

PTS

device drivers reference manual

M5A user library



Data
Systems

PHILIPS

PREFACE

This manual is one module in the complete set of documentation to support the PTS user. It contains the reference information on the I/O device drivers available on TOSS, for Assembler and CREDIT programmers.

The manual contains a detailed functional description of the drivers, and thus provides the CREDIT programmer with useful information. In addition, the calling sequence and the return codes are included, which are relevant for the Assembler programmer.

The interface of the drivers with a CREDIT application is described in module M4A, CREDIT Reference Manual. The general rules for the interface with an Assembler application are described in module M6H, Assembler Reference manual.

Other related documents are:

M15A Data Communication Drivers Reference manual, for a detailed description of the functions of the DC drivers.

M23A Disk File Handling manual, for general information on the different data management packages available on TOSS.

M21A and M22A PTS Programmers guide, for information on how to write applications in CREDIT.

For guidance on how to create a TOSS Monitor and configuration data for a specific installation, refer to module M12A, TOSS Monitor Generating and Configuration.

For instructions on how to use the DOS tools available for program development for PTS, refer to module M11A, DOS-PTS System Software Manual.

For a complete overview of the structure of the PTS documentation and training package, see the diagram overleaf.

PTS Training and Documentation package in learning sequence

CREDIT APPLICATION DEVELOPMENT

Training modules	Training manuals	Reference manuals
M100 Introduction	M2A Programmers Introduction	
M110 Elementary CREDIT	M21A Elementary CREDIT	M4A CREDIT M91A CREDIT Reference Card
M111 DOS-PTS		M11A DOS-PTS M90A PTS Reference Card
M112 Monitors and Configuration	M12A Monitor Generating & Configuration	M5A Device Drivers
M113 CREDIT Workstation handling	M22A CREDIT Workstation handling	(M4A CREDIT) (M91A CREDIT)
M114 Disk file handling	M23A Disk file handling (M21A Elementary CREDIT)	(M4A CREDIT) M8A TOSS Utilities (M90A PTS Reference Card)
A100 Introduction to Data Communication	A13 Introduction to Data Communication	
A101 Introduction to Networks		
M115 PTS Data Communication	M24A PTS Data Communication	(M4A CREDIT) M15A PTS Data Communication M19A IBM 3270 Simulator

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Chapter 1

INTRODUCTION

1.1 STRUCTURE OF THIS MANUAL

The manual is divided into two sections:

- Monitor Generating
- Configuration Data

The first section (Chapter 2) contains a description of the DOS-PTS Utility SYSGEN, which is used for the creating of a TOSS Nonitor, together with all the information needed to run the utility, and how to answer the various questions output by the utility.

The second section (Chapter 2) contains a description of the use of Configuration Data for PTS applications, and all the necessary information on how to create the data file to match the application configuration.

Chapter 2

DRIVER REFERENCE

I/O 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 micro-seconds.

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 I/O 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.

DRCDO1

Continued

DRCDO1

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 this way, 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: I/O and Activate:
 LDK A7,code LDKL A1,parameter
 LDKL A8,ecb-address LDK A7,code
 LKM LDKL A8,ecb-address
 DATA 1 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:

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	
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

I/O DRIVER REFERENCE

DRCD01

Continued

DRCD01

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.

I/O DRIVER REFERENCE

DRCD01

Continued

DRCD01

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. 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.

DNCD02

2.2 16Mb DISK

DNCD02

General 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:	I/O and Activate:
LDK A7,code	LDKL A1,parameter
LDKL A8,ecb-address	LDK A7,code
LKM	LDKL A8,ecb-address
DATA 1	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 retries or 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.

DRCDO2
-----Continued-----
DRCDO2

- 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.

DRCD02
-----Continued-----
DRCD02

- 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: I/O and Activate:
LDK A7,code LDKL A1,parameter
LDKL A8,ecb-address LDK A7,code
LKM LDKL A8,ecb-address
DATA 1 LKM
DATA -1
DATA start-address

Order code : The following order code may be used:
/02 - standard read

Buffer address : } All significant for order /02. The requested length
Requested length : } must be in the range 0 - 80. The effective length
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

DRCR01

Continued

DRCR01

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.

DRDI01

2.4 SIGNAL DISPLAYS AND LAMPS ON KEYBOARDS

DRDI01

General information : This driver handles output to Signal Displays PTS6241 and 6242, lamps on keyboards PTS6232, 6233, 6234, 6236, 6271, 6272, the FT90, 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: I/O and activate:
 LDK A7,code LDKL A1, parameter
 LDKL A8, ecb-address LDK A7, code
 LKM LDKL A8,ecb address
 DATA 1 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 : } Not significant
 Effective length :

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

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

DRDIO1

Continued

DRDIO1

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.

DRDI01

Continued

DRDI01

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

bit	0	1	2	3	4	5	6	7	8	9	10	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	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
	0											L				

Control word for PTS6292 Customer Display:

bit	0	1	2	3	4	5	6	7	8	9	10	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	1	2	3	4	5	6	7	8	9	10	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

DRDI01

Continued

DRDI01

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

I/O DRIVER REFERENCE

DRDI01

Continued

DRDI01

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.

DRDNO1

2.5 NUMERIC DISPLAY

DRDNO1

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:	I/O and Activate:
	:	LDK A7,code	LDKL A1,parameter
	:	LDKL A8,ecb-address	LDK A7,code
	:	LKM	LDKL A8,ecb-address
	:	DATA 1	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	:	} Only significant for order /06.
Requested length	:	
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.

DRDN01

Continued

DRDN01

- 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.

I/O DRIVER REFERENCE

DRDU01

Continued

DRDU01

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

I/O DRIVER REFERENCE

DRDU01

Continued

DRDU01

Calling sequence : Normal I/O: I/O and Activate:
 LDK A7,code LDKL A1, parameter
 LDKL A8, ecb-address LDK A7, code
 LKM LDKL A8,ecb-address
 DATA 1 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 system 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 at 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 transferred from the application 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 right byte is 1 for PTS6875 disks, or 2 for PTS6876 disks.
 On Toss-formatted 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.

I/O DRIVER REFERENCE

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

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.

DRDY02
-----Continued-----
DRDY02

- /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 and 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 length 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.

DRDY02
-----Continued-----
DRDY02

- /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.

DDRY02

Continued

DDRY02

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.

DRDY02

Continued

DRDY02

National character variations.

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

DRFD01

2.8 FLEXIBLE DISK

DRFD01

General description : This driver handles up to two daisy chained flexible disk drives PTS6879, connected to the CPU via channel unit CHFD on programmed channel.

It is possible to adapt the driver to handle drives on the CHFD on the multiplex channel instead of the programmed channel. If required, this must be specified during Monitor generation.

If a Memory Management Unit is included in the system, an MMU buffer is automatically included in the driver, the size being specified during Monitor generation. Logically the drives are independent of each other; however, physically, only one drive can be operated at a time, and each disk has its own file code.

Recommended file codes are /F8, /F9, /FA and /FB. These are assigned automatically if File Management or one of the data management packages is requested during Monitor generation.

On the physical level, the flexible disk should be preformatted to be compatible with IBM 3740. Data is stored per sector with 128 bytes in each sector. Each disk has 26 sectors per track, and a total number of 77 tracks, thus giving a total number of 2002 sectors per disk and a capacity of 0,25 Mbyte.

Because the driver can handle multiple-sector I/O, it is possible to read and write more than one sector with a single LKM request. The Sequential Read and Write orders (/O2 and /O6) however, transfer only one sector at a time.

In the driver description, three abbreviations are used: Standard - refers to unlabelled disks when the standard version of the driver is used.

TOSS - refers to TOSS-labelled disks.

IBM - refers to IBM-labelled disks when the IBM handling version of the driver is used.

The version of the driver to be used must be specified during Monitor generation, and may be one of the following:

Standard, TOSS, IBM, IBM and TOSS.

Three different types of disks are handled by the driver :

Unlabelled, TOSS-labelled, and IBM-labelled.

Unlabelled disks :

When reading/writing a sector, each sector is given a standard logical sector number in the range 0 - 2001.

DRFD01

Continued

DRFD01
-----TOSS-labelled disks :

When reading/writing a sector each sector is given a TOSS logical sector number in the range 0 - 1000. Two consecutive physical sectors are combined into one logical sector of 256 characters. Thus, to convert a TOSS logical sector number to a standard sector number, the former should be multiplied by 2.

IBM-labelled disks :

The driver provides means for sequential access to datasets on IBM-labelled disks. An IBM-labelled disk may contain up to 19 datasets. Each dataset has its own unique dataset label on one of the physical sectors 08-26 on track 00, corresponding to standard logical sectors 7-25.

It is the users responsibility to provide index track 00 with sufficient data, before using the disk. Using the TOSS utility Write IBM Labels (WIL), it is possible to initialize track 00 and create datasets.

Before a dataset is sequentially accessed, it must be opened by a Load request. At this request the user must select the dataset to be opened by specifying the dataset label sector. Only one dataset per drive can be opened simultaneously.

The data fields of the IBM-labelled disk that affect the driver are:

- Volume ID-field
- Beginning of extent (BOE) of specified dataset label
- End of Data (EOD) of the specified dataset label
- End of extent (EOE) of the specified dataset label.

The driver can only affect the EOD-field of the disk. Direct access to an IBM-labelled disk is also supported by this driver. Each sector is given a standard logical sector number, in the range 0 - 1923. All data on the IBM-labelled disks should be EBCDIC code and will be converted to ISO-7 by the driver.

Note: At Sequential Read/Write requests, no data in the dataset label on disk is affected. However, the CRN or EOD in the driver is updated. Direct Access does not affect these items.

I/O DRIVER REFERENCE

DRFD01

Continued

DRFD01

Calling sequence : Normal I/O: I/O and activate:
LDK A7,code LDKL A1,parameter
LDKL A8,ecb-address LDK A7,code
LKM LDKL A8,ecb-address
DATA ! LKM
DATA -1
DATA start-address

Order codes : The following order codes may be used:
/00 - test status
/01 - basic read
/02 - sequential read
/05 - basic write
/06 - sequential write
/11 - physical read
/15 - physical write
/1F - format volume
/21 - open
/22 - close
/24 - write deleted data
/26 - lock
/31 - rewind
/37 - load
/38 - unload

Buffer address : Only significant for orders /00, /01, /02, /05, /06,
/11, /15, /24. The buffer address must be even.

Requested length : When writing to the disk, the requested length should
Effective length : be as follows:
Standard - (n x 128) where n = 1-511
TOSS - (n x 256) where n = 1-255
IBM - (n x 128) where n = 1-511

Control word : Control word 2 must contain the logical number of the
(first) sector to be read /written. For order /37,
control word 1 must contain the data set number.

DRFD01

Continued

DRFD01

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

bit	Meaning	Orders in which bit set															
		/00	/01	/02	/05	/06	/11	/15	/1F	/24	/26	/31	/37	/38			
0	Illegal request	x	x	y	x	y	x	x		x	x	y	x	x			
2	End of extend (IBM)					y											
3	End of data (IBM)			y													
4	No data		x	y			x						y				
5	IBM label	y									y		y				
6	Write protected (status or warning)	x			x	y		x	z	x				y			
7	Retries performed		x	y	x	y	x	x	z	x	x		x	y			
9	Write protected (error)				x	y		x	z	x							
10	New volume loaded	z	z	z	z	z	z	z	z	z				y			
11	Illegal data set label												y				
12	Incorrect length		x	y		y	x	x		x							
13	Data error (CRC)		x	y		y	x	x		x	x		x	y			
14	Seek error		x	y	x	y	x	x	z	x	x		x	y			
15	Not operable	x	x	y	x	y	x	x	z	x	x	y	x	x			

Note: x = Standard/TOSS/IBM,

y = IBM

z = TOSS & IBM

An explanation of the bit meanings is given below:

Bit 0: Illegal request - illegal order, file code or sector number

Bit 2: End of extent (IBM) - set if an attempt is made to write outside the physical space reserved for the dataset at creation time.

Bit 3: End of data (IBM) - set if a record with a number equal to or greater than the EOD is addressed.

DRFD01

Continued

DRFD01

- Bit 4: No data - set if any of the sectors has a Deleted Address mark set. Bit 13 is also set.
- Bit 5: IBM label - set if the disk is not TOSS-labelled. Only significant if the TOSS & IBM version of the driver is used.
- Bit 6: Write protected - set if the flexible disk does not have a write-enable marker on it.
- Bit 7: Retries performed - set if retries have been performed by the driver due to CRC or seek errors.
- Bit 9: Write protected - set after Write orders, together with bit 6, if the flexible disk has no 'write-enable' marker.
- Bit 10: New Volume Loaded - 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 11: Illegal data set label(IBM) - set if the BOE/EOD/EOE fields can not be transformed into approved logical sector numbers.
- Bit 14: Seek error - set if the requested track is not found after recovery has been performed.
- Bit 15: Not operable - drive is not in operable state.

