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aan see distribution list afdeling

onderwerp

Commercial Spec Cassette System Sagittaire

datum 1973-08-10

Attached you will find the first draft of the spec Cassette System Sagittaire.

Not all chapters have been filled in yet, however all input information for development should be available in this document now.

Agreement on this specification as it is, should be achieved between Management, Marketing and the Development organisation as soon as possible, especially if the development is to be done outside Philips.

Comments are awaited in order to come to an optimal result.

Distribution:

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0 Table of contents

Commercial Requirement Spec Cassette System Sagittaire
Chapter 1: Scope

Documentnumber | L

Distribution

This document describes the commercial requirements and considerations for a cassette system on Sagittaire, consisting of a maximum of two cassette drives and a controller. The drives will be the Philips ELA drive. The controller will be developed to interface to the Sagittaire CPU on programmed or multiplex channel. It will allow search and simultaneous rewind operations.

Documentation will include design specification, manufacturing documents (Item Identification Documents), maintenance documents and sales brochures.

This specification has to be approved by Management Marketing and Development. Changes may be made by formal approval procedure only.

E.D. van Veldhuizen

MMG OEM P.P.

1. ECMA 34 Document No. TC 19/73/1
2. Purchase Specification Philips ELA Digital Cassette Drive Model dated 72 06 29
3. Element Performance Specification
   Element 3: Central Processor
   Section 6: Functional Performance
   Chapter 4/5: Input/Output System/Multiplex Channel
   dated: 25-11-1970
4. Mechanical Dimensions cassette drive (document no. to be filled in)
5. Sag Element: All control units
   Baseline 3: Element Design Specifications
   Type of page 4: Description of physical implementation
   dated: 15-6-1971

T.b.f.

Commercial Requirement Spec Cassette System Sagittaire
Chapter 3/5/6: Motivation, Marketing Strategy and Constraints, Allocation of Activities

Documentnumber: L

Distribution:

T.b.f.

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MMG OEM P.P.

Supersedes doc. no.: L

Philips-Electrologica B.V. Apeldoorn-Nederland

Data 1973-08-02


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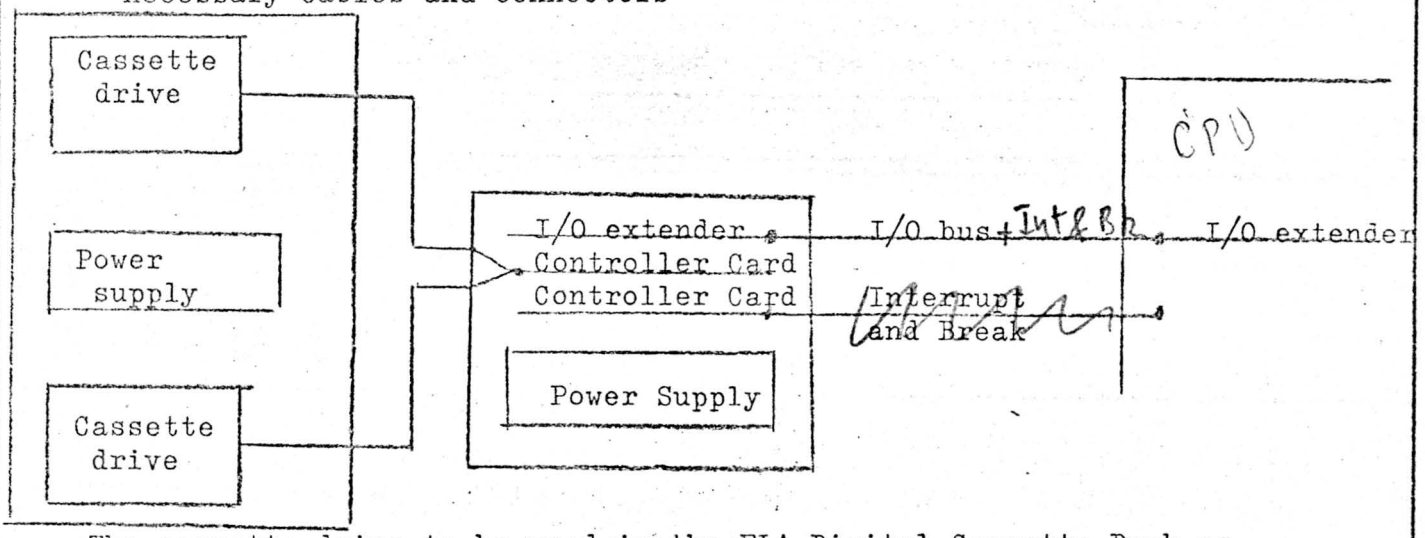
TABLE OF CONTENTS:

The cassette system consists of the following parts:

- max 2 cassette drives
- a controller (2 cards)
- controller-cabinet with power supply and backpanel
- tape drive-cabinet with power supply for two drives
- I/O bus extender
- necessary cables and connectors




The cassette drive to be used is the ELA Digital Cassette Deck as described in Purchase Specification Philips ELA Digital Cassette Drive Model dated 720629. (see Applicable document no. 2)
Up to two drives may be connected to one controller. Two drives with the necessary power supply will be housed in a cabinet. The controller cards, I/O extender and power supply are to be placed in another cabinet. The drives will be connected in ~~parallel~~ star to the controller. The controller is connected to the CPU by means of an I/O extender. It may be connected to the Programmed channel or the Multiplex channel. In case of Programmed channel the interrupt line is activated for each character as well as at the end of each CIO start command. In case of Multiplex channel a break line will be added, which is activated for each character, while the interrupt line is activated at the end of each CIO start command to ask for a Sense Status Command.

