - Cursor is sent to home position.
/0C - Screen is cleared and cursor sent to home position.
/0D - Carriage return is made.
/10 - Cursor moves one character to the right without destroying the character.
/11 - Set cursor address: this must be followed by two binary values specifying the cursor position required. The first value indicates the character position on the line (the column number) and the second indicates the linenumber (row-number). The first row or column is counted as zero. /20 must be added to the numbers for row and column, so for example, the tenth character position on the third line is indicated by the value /29 for the column, and /22 for the row.
This function is not available on PTS6342 and 6351.

/14 - Fast output: The specified character is displayed repeatedly in fast output mode, the specified number of times. The first byte following this code must indicate the number of times the character must be output. The second byte must contain the displayable character (range /20 - 7F). The number of times is specified as a binary value. /20 must be added to this number, so a fast output of 80 times the character is indicated by a value of /70. The cursor position will remain unchanged. This function is not available on PTS6342 and PTS6351.
20 - Cursor moves one position to the right and erases the character in that position.
/AE - Roomless point on the printer, will be displayed as an ordinary point.

The following special characters are only available for the PTS6344 an PTS6346 display:

/12 - Start underline: all output characters that follow this code will be underlined on the display, until a stop underline code is read.
/13 - Stop underlining: output characters that follow this code are not underlined on the display.
/1E - Low intensity: output of characters which follow this code is at low intensity, until a stop low intensity code is encountered.
/1F - Stop low intensity: all characters following are displayed at normal intensity.

The following special characters are only available for the PTS6351 display.

/11 - Set graphic mode: the display is set to graphic mode, and the following characters in the buffer are displayed accordingly.
/12 - Set alpha mode: The display is set to the alpha-numeric mode, and the following characters in the buffer are displayed accordingly.

The following special characters are only available for PTS6385 and PTS6386.

/0F - Test command
/15 - Switch cursor on
/16 - Switch cursor off
/17 - Start cursor blinking
/18 - Start cursor steady.

DRDY02 — Continued — DRDY02

Special character for PS6385 only:

/1B - Set country code.This character must be followed by one character in the range /31 - /39, to select the country code required, The numbers correspond to the different national character variations as shown in the list at the end of this driver description.

Special character for a keyboard which is connected directly to the display:

/1C - Data to keyboard.
Data following this character are addressed to the indicator lamps on the keyboard.

All special characters must be included in the requested length.

Order : /06 - standard write
The first word in the user buffer must contain a right-adjusted control character. It may contain any of the following:
/2B - The cursor is not moved before the text is displayed.
/30 - The cursor is sent to the leftmost position and advanced two lines before the text is displayed.
/31 - The display is erased and the cursor sent to the home position before the text is displayed.

Any other character in the control code, or a requested lenght of zero, causes the cursor to be sent to the left most position and advanced one line before the text is displayed. Trailing spaces are suppressed if so requested during Monitor generation.
All alphanumeric characters within the range /20-/5F are sent from the buffer to the display. Codes /60-/7F are reduced by /20, giving /40-/5F, unless lower case characters are requested during Monitor generation.

For PTS6344, 6346, 6385 and 6386 displays, a check is carried out by the drivers for a continuous string of at least six identical characters and if found, they are sent under fast output. This must be specified during Monitor generation.
In addition, eight special codes are recognised by the driver, and actions performed as follows:

/07 - Bell is sent to the display (Not PTS6385, 6386)
/11 - Tabulation character: this must be followed by two ISO-7 digits specifying the tabulation position required, on the same line. The code and the digits must be included in the requested length.

/14 - Fast output: the character following this code will be transmitted repeatedly in fast output mode up to the requested length. The cursor position will remain unchanged. Note that this function is simulated on PTS6342 and PTS6351 since the fast output hardware is not available on these displays.
/AE - Displayed as a point.

The following special characters are only available for the PTS6344 and 6346 display:

/12 - Start underline: all output characters that follow this code will be underlined on the display, until a stop underline code is read.
/13 - Stop underlining: output characters that follow this code are not underlined on the display. Underlining is also stopped automatically when the request is completed.
/1E - Low intensity: output of characters which follow this code is at low intensity, until a stop low intensity code is encountered.
/1F - Stop low intensity: all characters following are displayed at normal intensity. The stop low intensity is also automatically executed at the completion of the request.