Order : /00 - test status
 The addressed drive is selected and its status checked. Additionally for TOSS/IBM version of driver:
 If the disk is operable, the Volume Name is stored in the Flexible Disk DWT. If the disk is not operable, the request is completed with bit 15 set in the return code. If the requested length is 6, the volume name is transferred to the buffer specified in the ECB.

Order : /01, /11 - Basic and physical read.
 Control word 2 must contain the sector number of the first sector to be read. Control word 1 must be zero. One or more sectors are transferred from the disk to the buffer specified in the ECB.

DRFD01

Continued

DRFD01

- Order : /02 - sequential read
This order only applies to IBM-labelled disks.
The CRN is incremented by one, and the record now pointed to is read into the buffer specified in the ECB. The requested length is not significant, 128 bytes are always transferred. Control word 2 will be set by the driver with the standard logical sector number of the addressed sector.
This request is only accepted if the corresponding data-set has been opened with an order /37 - Load.
If a request error occurs, or the disk is not operable, the CRN will be unchanged.
- Order : /05 - basic write
One or more sectors are transferred from the buffer to the disk. No read-after-write checking is carried out.
- Order : /06 - sequential write
This order only applies to IBM-labelled disks.
One sector is written from the user buffer to the sector pointed to by the corresponding EOD number in the driver. The EOD number is incremented by one.
The requested length is not significant, since 128 bytes are always transferred. If an attempt is made to address a sector after EOE, the request is completed with bit 2 set in the return code. This order is only accepted if the corresponding data set has been opened with an order /37 - Load. If a request error occurs, or the disk drive is not operable, the EOD number will not be incremented.
- Order : /15 physical write
One or more sectors are transferred from the buffer to the disk. Read-after-write checking is carried out.
- Order : /1F - format volume
The volume will be formatted. To obtain a TOSS format, the ECB control word 1 must contain 0. The driver will write a "dummy" volume label on sector 0. To obtain IBM format, the ECB control word 1 must be set to 1. The driver will write a "dummy" volume label on sector 6.
- Order : /21 - open
The power is turned on to flexible disk drive unit.
There is then a delay of 1 second to allow the drives to become operable. There is only one power relay, so when this order is given to one of the units, power is turned on for all drives.
No check is made on the open/closed status of the drives and the order is accepted and the time delay performed, even if the drives are already open.
This order is only to be used for service purposes, and can be included during Monitor generation.

DRFD01

Continued

DRFD01

Order : /22 - close
The power is turned off from the flexible disk drive units. When this order is issued for one unit, power is turned off from all the drives. No check is made on the open/closed status of the drives and the order is accepted even if the drives are already closed. This order is only to be used for service purposes, and can be included during Monitor generation.

Order : /24 - write deleted data
See order /15, Physical Write for details. The only difference between orders /15 and /24 is that the sectors written by order /24 are preceded by a Deleted Data Address mark.

Order : /26 - lock
The driver locks the door of the selected device. In the case of an error at this request the door will be unlocked at return. If the door is already locked, no action is taken and the request is completed with a return code of zero (no bits set.)

Order : /31 - rewind
This order only applies to IBM-labelled disks. The EOD number of the selected drive is set equal to the BOE number. The CRN is set equal to the BOE number minus one.
This order is only accepted if the corresponding data set has been opened with an order /37 - load.

Order : /37 - load
The driver locks the door of the selected drive. The volume name is read and stored in the Monitor. If an error occurs, the door will be unlocked before the return.

For IBM labelled flexible disks this order must be successfully completed before any other request for the same disk can be executed. Control word 1 must contain the standard logical sector number of the data set label, i.e. a number in the range 7 - 25 for format 128-1.

After the driver has taken the actions described above, the BOE, EOD and EOE fields of the specified data set label are read from the disk. The contents of these fields are converted to standard logical sector numbers and are saved in the driver. If any of these numbers is illegal after conversion, the drive is unlocked and the request completed with bit 11 set in the return code. The CRN is set equal to the BOE number minus one.

DRFD01

Continued

DRFD01

Note: If the TOSS & IBM version of the driver is used, the driver checks if the disk is TOSS-labelled. If the disk is TOSS-labelled, positions 32 - 35 on sector 0 must contain "TOSS" in ISO-7 characters. The disk is IBM labelled if sector 7 positions 1 - 4 contain "VOL1" in EBCDIC characters. If neither label is present, the disk is treated as a TOSS disk.

Order

: /38 - unload

The door of the selected drive is unlocked.

IBM: Before unlocking, the driver checks whether any dataset was opened on this drive. If so, the EOD field of the dataset label is updated to the last sector number addressed by a sequential write, + 1.

Recovery at
power on

: All doors locked at the time of a power failure, will be locked during power off and after power on. The master clear signal given at power on or from the panel will set the drives to Open. At power on, the recovery routines will set the drives to the same status as they had before the power off.

If there was a request current at the time of the power failure, the driver will repeat this request. If it is unsuccessful, the request will be completed with bits set in the return code indicating the error.

DRFD02

2.9 FLEXIBLE DISK

DRFD02

General description : This driver handles up to two daisy chained flexible disk drives PTS6879, PTS6791 or PTS8862, connected to the CPU via channel unit CHFD on multiplex channel. It is not possible to have different types of flexible disk drives in one daisy chain. For PTS6805, only one or two flexible disk drives can be included in the configuration.

Logically the drives are independent of each other; however, physically, only one drive can be operated at a time, and each disk has its own file code.

Recommended file codes are /F8, /F9, /FA and /FB, and these are assigned automatically if one of the data management packages, or File Management is included during Monitor generation.

On the physical level, the flexible disk must be preformatted to be compatible with IBM 128-1 (single sided, single density) or IBM 256-2D (double sided, double density).

IBM 128-1:

Data is stored per sector with 128 bytes in each sector. Each disk has 26 sectors per track, and a total number of 77 tracks, thus giving a total number of 2002 sectors per disk and a capacity of 0,25 Mbyte.

IBM 256-2D:

Data is stored per sector with 256 bytes in each sector. Only sectors 0 - 25 contain 128 bytes per sector. Each disk has 26 sectors per track, 2 tracks per cylinder, and a total number of 77 cylinders, thus giving a total number of 4004 sectors per disk and a capacity of 1 Mbyte.

Because the driver can handle multiple-sector I/O, it is possible to read and write more than one sector with a single LKM request. The Sequential Read and Write orders (/02 and /06) however, transfer only one sector at a time.

In the driver description, the following abbreviations are used:

TOSS - refers to TOSS-labelled disks.
IBM - refers to IBM-labelled disks, when the IBM handling version of the driver is used.

DRPD02

Continued

DRFD02

One of three versions of the driver can be selected during Monitor generation:
TOSS-labelled disk handling
IBM-labelled disk handling
TOSS- and IBM-labelled disk handling.

Two different types of disks are handled by the driver :
TOSS-labelled, and IBM-labelled.

TOSS-labelled disks:

When reading/writing a sector, each sector is given a TOSS logical sector number in the range 0 - 1000 for format 128-1 and from 0 to 3990 for format 256-2D. In format 128-1, two consecutive physical sectors are combined into one logical sector of 256 bytes. Thus, to convert a TOSS logical sector number to a standard (physical) sector number for this format, the former should be multiplied by 2.

IBM-labelled disks:

The driver permits sequential access to datasets on IBM-labelled disks. An IBM-labelled 128-1 disk may contain up to 19 datasets. Each dataset has its own unique dataset label on one of the physical sectors 08-26 on track 00, corresponding to standard logical sectors 7-25.

An IBM-labelled disk with format 256-2D may contain up to 71 datasets. Each dataset has a unique dataset label on one of the physical sectors 18-26 on cylinder 00 head 0, and on sectors 1-26 on cylinder 00 head 1 (these are the logical sectors 7 - 51). Thus, cylinder zero is completely reserved for the dataset labels.

It is the users responsibility to provide index cylinder 00 with sufficient data, before using the disk. Using the TOSS utility Write IBM Labels (WIL), it is possible to initialize cylinder 00 and create datasets.

Before a dataset is sequentially accessed, it must be opened by a Load request. At this request the user must select the dataset to be opened by specifying the dataset-label number. Only one dataset per drive can be opened simultaneously.

DRFD02

Continued

DRFD02

The data fields of the IBM-labelled disk that affect the driver are:

- Volume ID-field
- Surface indicator
- Physical record length indicator
- Physical record sequence code
- Beginning of extent (BOE) of specified dataset label
- End of Data (EOD) of the specified dataset label
- End of extent (EOE) of the specified dataset label.

The driver can only affect the EOD-field of the disk. Direct access to an IBM-labelled disk is also supported by the driver. Each sector is given a standard logical sector number, in the range 0 - 1923 for 128-1 format, or 0 - 3899 for 256-2D format, by which it can be addressed.

All data on the IBM-labelled disks should be EBCDIC code and will be converted to ISO-7 by the driver.

Note: At sequential read/write requests, no data in the dataset label on disk is affected. However, the CRN or EOD in the driver is updated. Direct access does not affect these items.

Calling sequence	: Normal I/O:	I/O and activate:
	LDK A7,code	LDKL A1,parameter
	LDKL A8,ecb-address	LDK A7,code
	LKM	LDKL A8,ecb-address
	DATA 1	LKM
		DATA -1
		DATA start-address

Order codes : The following order codes may be used:

- /00 - test status
- /01 - basic read
- /02 - sequential read
- /05 - basic write
- /06 - sequential write
- /11 - physical read
- /15 - physical write
- /1F - format volume
- /24 - write deleted data
- /26 - lock
- /31 - rewind
- /37 - load
- /38 - unload

Buffer address : Only significant for orders /00, /01, /02, /05, /06, /11, /15, /24. The buffer address must be even.

DRFD02

Continued

DRFD02

Requested length : When writing to the disk, the requested length should
 Effective length : be a multiple of the logical sector length, as follows:
 TOSS : (n x 256) where n = 1-255
 IBM(128-1) : (n x 128) where n = 1-511
 IBM(256-2D) : (n x 256) where n = 1-255
 (sectors 26 - 3899)
 IBM(256-2D) : (n x 128) where n = 1- 26
 (sectors 0 - 25)

Control word : Control word 2 must contain the number of the (first)
 sector to be read /written. Control word 1 must be set
 to zero. For order /37, Control Word 1 must contain the
 dataset number.

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

		Orders in which bit set													
bit	Meaning	/00	/01	/02	/05	/06	/11	/15	/1F	/24	/26	/31	/37	/38	
0	Illegal request	x	x	y	x	y	x	x	x	x	x	y	x	x	
2	End of extend (IBM)					y									
3	End of data (IBM)			y											
4	No data/format	x	x	y			x						y		
5	IBM label	y									x		y		
6	Write protected (status or warning)	x			x	y		x	x	x				y	
7	Retries performed		x	y	x	y	x	x	x	x	x		x	y	
9	Write protected (error)				x	y		x	x	x	x				
10	New volume loaded	x	x	x	x	x	x	x	x	x					
11	Illegal data set label												y		
12	Incorrect length		x	y	x	y	x	x		x					
13	CRC error		x	y		y	x	x		x	x		x	y	
14	Seek error		x	y	x	y	x	x	x	x	x		x	y	
15	Not operable	x	x	y	x	y	x	x	x	x	x	y	x	x	

Note: x = TOSS and IBM, y = IBM

DRFD02

Continued

DRFD02

An explanation of the bit meanings is given below:

- Bit 0: Illegal request - illegal order, file code or sector number
- Bit 2: End of extent (IBM) - set if a Sequential Write order addresses a sector outside the physical space reserved for the data set at creation time.
- Bit 3: End of data (IBM) - set if a record with a number equal to or greater than the EOD is addressed by Read Sequential.
- Bit 4: No data - set if any of the sectors read has a 'Deleted Address' mark set.
For the order /00, Test Status, this bit indicates the disk format:
0 = format 128-1
1 = format 256-2D
- Bit 5: IBM label - set if the disk is IBM-labelled. Only significant if the TOSS & IBM version of the driver is used.
- Bit 6: Write protected - set if the flexible disk does not have a write-enable marker on it.
- Bit 7: Retries performed - set if retries have been performed by the driver due to CRC or seek errors.
- Bit 9: Write protected - set after Write orders, together with bit 6 if the flexible disk has no 'write-enable' marker.
- Bit 10: New Volume Loaded - 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 11: Illegal dataset label(IBM) - set if the BOE/EOD/EOE fields can not be transformed into legal logical sector numbers.
- Bit 14: Seek error - set if the requested track is not found after recovery has been performed.
- Bit 15: Not operable - drive is not in operable state.

Order

: /00 - test status

The addressed drive is selected and its status checked. If the disk is operable, the Volume Name is stored in the Flexible Disk DWT. If the disk is not operable, the request is completed with bit 15 set in the return code. If the requested length is 6, the volume name is transferred to the buffer specified in the ECB.

For this order, bit 4 in the return code has a different meaning and indicates the format of the disk:
0 = format 128-1
1 = format 256-2D

DRFD02

Continued

DRFD02

Order : /01, /11 - Basic and physical read.
Control word 2 must contain the sector number of the first sector to be read. Control word 1 must be zero. One or more sectors are transferred from the disk to the user buffer.

Order : /02 - sequential read
This order only applies to IBM-labelled disks. The CRN is incremented by one, and the record now pointed to is read into the user buffer. The requested length is not significant, 128 bytes for format 128-1, or 256 bytes for format 256-2D, are always transferred. Control word 2 will be set by the driver with the standard logical sector number of the addressed sector.
This request is only accepted, if the corresponding data set has been opened with an order /37 - load. If a request error occurs, or the disk is not operable, the CRN will be unchanged.

Order : /05 - basic write
One or more sectors are transferred from the buffer to the disk. No read after write checking is carried out.

Order : /06 - sequential write
This order only applies to IBM-labelled disks. One sector is written from the user buffer to the sector pointed to by the corresponding EOD number in the driver. The EOD number is incremented by one. The requested length is not significant, since 128 or 256 bytes are always transferred. If an attempt is made to address a sector after EOE, the request is completed with bit 2 set in the return code. This order is only accepted if the corresponding data set has been opened with an order /37 - load. If a request error occurs, or the disk drive is not operable, the EOD number will not be incremented.
The standard logical sector number of the addressed sector will be set in control word 2, by the driver.

Order : /15 physical write
One or more sectors are transferred from the buffer to the disk. Read-after-write checking is carried out.

Order : /1F - format volume
The volume will be formatted,. To obtain a TOSS format, the ECB control word must contain 0. The driver will write a volume label on sector 0. To obtain IBM format, the ECB control word must be set to 1. The driver will write a volume label on sector 6.

DRFD02

Continued

DRFD02

- Order : /24 - write deleted data
See order /15, Physical Write for details. The only difference between order /15 and /24 is that the sectors written by order/24 are preceded by a Deleted Data Address mark.
- Order : /26 - lock
The driver locks the door of the selected device. In the case of an error at this request the door will be unlocked at return. If the drive is already locked, no action is taken and the request is completed with a return code of zero, no bits set.
- Order : /31 - rewind
This order only applies to IBM-labelled disks. The EOD number of the selected drive is set equal to the BOE number. The CRN is set equal to the BOE number minus one.
This order is only accepted if the corresponding data set has been opened with an order /37 - load.
- Order : /37 - load
The driver locks the door of the selected drive. This order must be successfully completed before any other request for the same disk can be executed. If an error occurs, the door will be unlocked before the return. The volume name is read and stored in the Monitor. Control word 1 must contain the dataset label number, i.e. a number in the range 7 - 25 for format 128-1 or 7 - 77 for format 256-2D.

After the driver has taken the actions described above, the BOE, EOD and EGE fields of the specified data set label are read from the disk. The contents of these fields are converted to standard logical sector numbers and are saved in the driver. If any of these numbers is illegal after conversion, the drive is unlocked and the request completed with bit 11 set in the return code. The CRN is set equal to the BOE number minus one.

Note: If the TOSS & IBM version of the driver is used, the driver checks if the disk is TOSS-labelled. If the disk is TOSS-labelled, positions 32 - 35 on sector 0 must contain "TOSS" in ISO-7 characters. The disk is IBM labelled if sector 7 positions 1 - 4 contain "VOLL" in EBCDIC characters. If neither label is present, the disk is treated as a TOSS disk.

DRFD02

Continued

DRFD02

Order

:/38 - unload

The door of the selected drive is unlocked.

IBM: Before unlocking, the driver checks whether any dataset was opened on this drive. If so, the EOD field of the dataset label is updated to the last sector number addressed by a sequential write, + 1.

Recovery at
power on

: All doors locked at the time of a power failure, will be locked during power off and after power on. The master clear signal given at power on or from the panel will set the drives to open. At power on, the recovery routines will set the drives to the same status as they had before the power off.

If there was a request current at the time of the power failure, the driver will repeat this request. If it is unsuccessful, the request will be completed with bits set in the return code to indicate the error.

DRGPO1
-----2.10 GENERAL TERMINAL PRINTER-----
DRGPO1

General information : This driver handles the General Terminal Printer
PTS6321.

The driver includes a device-dependent echo function, which makes it possible to use the printer as an echo device for any keyboard that runs 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:	I/O and Activate:
		LDK A7,code	LDKL A1,parameter
		LDKL A8,ecb-address	LDK A7,code
		LKM	LDKL A8,ecb-address
		DATA 1	LKM
			DATA -1
			DATA start-address

Order code : The following order codes may be used:

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

Buffer address	:	} Only significant for orders /05 and /06. For order /05 the first word in the buffer is used for normal output data. For order /06 the first word must be reserved for a control code, and this word must be included in the requested length.
Requested length	:	
Effective length	:	

I/O DRIVER REFERENCE

DRGP01

Continued

DRGP01

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

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

Control word : Not significant.

Order : /00 - test status
A dummy character is sent to the printer. If time out is signalled by the channel, bit 15 is set in the return code (power off on selector unit).

Order : /05 - basic write
The requested number of characters are sent to the printer without any check. Trailing spaces are suppressed if this is requested during Monitor generation.

Order : /06 - standard write
The first word in the buffer is reserved for control information. It may contain one of the following codes in the rightmost byte:
/28 : Print the line without advancing the paper.
The print head is not moved before the text is printed.
/30 : Advance the paper two lines before printing and perform carriage return.

Any other code will cause carriage return and line feed before the text is printed. All alphanumeric characters in the range /20 - /5F, in the user buffer, are sent to the printer. Codes /60-/7F are reduced by /20, giving /40-/5F.

DRGPO1

Continued

DRGPO1

The standard codes for roomless point digits are /21, /22, /23, /24, /3B, /3C, /3E, /40, /5E, and /5F for 0, 1, 2, ..., 9. Non-standard codes for roomless point digits may be specified during Monitor generation. The following special characters may appear in the data to control the output printing:

- /AE The point is printed as roomless; that is, the digit following /AE is converted and printed as a roomless point digit (point placed to the left of the digit). If roomless point must be excluded from the driver, this must be specified during Monitor generation. It will then be printed as a point.
- /13 This code is sent directly to the printer. By hardware, this causes a special character to be printed.
- /14 as /13 above.
If special characters /13 and /14 are to be included, they must be specified during Monitor generation.
- /11 Tabulation character; this character must be followed by two ISO-7 digits, giving the tabulation position on the current line.
- /09 Hardware tabulation
Note :Hardware tabulation will reset the head position counter in the driver, and this may cause text to be overwritten when recovering from power failure.

Special characters and tabulation characters must be included in the requested length. Illegal characters in the buffer are ignored, and the request is completed with bit 13 set in the return code. Trailing spaces are suppressed in the printout if this is requested during Monitor generation.

Echo function

: The printer may be attached to a keyboard as an echo device. All characters in the range /20 - /5F are echoed. Each character is echoed together with a space to get visibility of the last character printed, if requested during Monitor generation. End of record character is echoed if it is in the range /20 - /5F for standard read or /30 - /39 for numeric read. If this is required it must be specified during Monitor generation. Backspace key (code /08 from the keyboard driver) is echoed with code 20 (-). After Clear the paper is advanced one line and the print head is sent to the position it was in before the read-with-echo request was set up. Head positioning is carried out with backspace.

I/O DRIVER REFERENCE

DRGP01

Continued

DRGP01

Recovery at
power on

: At power up the following actions are taken:
If the order is /06, the print head is sent to the
position it was in before the write request, and the
line is printed.
If the order is /05, the request is completed with bit
14 set in the return code.
If the printer is in echo mode, no action is taken.

DRGPO2

2.11 GENERAL TERMINAL PRINTER

DRGPO2

General information : This driver handles the PTS8081 printer, connected to the CPU via V-24 interface cards ASCU2 or SALCU2. The printer contains two print stations, one for continuous stationery, and one (optional) for printing documents. If the document station is used, it must be specified during Monitor generation. The two stations are logically two devices, each with its own file code. The recommended file codes are /30 for the line printer and /32 for the document station.

The document station can print on documents of widths between 148mm to 305mm maximum, and form height of 148mm to 330mm maximum.

The line printer can handle continuous stationery with a width between 100 and 375mm. Up to 5 copies can be produced simultaneously, with width 148 to 297 mm and height between 51 mm. and 305 mm.

It is not possible to print more than one line with each request.

Calling sequence	:	Normal I/O:	I/O and Activate:
		LDK A7,code	LDKL A1,parameter
		LDKL A8,ecb-address	LDK A7,code
		LKM	LDKL A8,ecb-address
		DATA 1	LKM
			DATA -1
			DATA start-address

Order codes : The following order codes may be used:

- /00 - test status
- /06 - write
- /0B - position document
- /24 - set printer parameters
- /38 - release document

DRGP02

Continued

DRGP02

```

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

```

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

		Order				
		/00	/06	/0B	/24	/38
bit	Meaning					
0	Request error		x	x	x	x
2	End of paper/document out	x	x	x	1	
13	Code check error		x			
15	Printer not operable	x	x	x		

Control word : Only significant for orders /0B and /24, containing the line number for order /0B and the parameters for order /24

Order : /00 - test status
This order may be used to test the status of either of the two print stations, and the return code shows the status on completion of the request.

Order : /06 - write
If using the document station, the document must have been positioned using order /0B before this order is accepted. Else, bit 0 will be set in the return code.

This order results in the printing of one line on either the continuous stationery or the document station. The first word in the buffer must contain a control character in the righthand byte, while the contents of the left byte is irrelevant. The control characters are:

- /2B ~ print the line without advancing the paper.
Printing starts from the position following the last printed position on the line.
- /30 ~ advance the paper two lines before printing.
- /31 ~ skip to top of form or print on top line of document.

DRGP02

Continued

DRGP02

Any other value in the control code will result in one line feed being made before the line is printed. The requested length must include these two bytes. If the requested length contained in the ECB is set to 2, only the action specified by the control character is carried out.

Control code /31 makes it possible to print on the document station without previous positioning of a document. In this case the driver will wait till a document is inserted in the document station, before completing the request.

All alphanumeric characters in the range /20-/7E are accepted and sent to the printer.

If an illegal character (/7F-/FF, except /AE) is detected in the buffer, it is ignored, and the request is completed with bit 13 set in the return code.

The character /AE (roomless point) is converted to /2E (point) and printed as a point.

If the end-of-paper condition is detected, the request is completed with bit 2 set in the return code.

The request is completed with bit 15 set in the return code (not operable), if any of the following conditions exist:

- The printer is switched off.
- The cover is open.
- The single line or top of form key is pressed.
- A form is inserted illegally in the front gate.
- The request specifies the document station, and the document station does not exist in the device.

Order

: /OB - position document

This order must be issued to the document station, to position the document, before any printing may take place. The control word must contain the line number in binary form. The top line is counted as line number 1.

The lower edge of the last line on the document is 48,5mm from the bottom of the document. If no document is in the station, the driver will wait till a document is inserted before completing the request. The request is completed with bit 15 (not operable) set in the return code, if any of the following conditions exist:

- The printer is switched off.
- The cover is open.
- The single line or top of form key is pressed.
- A form is inserted illegally in the front gate.
- The request specifies the document station, and the document station does not exist in the device.

DRGP02

Continued

DRGP02

Order

: /24 - set printer parameters

When the device addressed by Write orders changes from the document station to the station for continuous forms and vice versa, and the parameters for one of the devices have been changed by order /24, this order must be issued again to set the parameters for the addressed device to the correct values before printing is started. This order makes it possible to change one or both of the following parameters:

- The number of lines between form feed on the continuous stationery device, or the number of lines on a document.
- The National Character variation.

Number of lines:

Bits 0-7 of the control word must contain a value in the range /01 - /10, to specify the index to the selected number of lines according to the following table:

Index	Document station Number of lines	Line printer Page length (inches)
1	12	2
2	15	2 1/2
3	18	3
4	24	4
5	25	4 1/6
6	30	5
7	33	5 1/2
8	35	5 5/6
9	36	6
/A	48	8
/B	50	8 2/6
/C	51	8 1/2
/D	60	10
/E	66	11
/F	70	11 4/6
/10	72	12

The line spacing is 1/6 inch.

Page length on the line printer is the distance between two form feeds.

National character variation:

Bits 8-15 of the control word must contain a binary value indicating the selected national character variation according to the table at the end of this driver description.