All special characters must be included in the requested length. Illegal characters are ignored and when the request is completed, bit 13 is set in the return code.

If LRC error occurs for remote connected terminals, the message is automatically retransmitted by the driver. No indication is given in the return code.
At completion of the write request the actual cursor position is returned in the control word, with the line number in the left byte and the column number in the right byte.

Order : /0B - set cursor and write

By means of this order the cursor may be sent to any position on the screen before the text is displayed. Data already on the display is not erased.
The control word must contain two binary values, the one in the leftmost byte being the line number and that in the rightmost byte the column number at which the display is to start.
The cursor home position is /0101 for all displays.
The number of lines and characters per line for each display is as follows:

PTS6342 - 12 lines of 80 characters
PTS6344 - 20 lines of 64 characters or
24 lines of 80 characters (option)
PTS6346 - 20 lines of 64 characters or
24 lines of 80 characters (option)
PTS6351 - 8 lines of 36 characters
PTS6385 - 1 line of 40 characters
PTS6386 - 6 lines of 40 characters.

After the cursor is positioned, the text in the user buffer is displayed according to the rules described for order /06 Standard Write. The first word in the buffer is not significant, but must be included in the requested length. If the requested length is 0 or 2, the cursor is positioned, but no text is displayed.
After the request is completed, the new cursor position is returned in the ECB control word.

Order : /31 - erase

This order causes a given number of characters to be erased from one line of the display.
The erasure starts from the position of the cursor at the time the order is set up, and the cursor remains in that position.
For PTS6344, 6346, 6385 and 6386 this is done in fast output mode. The control word must contain the number of characters to be erased in binary form.
The maximum number of characters that can be erased is as follows:

PTS6342/4/6 - 80 or 64
PTS6351 - 36
PTS6385 - 40
PTS6386 - 40

DRDY02 — Continued — DRDY02

Echo function : The display may be attached to a keyboard as an echo device. All alphanumeric characters in the range /20 to /5F are echoed. Echo of end-of record key, if required, must be specified during Monitor generation.
Backspace key (/08 from the keyboard driver) will move the cursor one space to the left. The cursor cannot be moved further to the left than the position it was in before the read-with-echo request was set up. The character in the new cursor position is erased.
The clear key (/18 from the keyboard driver) will erase the information that has been echoed for the current read request, and the cursor is sent to the position it was in before the read-with-echo was set up.

Recovery at power on : If there is a request current when power fails, the request is completed with bit 15 set in the return code.
At power on the display is erased and the cursor sent to the home position. For PTS6385 and 6386, the cursor blink/steady is sent to the screen, depending on the setting at Monitor generation. For PTS6385 only, the country code defined during Monitor generation is sent to the display. Power on is also signalled to the application via the general keyboard driver DRKB04.
If a write request is issued for a display which has power off, or for which the selector unit has power off the request is completed with bit 15 set in the return code.

Country codes: If a PTS6385 is included in the system, the country code to be used (for national characters) must be specified during Monitor generation, as a one-digit numeric from the following list:

0 - GB/NL/B
1 - D/A/L/CH
2 - F/CH/B/L
3 - E
4 - I/CH
5 - S/SF
6 - DK/N
7 - P
8 - YU
9 - US

This will result in the correct national character being displayed, on submission of certain codes to the driver, as can be seen in the following table.

National character variations.

		Character code				
NCV	Countries	/23	/40	/5B	/5C	/5D
0	Great Britain, Netherlands, Belgium	£	@	[	\	]
1	Germany, Luxembourg, Austria, Switzerland	#	§	Ä	Ö	Ü
2	France, Switzerland, Belgium, Luxembourg(1)	£	à	°	ç	§
3	Spain, Argentina, Venezuela	£	@	[	Ñ	]
4	Italy, Switzerland	£	§	°	ç	É
5	Sweden, Finland	#	É	Ä	Ö	Å
6	Denmark, Norway(1)	£	@	Æ	Ø	Å
7	Portugal, Brazil	£	@	Ã	Ç	Õ
8	Yugoslavia	£	Ž	Ć	Č	Š
9	USA, Canada, Australia	#	@	[	\	]