DRGP02

Continued

DRGP02

Order /38 : Release document
This order is used to release the document when the printing is finished. If no document is in the station, no action is taken and the request is completed with no bits set in the return code.

Recovery at power on : After power up on the computer, the document is positioned to the current position and any requests that were current or in the queue are repeated.

Monitor generation parameters : The following parameters may be specified during Monitor generation:

- If a document station is included - default: no document station.
- Page length on the printer. Only the values specified in the table for order /24 - set parameters - are allowed. Default 48 lines.
- Number of lines on document. Only the values specified in the table for order /24 - set parameters - are allowed. Default 36 lines.
- National character set - specified as a value 1 through 15, according to the following list: (Default is 2).

- 1 - Germany, Austria, Luxembourg, Switzerland
- 2 - Great Britain Netherlands, Belgium, New Zealand, South Africa.
- 3 - France, Switzerland, Belgium, Luxembourg,
- 4 - Spain, Mexico, Argentina, Venezuela
- 5 - Italy, Switzerland
- 6 - Sweden, Finland
- 7 - Denmark, Norway
- 8 - Portugal, Brasil
- 9 - Yugoslavia
- 10 - USA, Canada, Australia
- 11 - Sweden (special version)
- 13 - Greece *
- 14 - Japan *
- 15 - Israel *

* With another character generator in the printer.

DRGP03

2.12 GENERAL TERMINAL PRINTER

DRGP03

General information : This driver handles the PTS6374/75 General Terminal Printer connected to the CPU via CHRT or CHLRT, or via the V24 interface cards ASCU4Z or SALCUZ, or via LWSI/RWSI.

In the standard version this printer has one print station with friction paper feed mechanism. It can optionally be furnished with a tractor feed mechanism for continuous stationery. Front feed for document stationery is an option when the tractor feed mechanism is included.

Logically the options are treated as a subdevice with a different file code. Recommended file codes are /30 for the tractor feed and /32 for the front feed device and friction feed handler. The two logical devices are assigned to the same DWT, but with different indices, being 0 for the tractor feed device (continuous stationery) and 1 for the document handler (friction feed or front feed).

The friction feed version handles single sheets or top-glued form sets of widths from 105 mm to 307 mm maximum and a minimum height of 70 mm. The front feed handles single sheets or bottom glued form sets of widths from 105 mm to 304 mm. and height between 148 mm and 330 mm maximum. The tractor feed handles continuous fan-folded paper with a width from 148 mm to 340 mm, including the paper guide, and a height from 101 mm to 304 mm (distance between the perforations).

The number of copies that can be printed with acceptable quality depends also on the quality of the paper. Generally one original plus three copies can be printed.

A 9x9 character matrix and a 18x25 character matrix are installed in the standard version of the printer. It is possible to have different matrixes instead, and a third matrix can be added. With an (optional) additional board in the printer, 6 more character matrixes can be installed.

The print speed is 150 char/sec. when the 9x9 matrix is used, and 80 char/sec. when the 18x25 matrix is used.

It is not possible to print more than one line with each request.

After printing on tractor feed stationery it is recommended to issue a form feed before power off on the printer, or before changing to print on front feed device. This will make the actual page position correspond with the hardware page length control, which is reset to the beginning of a page.

DRGPO3

Continued

DRGPO3

Calling sequence	: Normal I/O:	I/O and Activate:
	LDK A7,code	LDKL A1,parameter
	LDKL A8,ecb-address	LDK A7,code
	LKM	LDKL A8,ecb-address
	DATA 1	LKM
		DATA -1
		DATA start-address

Order codes : The following order codes may be used:

/00 - test status
 /05 - basic write
 /06 - write
 /0B - position document
 /24 - set printer parameters
 /27 - set form parameters
 /38 - release document

Buffer address : Only significant for orders /05, /06 and /27. For order
 Requested length : /06, the first word in the buffer contains a control
 Effective length : character in the right byte. This word must be included
 in the requested length.

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

bit	Meaning	Order						
		/00	/05	/06	/0B	/24	/27	/38
0	Illegal request			x	x	x	x	
2	End of paper/document out		x	x				
7	Recovery after power on	x	x	x	x	x	x	x
13	Illegal character in buffer			x				
15	Printer not operable	x	x	x	x	x	x	x

Control word : Only significant for orders /00, /0B, /24, /27.

DRGP03

Continued

DRGP03

Order : /00 - test status

This order may be used to test the status of either of the two print stations, and the return code shows the status on completion of the request.

This request is completed with bit 15 (printer not operable) set in the return code if the power is off, if an ink ribbon error is detected, or if the printer is otherwise not operable. If there is a permanent error condition in the printer, bits 3-15 of the ECB control word will contain the 'service status' to indicate the error:

<u>Value</u>	<u>Indicating</u>
00	No service status information present
08	Firmware error
10	Printer control unit I general
11	Printer control unit I ROM
12	Printer control unit I RAM
13	Printer control unit I V24 interface
14	Printer control unit I I/O control operator panel
15	Printer control unit I I/O control paper handling
20	Printer control unit P general
21	Printer control unit P ROM
22	Printer control unit P RAM
23	Printer control unit P I/O control horizontal drive
24	Printer control unit P I/O control needles
31	Printer control unit PHOPT ROM
33	Printer control unit PHOPT I/O control keyboard
34	Printer control unit PHOPT I/O control front feed
41	Printer control unit CARGEN ROM
42	Printer control unit CARGEN RAM
50	Device horizontal drive
51	Device needles
52	Device vertical drive
53	Device bar code reader
60	Device front feed
61	Device automatic single sheet handler
70	Device operator panel
71	Device keyboard
99	Undefined error

Order: /05 - basic write

With this order all characters in the user buffer are sent to the printer without any check. Both data characters and printer control codes can be sent. Carriage Return and Line Feed must be inserted in the text where they are wanted.

DRGP03

Continued

DRGP03

Order:

/06 - standard write

This order results in the writing of one line on either the continuous stationery or the document station. When printing on the document station, the document must have been positioned by order /0B or by the control code /31 in the second byte in the buffer, before any printing is started.

The first word in the buffer must contain a control character in the right byte. This word must be included in the requested length. The control value may be one of the following:

- /2B - print the line without advancing the paper.
Printing starts from the position following the last printed position on the line. If order /0B (position document) was executed previously, a carriage return is performed before printing is started.
- /30 - advance the paper two lines and carriage return before printing.
- /31 - form feed: skip to top of form for continuous stationery, or insert a new document to top line and print. A previously inserted form is ejected. If a form is ejected or there is no form in the hopper, the device will switch off-line. When this occurs and the SYSGEN option "End of request if inactive" is not specified, pressing the start key will bring the device back on-line and the document will be inserted and positioned. If this option is specified, the instruction will terminate with bit 15 set in the return code.

Any other value in the control code will result in one line feed and carriage return being made before the line is printed. If the requested length in the ECB is set to 2, only the action specified by the control character is carried out. If the requested length is zero, a line feed and a carriage return are performed.

A number of control codes may be inserted in the text to perform the following functions of the printer:

<u>Code</u>	<u>Meaning</u>
-------------	----------------

- | | |
|-----|--|
| /09 | Horizontal tabulation.
The current print position is advanced to the next tabulation stop on the current line.
The tabulation stops must have been set by the order /27, set form parameters. This control code must not be used in combination with code /2B (print from current position). |
|-----|--|

DRGP03

Continued

DRGP03

- /1B Partial line up/down.
This code must be followed by one of the following two codes:
- /4C Partial line movement up .
- /4B Partial line movement down .
Partial line up/down condition, once set, remains valid until the opposite code is sent, even if new requests are started.
- /12 Start underline
All output characters following this code will be printed underlined, until a stop underline code (/13) is sent.
- /13 Stop underline
Output characters that follow this code will be printed without underlining.

If the requested parameters are not correctly supplied, the request is completed with bit 0 set in the return code.

Bit 2 will be set in the return code if:

- if the stacker of the automatic single sheet handler is full.
- if there is no paper in the printer.
- if the paper is not fed properly.

For front feed or friction feed only, the error lamp on the printer panel is lit when a paper must be inserted. After correction of the situation, the operator must press the Start key on the printer.

Control code /31 makes it possible to print without previous positioning of a document. In this case the printer will wait for the document to be inserted in the document station, before completing the request.

All alphanumeric characters in the range /20-/7F and /A1-/FE are accepted and sent to the printer.

In the range /00-/1F some codes are reserved for special characters, the other codes are ignored by the driver.

If an illegal character is detected in the buffer, it is ignored, and the request is completed with bit 13 set in the return code.

The character /AE is converted to /2E and printed as a point.

If the end-of-paper condition is detected, the request is completed with bit 10 set in the return code.

The request is completed with bit 15 set in the return code (not operable), if any of the following conditions exist:

- The printer is switched off.
- The Single Line or Top of Form key is pressed.
- A form is inserted illegally in the front gate.

DRGP03

Continued

DRGP03

Order : /08 - position document
This order may be issued to the front feed or friction feed document station, to advance the single sheet to a specific line before printing starts.
The order /08 is excluded from the driver if only tractor feed is specified during Monitor generation.
When there is no paper in the front feed device or the friction feed device the printer will wait for the document to be inserted before completing the request.
The error lamp and start/stop lamp will be lit. After inserting a paper the operator must press the Start key on the printer.

The right byte of the ECB control word must contain the line number where to position the document, in binary form. This value may be higher or lower than the current line number, the document will be moved backward or forward as required.

The order may be completed with bit 0 set in the ECB return code, if the parameter is not valid.
Bit 15 will be set if the printer is not operable (power off, ink ribbon error or other reason).

Order : /24 - set printer parameters
This order makes it possible to change one or more of the following parameters:
- The number of lines between form feed on the continuous stationary device, or the number of lines on a document.
- The National Character variation.
- Character matrix
- Character density

This order need only be used if it is necessary to change one or more of these parameters during application running. Otherwise, the parameters are set up during Monitor generation.

The order will change the parameters for one sub-device at a time. The parameters are stored in the device work table DWT, separate for each device, and the correct parameters are automatically sent to the printer.

The ECB control word contains values for the parameters to be changed, as described below. If a parameter must not be changed, the corresponding bits in the control word must be set to zero.

Bits 0-3 indicate the character density

- 1 := 10 characters/inch
- 2 := 12 characters/inch
- 3 := 15 characters /inch
- 4 := proportional. Character width determined by the character generator.

DRGP03

Continued

DRGP03

Bits 4-7 must contain a value in the range /01 - /0F, to specify the index to the selected page length for the hardware form-length control-function.

The actual line space must be taken into account when changing this parameter, for a change of line space afterward with order /27, set form parameters, will not affect the selected page length.

The table below shows the page lengths corresponding to the different parameter values, for the line spacings 1/12", 1/8", 1/6", 1/4", 1/3", and the resulting number of lines per page.

Parameter value	Line spacing					lines/ page
	1/12"	1/8"	1/6"	1/4"	1/3"	
1	1 1/4	1 7/8	2 1/2	2 3/4	5	15
2	1 1/2	2 1/4	3	4 1/2	6	18
3	2	3	4	6	8	24
4	2 1/12	3 1/8	4 1/6	6 1/4	8 1/3	25
5	2 1/2	3 3/4	5	7 1/2	10	30
6	2 3/4	4 1/8	5 1/2	8 1/4	11	33
7	2 11/12	4 3/8	5 5/6	8 3/4	11 2/3	35
8	3	4 1/2	6	9	12	36
9	4	6	8	12	16	48
A	4 1/6	6 1/4	8 1/3	12 1/2	16 2/3	50
B	4 1/4	6 3/8	8 1/2	12 3/4	17	51
C	5	7 1/2	10	15	20	60
D	5 1/2	8 1/4	11	16 1/2	22	66
E	5 2/3	8 3/4	11 2/3	17 1/2	23 1/3	70
F	6	9	12	18	24	72

Page length on the line printer is the distance between each top of form.

Bits 8-11 indicate the character matrix, provided the necessary hardware is present:

- 1 9x9 or primary matrix
- 2 18x25 or first alternative matrix
- 3 first text quality or second alternative matrix
- 4,5,6 reserved for optional resident matrixes
- 7,8,9 reserved for optional loadable matrixes

The following combinations of character density and matrix font are allowed:

Matrix Character density

- 9x9 1,2
- 9x7 3
- 18x25 1,2,4
- 36x50 1,2,3

DRCP03

Continued

DRCP03

Bits 12-15 indicate the selected National Character variation with a value according to the table at the end of this driver description.

The request is completed with bit 0 set in the return code if any of the parameters has an illegal value. Bit 15 will be set if the printer is not operable.

Order /27:

Set form parameters

With this order, form parameters are set for the friction or tractor feed and the front feed device. It is not possible to set form parameters for these subdevices separately.

The ECB control word must contain a value in bits 12-15, defining the type of the information sent to the printer as follows:

- 1 further information is present in the Control Word
- 2 basic write
- 3 set or clear horizontal tabulation positions.

Value 1

Information set in Control Word.

Bits 8-11 contain a binary value to select the number of lines per inch, according to this table:

<u>Value</u>	<u>lines/inch</u>
1	3
2	4
3	6
4	8
5	12
6	16
7	24
8	48

Note that a newly selected line spacing will not affect the page length as set for the printer during Monitor generation or by order /24 (set printer parameters).

DRGP03

Continued

DRGP03

Value 2

Basic Write

The order /27 can now be used in the same way as the order /05, Basic Write.

Value 3

Set or clear horizontal tabulation positions.

Buffer address and requested length must be set in the ECB.

The first byte in the specified buffer contains a control value (binary)

0 - Clear all tabulation positions

The tabulation positions need not be specified.

1 - Set tabulator positions

Up to 16 tabulation positions can be set. The positions must be defined by binary values in the second and next bytes in the buffer. For example, to set tabulation positions at position 2, 15 and 23, the buffer for this order must contain the value 0 in the first byte, 2 in the second, 15 in the third and 23 in the fourth byte.

When code /09 is recognised in the text string in a subsequent write request, the print head is moved to the next horizontal tabulation position set up by this order.

The order /27 will be completed with bit 0, request error, set in the return code if an illegal parameter value is given, except for the index values 2 and 3 (set or clear tabulation).

The request is completed with bit 15 set if the printer is not operable.

Order /38

: Release document

This order is used to release the document when the printing is finished. It can be used if front feed or friction feed is included. If no document is in the station, no action is taken and the request is completed with no bits set in the return code.

Recovery at power on

: After power up on the computer, the actual parameters are sent to the printer except those which had been set by the order /27 (set form parameters) and any current request is repeated. Bit 7 in the return code will be set to indicate that recovery has been executed. A running request will be ended with bit 15 set in the return code if this is specified during Monitor generation. This is recommended if the communication interface has no automatic power-up function.

The form feed control function will have reset the line counter, although the actual page length has been sent to the printer during recovery.

DRCP03

Continued

DRGP03

Monitor generation parameters : The following parameters may be specified during Monitor generation:

- If a front feed or friction feed is included. (Default tractor feed).
 - Page length on the printer. Only the values specified in the table for order /24, Set Parameters, are allowed. Default 64 lines.
 - Number of lines on document. Only the values specified in the table for order /24, Set Parameters, are allowed. Default 64 lines.
 - Character matrix. (Default 1).
 - Character density. (Default 10 char/inch).
 - End of request if printer not operable. (Default No).
 - Order /27, Set Form Parameters, included. (Default Yes).
 - National character set specified as a value 1 thru 15, according to the following list (Default 2):
-
- 1 - Germany, Austria, Luxembourg, Switzerland
 - 2 - Great Britain Netherlands, Belgium, New Zealand, South Africa.
 - 3 - France, Switzerland, Belgium, Luxembourg,
 - 4 - Spain, Mexico, Argentina, Venezuela
 - 5 - Italy, Switzerland
 - 6 - Sweden, Finland
 - 7 - Denmark, Norway
 - 8 - Portugal, Brasil
 - 9 - Yugoslavia
 - 10 - USA, Canada, Australia
 - 11 - Sweden (special version)
 - 12 - Greece *
 - 13 - Japan *
 - 14 - Israel *

* With another character generator on the printer.

DRGP03

Continued

DRGP03

Table of national character variations.

NCV	Countries	Character code									
		/23/	/40/	/5B/	/5C/	/5D/	/60/	/7B/	/7C/	/7D/	/7E/
1	Germany, Luxembourg, Austria, Switzerland	#	§	Ä	Ö	Ü	'	ä	ö	ü	ß
2	Great Britain, Netherlands, Belgium	E	@	[\]	'	{		}	~
3	France, Switzerland, Belgium, Luxembourg	E	à	°	ç	§	'	é	ù	è	..
4	Spain, Argentina, Venezuela, Mexico	E	@	[Ñ]	'	{	ñ	}	~
5	Italy, Switzerland	E	§	°	ç	é	ù	à	ò	è	ì
6	Sweden, Finland	#	É	Ä	Ö	Å	é	ä	ö	å	~
7	Denmark, ⁽¹⁾ Norway	E	@	Æ	Ø	Å	'	æ	ø	å	~
8	Portugal, Brazil	E	@	À	Ç	Õ	'	ã	ç	õ	~
9	Yugoslavia	E	Ž	Ć	Č	Š	Ž	ć	č	š	~
10	USA, Canada, Australia	#	@	[\]	'	{		}	~
11	Sweden, industry version	E	@	Ä	Ö	Å	'	ä	ö	å	~

I/O DRIVER REFERENCE

DRGP04

2.13 HARDCOPY PRINTER HP75

DRGP04

General information : This driver handles the hardcopy printer HPC 6323 (HP75).

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: I/O and Activate:
 LDK A7,code LDKL A1,parameter
 LDKL A8,ecb-address LDK A7,code
 LKM LDKL A8,ecb-address
 DATA 1 LKM
 DATA -1
 DATA start-address

Order code : The following order code may be used:
 /00 - test status
 /05 - basic write
 /06 - standard write
 /24 - test output buffer and set printer parameter

Buffer address : Only significant for orders /05 and /06. For order
Requested length : /05, the first word in the buffer is used for normal
Effective length : output data. For order /06, the first word must be reserved for a control code, and this word must be included in the requested length.

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

		Order			
bit	Meaning	/00	/05	/06	/24
0	Illegal request	x	x	x	x
13	Code check error			x	
14	Throughput error		x		
15	Not operable	x	x	x	x

Control word : Only significant for order /24.

Order : /00 - test status
 One line feed is sent to the printer and executed. If the printer is not operable, bit 15 is set in the return code.

DRGPO4
-----Continued-----
DRGPO4

Order : /05 - basic write
The requested number of characters are sent to the printer without any check. The last character in the buffer must be a line feed (/0A).

Order : /06 - standard write
The first word in the buffer is reserved for control information. This word must be included in the requested length. It may contain the following code in the right byte:
/30 : Advance the paper one line before printing. As the preceding print request must have ended by a line feed, the result is that two line feeds are generated between the lines of text.

Any other code will cause no special action at all and printing will start at the current position. All alphanumeric characters in the range /20 - /7F, in the user buffer, are sent to the printer. Roomless point is not available, this character code (/AE) will be converted to /2E and printed as an ordinary point.

One special character may appear in the data to control the output printing:

/11 Tabulation character; this character must be followed by two ISO-7 digits, giving the tabulation position on the current line.

The following special characters, if they occur in the buffer, are ignored: /09, /12, /13, /14, /1E, /1F. The hardware needed to perform the functions normally associated with them, is not available in the printer.

Illegal characters in the buffer are ignored, and the request is completed with bit 13 set in the return code. Every standard write request is ended with Carriage Return and a Line Feed.

Order: /24 - Test Output Buffer and Set Printer Parameters
One line feed is sent to the printer, and a parameter is set in the driver to select one of two output modes. Which output mode to select is indicated by bit 15 in the ECB control word:

0 - output mode 1

Standard and basic write requests are finished without waiting for the output buffer in the printer to be empty. This implies that a request can be completed before all characters are printed.

1 - output mode 2

Write requests are not completed before the printer buffer is empty and all the characters have been printed.

I/O DRIVER REFERENCE

DRGP04

Continued

DRGP04

If there are any characters in the printer buffer when this order /24 is issued, these characters are printed before the line feed is sent to the printer and the parameter is changed.

Recovery at
power on:

No recovery is performed at power on.
If there is a request current, it is completed with bit 14 set in the return code.

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 configure 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.

DRIC01
-----Continued-----
DRIC01

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	I/O and Activate:
		LDK A7,code	LDKL A1,parameter
		LDKL A8,ecb-address	LDK A7,code
		LKM	LDKL A8,ecb-address
		DATA 1	LKM
			DATA -1
			DATA start-address

Order codes : The following order codes may be used:

- /02 - read
- /06 - write
- /39 - set timeout value

DRIC01

Continued

DRIC01

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

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

Bit	Meaning	Order		
		/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.

DRIC01
-----Continued-----
DRIC01

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.

DRIC01
-----Continued-----
DRIC01

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:	I/O and Activate:
		LDK A7,code	LDKL A1,parameter
		LDK A8,ecb-address	LDK A7,code
		LKM	LDK A8,ecb-address
		DATA 1	LKM
			DATA -1
			DATA start-address

DRKB04

Continued

DRKB04

- 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 : Significant for all orders except /31.
 Requested length : The end-of-record key is included in the length, for
 Effective length : 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:

		order in which bit set			
bit		/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.

DRKB04

Continued

DRKB04

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 request is 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.

DRKB04

Continued

DRKB04

- 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.

DRKB04

Continued

DRKB04

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:

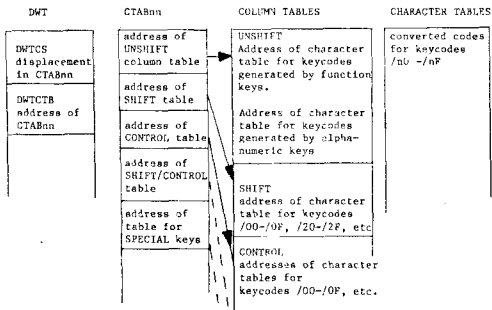
- 1 : Key-lock no. 4 turned OFF
- 2 : Key-lock no. 3 turned OFF
- 3 : Key-lock no. 2 turned OFF
- 4 : Key-lock no. 1 turned OFF
- 5 : Key-lock no. 4 turned ON
- 6 : Key-lock no. 3 turned ON
- 7 : Key-lock no. 2 turned ON
- 8 : Key-lock no. 1 turned ON

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:



DRKB04

Continued

DRKB04

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 DWTCTB 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.

DPK304

Continued

DRKB04

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 addition, 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 LCM 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.

DRKB04

Continued

DRKB04

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: I/O and Activate:
 LDK A7,code LDKL A1,parameter
 LDKL A8,ecb-address LDK A7,code
 LKM LDKL A8,ecb-address
 DATA 1 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 : Only significant for orders /05 and /06. For order
 Requested length : /06 the first word and last character of the buffer
 Effective length : 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:

		Order		
bit	Meaning	/00	/05	/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.

I/O DRIVER REFERENCE

DRLP01

Continued

DRLP01

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 TOSB 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:	I/O and Activate:
	LDK A7, code	LDKL A1, parameter
	LDKL A8, ecb-address	LDK A7, code
	LKM	LDKL A8, ecb-address
	DATA I	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.

I/O DRIVER REFERENCE

DRMD01

Continued

DRMD01

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	
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 EGS.

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.

I/O DRIVER REFERENCE

DRMD01

Continued

DRMD01

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.

I/O DRIVER REFERENCE

DRMSO2

2.18 MAGNETIC STRIPE UNIT

DRMSO2

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 Identification 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 Longitudinal 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 I/O and activate:
 LDK A7,code LDKL A1,parameter
 LDKL A8 ecb-address LDK A7,code
 LKM LDKL A8,code
 DATA 1 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 : } Only significant for orders /02, /06 and /0A.
 Effective length : }

I/O DRIVER REFERENCE

DRMS02

Continued

DRMS02

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, or 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.

DRMS02

Continued

DRMS02

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 passport

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.

DRMS02

Continued

DRMS02

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

/OA - 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.

DRMS02

Continued

DRMS02

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.

I/O DRIVER REFERENCE

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.

I/O DRIVER REFERENCE

DRMT01

2.19 MAGNETIC TAPE

DRMT01

General information : This driver handles up to four 1/2" magnetic tape recorders, PT56872 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:	I/O and Activate:
	:	LDK A7,code	LDK A1,parameter
	:	LDKL A8,ecb-address	LDK A7,code
	:	LKM	LDKL A8,ecb-address
	:	DATA 1	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	:	} 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.
Requested length	:	
Effective length	:	

I/O DRIVER REFERENCE

DRMT01

Continued

DRMT01

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.

I/O DRIVER REFERENCE

DRMT01

Continued

DRMT01

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.

I/O DRIVER REFERENCE

DRMT01

Continued

DRMT01

- 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 issuing 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:	I/O and Activate:
		LDK A7,code	LDKL A1,parameter
		LDKL A8,ecb-address	LDK A7,code
		LKM	LDKL A8,ecb-address
		DATA 1	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	:	} Not significant.
Requested length	:	
Effective length	:	

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.

DRSOP1

Continued

DRSOP1

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

Buffer address Requested length Effective length	}	Not used
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I/O DRIVER REFERENCE

DRSU01

Continued

DRSU01

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).

I/O DRIVER REFERENCE

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:	I/O and Activate:
		LDK A7,code	LDKL A1,parameter
		LDKL A8,ecb-address	LDK A7,code
		LKM	LDKL A8,ecb-address
		DATA 1	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	:	} 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.
Requested length	:	
Effective length	:	

I/O DRIVER REFERENCE

DRTC01

Continued

DRTC01

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

bit	Meaning	Order in which bit is set											
		/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	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	x
7	B Side	x	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 whether 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.

I/O DRIVER REFERENCE

DRTC01

Continued

DRTC01

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 performs 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.

I/O DRIVER REFERENCE

DRTCOL

Continued

DRTCOL

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.

DRTCO1
-----Continued-----
DRTCO1

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 cassette 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:	I/O and Activate:
LDK A7,code	LDKL A1,parameter
LDKL A8,ecb-address	LDK A7,code
LKM	LDKL A8,ecb-address
DATA 1	LKM
	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:

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

Requested length:

Effective length:

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

I/O DRIVER REFERENCE

DRTN01

Continued

DRTN01

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.

I/O DRIVER REFERENCE

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.

DRTN01

Continued

DRTN01

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

DRTN01
-----Continued-----
DRTN01

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:

byte	
0	not used
1	
2	number of
3	notes from
4	cassette 1
5	
6	not used
7	
8	number of
9	notes from
10	cassette 2
11	
	etc.

DRTN01

Continued

DRTN01

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 preceded 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.

DRTPO2

2.24 TELLER TERMINAL PRINTER

DRTPO2

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: I/O and Activate:
LDK A7,code LDKL A1,parameter
LDKL A8,ecb-address LDK A7,code
LKM LDKL A8,ecb-address
DATA 1 LKM
DATA -1
DATA start-address

Order codes : The following order codes may be used:
/00 - test status
/06 - write
/08 - position voucher/passbook and print
/22 - cut journal tape
/26 - perforate journal tape
/37 - grasp voucher/passbook
/38 - release voucher/passbook

Buffer address : Only significant for orders /06 and /08. The first
Requested length : word of the buffer must be reserved for a control
Effective length : code and is included in the requested length.

I/O DRIVER REFERENCE

DRTPO2

Continued

DRTPO2

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

bit	Meaning	Order in which bit is set							
		/00/	/06/	/08/	/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 /08. 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 /08). The control character may have one of the following values:
 /28 - 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.

DRTPO2-----
Continued-----
DRTPO2

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 symbol 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.

DRTP02

Continued

DRTP02

- 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 : /08 - 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.

I/O DRIVER REFERENCE

DRTPO2

Continued

DRTPO2

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).

DRTPO3

2.25 TELLER TERMINAL PRINTER

DRTPO3

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 DTP03, 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.

DRTPO3

Continued

DRTPO3

The standard version of DTP03 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.

I/O DRIVER REFERENCE

DRTP03

Continued

DRTP03

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

		order in which bit is set							
bit	Meaning	/00	/06	/08	/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

I/O DRIVER REFERENCE

DRTPO3

Continued

DRTPO3

- /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:

D RTP03
-----Continued-----
D RTP03

	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

: /08 - 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.

DRTPO3

Continued

DRTPO3

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:

bit	0	3	4	7	8	11	12	15
	L			NCV			CPJ	
							CPD	

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."

DRTPO3
-----Continued-----
DRTPO3

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.

D RTP03

Continued

D RTP03

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 D RTP03 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.

DRTP03

Continued

DRTP03

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 /OB (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 height 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 /OB (Position Document) and /O6 (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.

I/O DRIVER REFERENCE

DRTP03

Continued

DRTP03

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	2*	3
	4,5	6	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).

DRTPO3

Continued

DRTPO3

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.

DRIP03

Continued

DRIP03

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.

DRTPO3
-----Continued-----
DRTPO3

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 DTP03 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 DTP03. 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.

I/O DRIVER REFERENCE

DRTPO3

Continued

DRTPO3

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.

DRTP03

Continued

DRTP03

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 /18 is printed as described. Any other legal code preceded by /18 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, \$, @, #, <, C, 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 be 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 aligned 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.

I/O DRIVER REFERENCE

DRTP03

Continued

DRTP03

- 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 f, y, r 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.

I/O DRIVER REFERENCE

DRTPO3

Continued

DRTPO3

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 DTP03).

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 right edge of the document.
MF	2	
LM	0	Print with right margin. The right most character on each line is printed 5.9mm from the right edge 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.

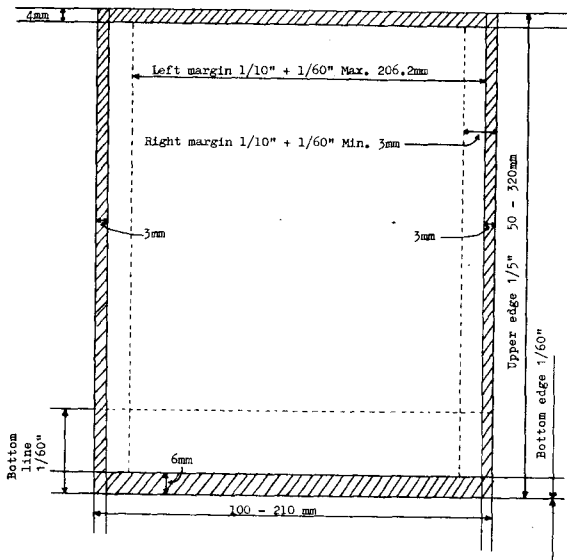
I/O DRIVER REFERENCE

DRTP03

Continued

DRTP03

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



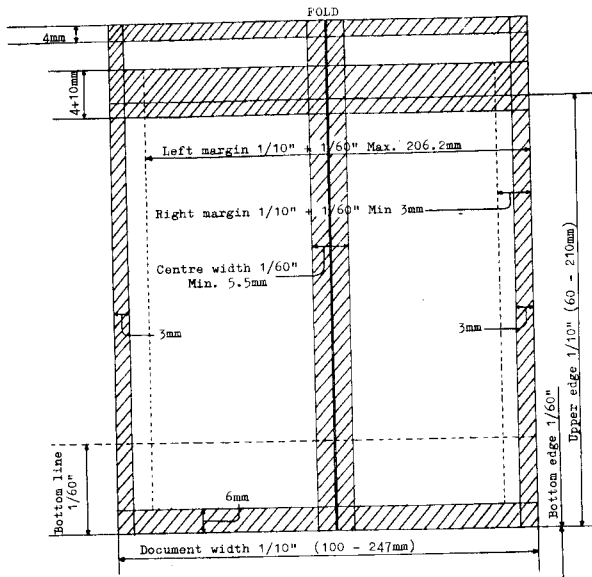
Areas in which printing is not possible.

D RTP03

Continued

D RTP03

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



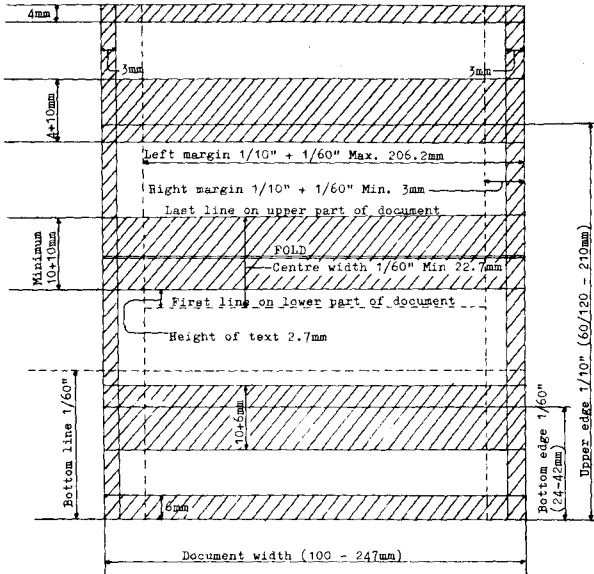
Areas in which printing is not possible. However, the areas around the edges of the inner pages may be printable if the inner pages are thin. The bottom line may be defined in non-printable area, but then it can not be printed.

DRTP03

Continued

DRTP03

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.

I/O DRIVER REFERENCE

DRTPO3

Continued

DRTPO3

Table of national character variations.

NCV	Countries	Character code									
		/23	/40	/5B	/5C	/5D	/60	/7B	/7C	/7D	/7E
0	Great Britain, Netherlands, Belgium	E	U	I	\	I	'	{		}	~
1	Germany, Luxembourg, Austria, Switzerland	#	S	A	O	U	'	a	u	ü	ß
2	France, Switzerland, ⁽¹⁾ Belgium, Luxembourg	E	a	o	c	s	'	e	u	e	..
3	Spain, Argentina, Venezuela	E	U	I	N	I	'	{	ñ	}	~
4	Italy, Switzerland	E	S	o	c	E	u	a	o	e	i
5	Sweden, Finland	#	E	A	O	A	e	a	o	a	~
6	Denmark, ⁽¹⁾ Norway	E	U	Æ	O	Å	'	æ	ø	å	~
7	Portugal, Brazil	E	U	A	C	O	'	ã	c	õ	~
8	France, Switzerland, ⁽²⁾ Belgium, Luxembourg	a	a	e	c	i	o	e	u	e	u
9	USA, Canada, Australia	#	U	I	\	I	'	{		}	~
10	Denmark, ⁽²⁾ Norway	#	E	Æ	O	Å	e	æ	o	å	~

DRTPO4

2.26 FINANCIAL TERMINAL PRINTER `FT80`

DRTPO4

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.

DRTPO4

Continued

DRTPO4

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:	I/O and Activate:
LDK A7,code	LDKL A1,parameter
LDKL A8,ecb-address	LDK A7,code
LKM	LDKL A8,ecb-address
DATA 1	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.
: }

DRTF04

Continued

DRTF04

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

		Order in which bit is set				
bit	Meaning	/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.

DRTP04
-----Continued-----
DRTP04

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 the 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.

I/O DRIVER REFERENCE

DRTPO4

Continued

DRTPO4

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 are sent 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.

I/O DRIVER REFERENCE

DRTPO4

Continued

DRTPO4

NCV	Countries	Character code									
		/23	/40	/5B	/5C	/5D	/60	/7B	/7C	/7D	/7E
0	Great Britain, Netherlands, Belgium	£	@	[\]	@	[\]	~
1	Germany, Luxembourg, Austria, Switzerland	#	\$	Å	Ö	Ü	\$	Å	Ö	Ü	~
2	France, Switzerland, Belgium, Luxembourg	£	à	•	c	§	a	•	c		~
3	Spain, Argentina, Venezuela	£	@	[Ñ]	@	[Ñ]	~
4	Italy, Switzerland	£	\$	•	§	É	\$	•	§	É	~
5	Sweden, Finland	#	É	Å	Ö	Å	É	Å	Ö	Å	~
6	Denmark, Norway	£	@	Æ	Ø	Å	@	Æ	Ø	Å	~
7	Portugal, Brazil	£	@	Ã	ç	Ö	@	Ã	ç	Ö	~
8	Yugoslavia	£	Ž	Ć	Č	Š	Ž	Ć	Č	Š	~
9	USA, Canada, Australia	#	@	[\]	@	[\]	~
10	Denmark (2) Norway	#	É	Æ	Ø	Å	É	Æ	Ø	Å	~

I/O DRIVER REFERENCE

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: I/O and Activate:

LDK A7,code	LDKL A1,parameter
LDKL A8,ecb-address	LDK A7,code
LKM	LDKL A8,ecb-address
DATA 1	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 : } Significant for all orders. For orders /02 and /03
Requested length : } the length includes the end-of-record key. For /06
Effective length : } 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	

DRTW01

Continued

DRTW01

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 : 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.

I/O DRIVER REFERENCE

DRTW01

Continued

DRTW01

Recovery at
power on

: At power on the following actions are taken:
If the order was /01, /02 or /03 the read request is completed with -2 in the control word.
If no read request is current a power up flag is set, causing the first read request after power on to be completed with the control word set to -2, or to zero if the application is written in CREDIT.
An alternative, chosen during Monitor generation, is for the read request to be completed at power on.
If the order was /05, the request is completed with bit 14 set in the return code.
If the order was /06, the print head is sent to the position it was in before the write request, and the line is printed again. No indication is given in the return code.

DRVU01

DRVI01

DRVU01

Continued

DRVU01

Return code : When errors occur, 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	
15	Not operable	x	x	x	x	x

Control word : For order /0B the control word contains the cursor position. For order /31 it contains the number of characters to be erased. For all orders, the cursor position is returned in the control word on completion of the request. The left byte contains the line number and the right byte contains the column number, as a binary value.

If the cursor position is the last column of a row, and if the last column is written into, and if the cursor has not been positioned since the writing of the last column, the column number in the control word is incremented by 1. The cursor will remain in the last position.

Requested length : For orders /06, Standard Write, and order /0B, Set Cursor and Write, the requested length must include the first word in the buffer containing the control code.

Order : /00 - test status
A dummy character is sent to the display and if the VCCU1/4 is not operable, the request is completed with bit 15 set in the return code.

The cursor position is returned in the control word of the ECB, with the line number in the left byte and the column number in the right byte.

DRVU01

Continued

DRVU01

Order

: /05 - basic write

This order can not be used by CREDIT applications. The requested number of characters are sent to the display. Trailing spaces are suppressed unless they are requested during Monitor generation. All alphanumeric characters (/20-/7F) are accepted and sent to the display. Roomless point (/AE) is displayed as a point (/2E). Command characters (/00-/1F) are ignored, without any indication of their occurrence in the return code, except for Line Feed (/0A) and Carriage Return (/0D) which are normally executed. The cursor position after the request is returned in the control word of the ECB. This is the first free position on the current line.

Last column handling:

When the last column of a row has been written into on the screen, the cursor remains in that position, and the following characters are written into that same position.

Bottom line handling:

When the current cursor position is on the bottom line and a Line Feed must be executed, scroll mode is entered and

- the top line of the screen is erased
- the second line is erased
- the current write position on the screen will now be on the top line of the screen, and in the same column as when the line feed was issued.

When scroll mode has been entered already, subsequent line feeds will have the following result:

If the current write position is on the bottom line of the screen, the same actions are taken as described above.

Else, Line Feed is normally executed, and the line following the new current line is erased.

Order

: /06 - standard write

If the requested length is equal to or greater than 2, the first word in the user buffer must contain a right-adjusted control character. It may contain any of the following codes:

- /2B - Display from current cursor position. 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.

DRVU01
-----Continued-----
DRVU01

Any other character in the control code, or a requested length of less than 2, causes the cursor to be sent to the left most position and advanced one line before the text is displayed. Trailing spaces are suppressed, unless requested otherwise during Monitor generation. All alphanumeric characters within the range /20-/7F are sent from the buffer to the display. Roomless point (/AE) is displayed as a point (/2E).

In addition, six special codes are recognised by the driver, and actions performed as follows:

- /11 - Tabulation character: this must be followed by two ISO-7 digits specifying the tabulation position required on the current line (positions 1 up to 80). If column 0 is specified, the cursor is positioned in column 1, and if the value is greater than 80, in column 80. 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 at the begin of the fast output string.
- /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 this code 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.

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.

I/O DRIVER REFERENCE

DRVU01

Continued

DRVU01

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. No data which is already on the display is erased. The control word must contain two binary values, in the left byte the linenumber and in the right byte the column number at which the display must start. If the line number is zero, display will start at line 1, if the line number is greater than 24 it will start at line 24. If the column number is zero, display will start at column number 1, if it is greater than 80 display will start at column 80.
The 'cursor home' position is /0101 for all displays.

After the cursor is positioned, the text in the user buffer is displayed according to the rules described for order /06 above. 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 control word.

Order

: /31 - erase

This order causes a specified 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.
The control word in the ECB must contain the number of characters to be erased in binary form (0 to 80).

Echo function

: The display may be attached to a keyboard as an echo device. All alphanumeric characters in the range /20 to /7F are echoed. Echo of end-of-record key, if required, must be specified during Monitor generation. The End of Record key is echoed as the character corresponding with the EOR code if this is within the range /20 - /7F. Characters outside this range are not echoed on the display.
The 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. If during an echo request the cursor is in the last position on the line (column 80), that position is erased and the cursor is not moved.
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.

APPENDIX A

Keyboard Layouts and Use of Conversion Tables

This appendix gives keyboard layouts for the PTS6231, 6232, 6233, 6234, 6236, 6271, and 6272 keyboards with the codes generated by the keys.

The layout of the character sets on the keyboards varies with the national version of the keyboard.

In character conversion, the first digit (bits 0-3) of the generated code is used to index the column table. The second digit (bits 4-7) is used to index the character table.

To convert the code for any one key, the source conversion table must have a non-zero entry for the column in which the key occurs, and the character table must have codes for all the keys in that column. Thus, to convert code /41, for example, there must be a fourth entry in the column table. All codes from /40 to /4F must be in the character table, except for the second entry, which must contain the character to which /41 is converted.

Only the codes for special characters shown in layouts are automatically generated. Thus, if the application requires the characters !, ", %, *, / , - or the national versions of #, \$, {, }, |, ~ the appropriate code conversion table must be supplied.

Note that the symbols shown as @, [,], \, may generate different characters on an output device, depending on the National Character Variation selected for output; whether by hardware as on displays, or software, as on some printers.

The reader should also refer to the code conversion section of driver description DRKB04. Examples on the use of conversion tables are given at the end of this appendix.

KEYBOARD LAYOUTS AND CODE CONVERSION

PTS6232

This is a full alphanumeric keyboard with clusters for alphabetic, numeric and function keys, plus a 2 position keylock.

The keyboard layout shows the codes generated by the keys with the keylock in position 1. With the keylock in position 2 the following codes are altered:

Codes /60 and /6A become /00 (nulls).

Codes /61 to /69 become /71 to /79.

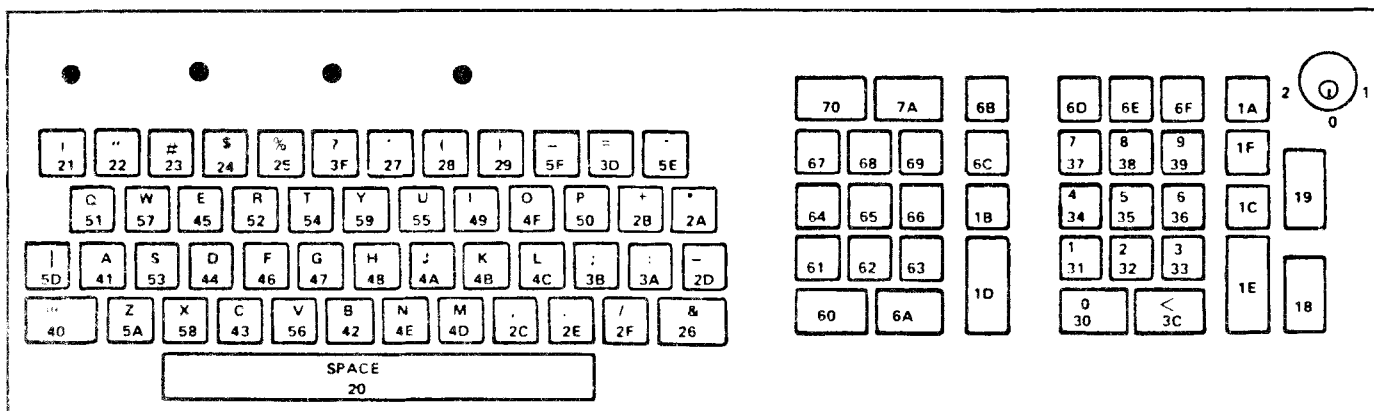
Codes /6B to /6F become /7B to /7F.

All other codes are unchanged.

Code conversion.

If code conversion is required a conversion table must be set up. Only the UNSHIF section of CTAB can be used.

PTS 6232 — Keylock in position 1.



Position 2 : Codes 60, 6A become 00 : Codes 61-69, 6B-6F become 71-79, 7B-7F : All other codes are unchanged

Keyboard Layout for PTS6232

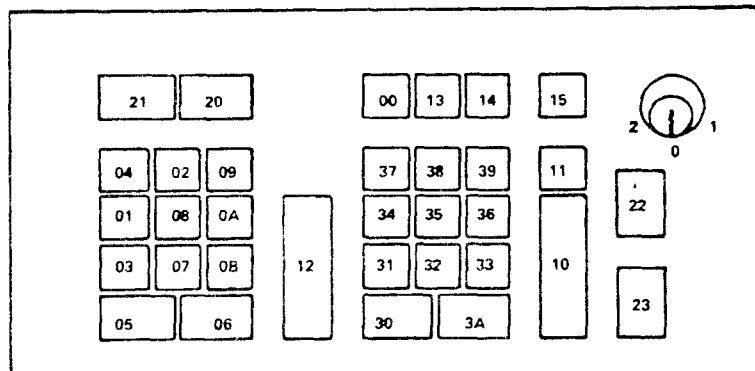
PTS6231

This keyboard has numeric and function keys, plus a single keylock. With the keylock in position 1 normal numerics are generated from the numeric cluster (/30-/39), and the function keys generate codes as shown. With keylock in position 2, all codes for the function keys are changed, and the codes generated by the numeric cluster are /70 to /79. The keyboard layout is given with codes generated for keylock positions 1 and 2.

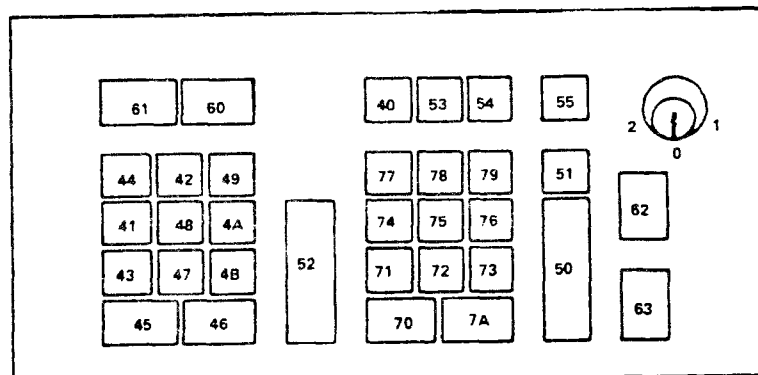
Code conversion

If code conversion is required a conversion table must be set up. Only the UNSHIF section of CTAB can be used.

PTS 6231 - Keylock in position 1.



PTS 6231 - Keylock in position 2



Keyboard Layout for PTS6231

PTS6234

This is a full alphanumeric keyboard with alphabetic cluster and numeric/function cluster, plus a two position keylock.

The keylock position only affects the codes generated by the numeric/function cluster.

The shift key only affects the alphabetic cluster. The standard version of the PTS6234 is strapped to give codes for upper case letters irrespective of shift mode. (Note that other keys in the alphabetic cluster are affected by the shift mode).

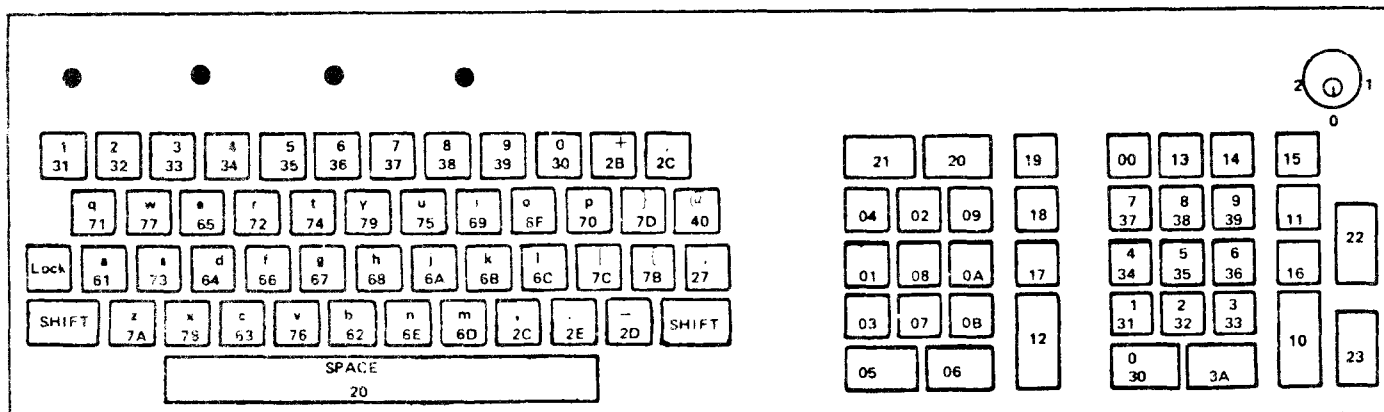
Code conversion

If code conversion is required a conversion table must be set up. Only the UNSHIF part of CTAB can be used. Depressing the shift key alters the codes output by the keyboard, and does not change the status of the driver.

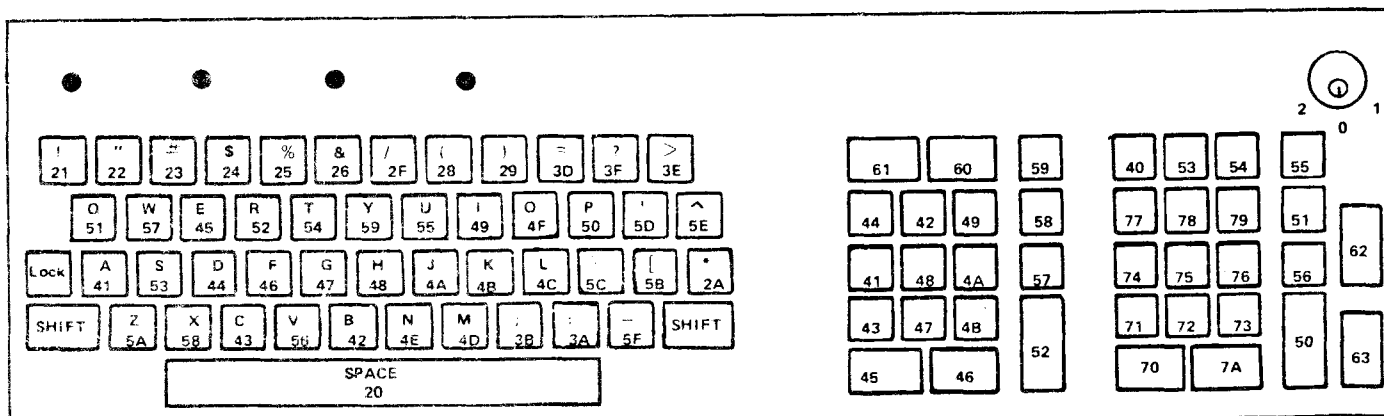
To avoid code interference between the alphabetic and numeric clusters, the 'special' section of the code conversion table can be used. The keyboard is given 2 device addresses (one for each key cluster) and only one DWT. The key codes received from the device address given first in SYSGEN are code converted via the 'special' table. This is used for the numeric/function cluster. Keyboard layouts with codes generated are shown for shift/unshift modes, and for keylock positions 1 and 2.

KEYBOARD LAYOUTS AND CODE CONVERSION

PTS 6234 — Keylock in position 1 and Unshift Mode



PTS 6234 — Keylock in position 2 and Shift Mode



Notes . Change of Shift Mode only affects the alphabetic cluster; change of keylock setting only affects the numeric/function cluster.
The standard version of the keyboard is strapped to generate shifted character irrespective of mode.

Keyboard Layout for PTS6234

PTS6233

This keyboard has only a numeric/function cluster, with a 2 position keylock. It generates the same codes as the PTS6234 numeric/function cluster, and is handled by the driver in the same way.

PTS6271, PTS6272 and PTS6236

The PTS6272 is a full alphanumeric keyboard with alphabetic, numeric and function clusters, and up to 4 keylocks.

The PTS6236 is similar to the PTS6272 but does not have the numeric shift, (Key A15 generates nulls), and does not have keys to generate codes /28 and /29.

The PTS6271 has only numeric and function clusters, and these are handled by the driver in the same way as the numeric and function clusters of the PTS6272.

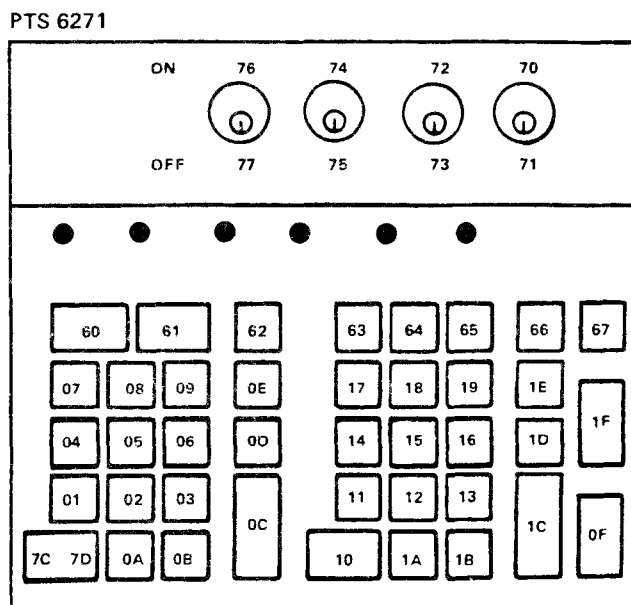
Code Generation

- Refer to keyboard layout for the PTS6272. The codes shown in the lower half of each box give the hexadecimal codes generated by the keys. Where possible the character equivalent is given in the upper half of the box. For the PTS6271 and PTS6236 only codes generated are shown.
- Where 2 hexadecimal codes are shown, the upper or leftmost is generated when the key is pressed, and the other is that generated when the key is released (SHIFT, CONTROL and NUMERIC SHIFT). These codes are not passed to the application buffer. They are used to alter the internal status of the driver to switch to different parts of the code conversion table.
- Keylock codes (/70 to /76) are reported by way of the ECB Control Word 1, and are passed to the application buffer.

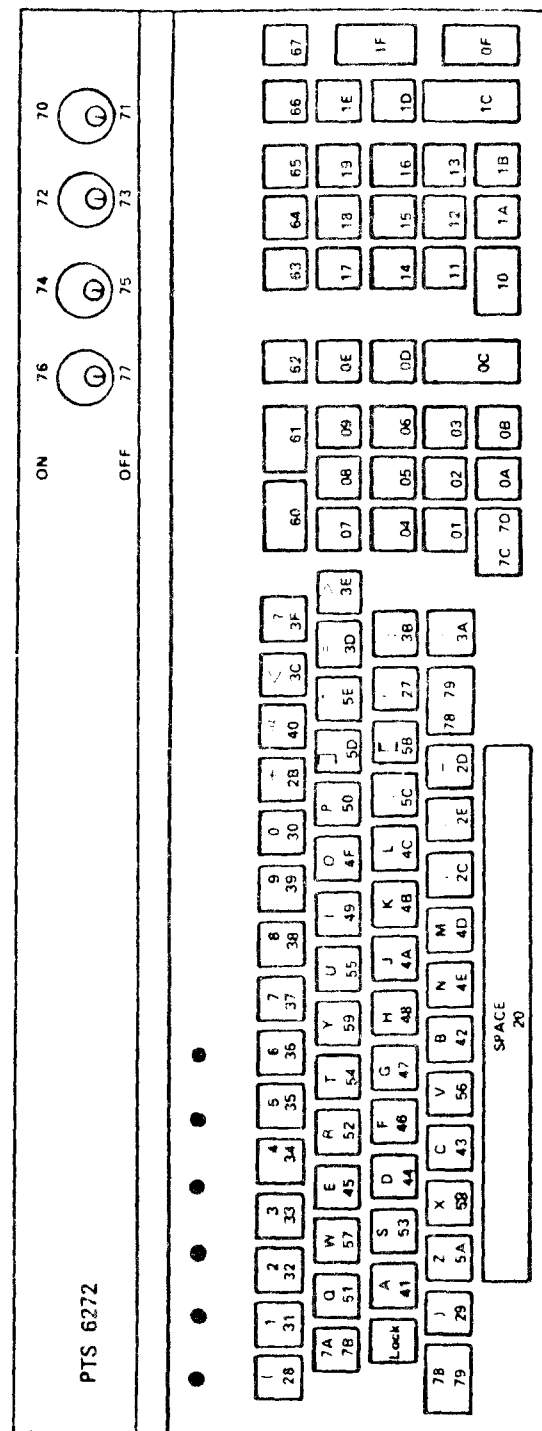
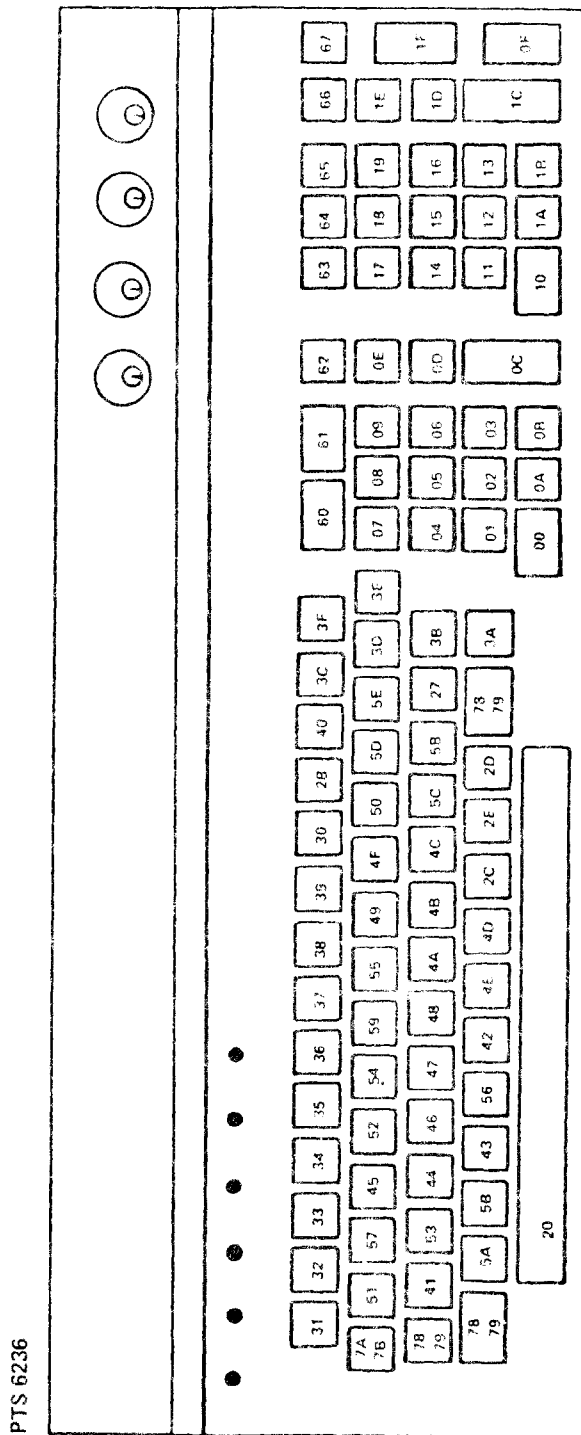
Code Conversion

If only upper case characters are required, and only the numerics from the top row of the alphabetic key cluster, then it is not necessary to provide a code conversion table.

If lower and upper case are required, and/or numerics from the numeric cluster a code conversion table must be supplied.



Keyboard Layout for PTS6271.



Keyboard Layouts for PTS6236 and 6272.

Conversion examples

Source of a typical conversion table for PTS6236 or PTS6272 is as follows:

```
ENTRY CTAB01
CTAB01 DATA  UNSHIF,SHIFT,0,0,0,

UNSHIF DATA  0,0,U2,0,0,U5,0,0,0
SHIFT DATA  0,0,0,0,0,S4,S5,0,0,0

U2      DATA  /2021,/2223,/2425,/2618,/2829,/2A2B,/2C2D,/2E2F
U5      DATA  /5051,/5253,/5455,/5657,/5859,/5A08,/0D5D,/5E5F
S4      DATA  /4061,/6263,/6465,/6667,/6869,/6A6B,/6C6D,/6E6F
S5      DATA  /7071,/7273,/7475,/7677,/7879,/7A5B,/5C5D,/5E5F
```

This table converts the key codes:

```
/27 to /18,
/5B to /08,   in unshift mode.
/5C to /0D
```

Lower case characters are generated when the Shift key is pressed (codes /41 - /5A are converted to /61 - /7A).

Conversion of keycode /5C in Unshift mode, to /0D occurs in the following manner:-

```
ENTRY CTAB01
```

The UNSHIF column table is accessed.

```
CTAB01 DATA  UNSHIF,SHIFT,0,0,0
```

The first digit of keycode, 5, is displacement in column table:

```
UNSHIF DATA  0,0,U2,0,0,U5,0,0
SHIFT DATA  0,0,0,0,0,S4,S5,0,0
U2      DATA  /2021,/2223,/2425,/2618,/2829,2A2B,/2C2D,/2E2F
```

The second digit of keycode, C, is displacement in character table:

```
U5      DATA  /5051,/5253,/5455,/5657,/5859,/5A08,/0D5D,/5E5F
S4      DATA  /4061,/6263,/6465,/6667,/6869,/6A6B,/6C6D,/6E6F
S5      DATA  /7071,/7273,/7475,/7677,/7879,/7A5B,/5C5D,/5E5F
```

In this example, conversion is not needed for Control and Shift/control modes, and the corresponding entries in CTAB01 are zero.

To convert keys pressed when the Control key is pressed, to the same codes as keys pressed in Shift mode, the address of the SHIFT column table must also be specified in the Control position (the third entry) in CTAB01, as follows:

```
CTAB01 DATA UNSHIF,SHIFT,SHIFT,0,0,
```

In the same way, different ranges of keycodes can be converted to the same character codes, by specifying the addresses of the same character tables in the corresponding entries in the column tables. For example, the keycodes in the range /20 - /2F will be converted to the same codes as keycodes /40-/4F, in Shift mode, if the SHIFT column table contains the same character table address in the third entry:

```
SHIFT DATA 0,0,S4,0,S4,S5,0,0
```