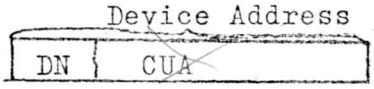
## 4.2.1. Hardware Software Interface

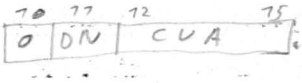
### 4.2.1.1. Record format

The information is written in blocks as described in ECMA 34. A block consists of a preamble, data and postamble. The data part includes the CRC word, however the CRC word is not sent to the CPU. So between controller and CPU only the data without CRC is transferred.
A tape mark may be written between blocks. To allow for fast search operations, the tape marks have to be written at least 50 cm apart.
The minimum block size is 10 data characters (excluding CRC) to be able to distinguish between a tape-mark and a data block in fast search. The maximum block size is 256 data characters (excluding CRC).
When the controller is connected to a multiplex channel the actual number of characters has to be filled in, in the multiplex word.

### 4.2.1.2. Addressing and Interrupts

The device address of each device consists of the Device number (0 or 1) and the Control Unit Address.
The total is the Device Address of 6 bits




The control Unit Address can be set on the controller card. The device number is determined by the position of the interface connector for the drive. One interrupt line and one break line are going from the controller to the CPU. An interrupt is given when a CIO command is finished and the status has been set. The controller then enters the Wait state and gives an interrupt signal. The interrupt is reset as soon as an I/O command is given for the drive for which the interrupt was issued. On Programmed Channel interrupts are given for each character. On Multiplex channel break signals are given.

4.2.1.3. I/O commands

4.2.1.3.1. General

The following I/O commands will be recognized and executed by the controller:

CIO start: 1 Lock
2 Unlock
3 Erase forward
4 Rewind
5 Backward space block
6 Forward space block
7 Fast Search tape mark backward
8 Fast Search tape mark forward
9 Write a block forward
10 Read a block forward

CIO stop
Test Status (TST)
Input to register (INR)
Output from register (OTR)
Sense Status (SST)

The format of the CIO start commands is:

| 0 | 1 | | | 4 | 5 | 7 | 8 | 9 | 10 | 11 | 15 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 1 | 0 | 0 | 0 | R1 | | 1 | 1 | DN | DV | C.U.A. |

R1: Specifies the register of which bits 12, 13, 14 and 15 specifiy the command sent via the BOU-lines (see Logical Interfaces).

DN: Device Number 0 or 1

C.U.A.: Control Unit Address

R1 contents:

bitnumber

12 13 14 15 have the following meaning:

"1" = Forward

"1" = Fast

"00" = Special cases

"01" = No data transfer

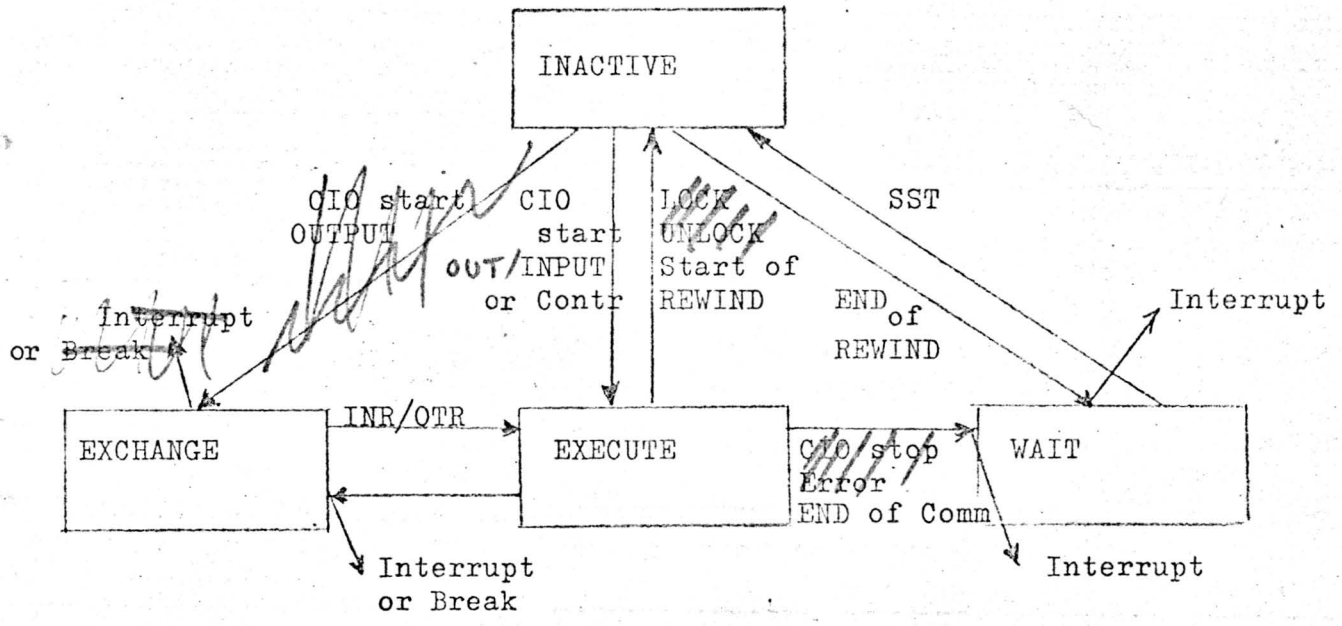
"10" = Write

"11" = Read

so that the CIO start commands have the following code:

| | | |
|---|---|---|
| 0000 | Lock | (LOCK) |
| 0011 | Unlock | (UNLK) |
| 0001 | Erase forward | (ERFD) |
| 0010 | Rewind | (REWD) |
| 0100 | Backward space block | (BDSB) |
| 0101 | Forward space block | (FDSB) |
| 0110 | Fast Search tape mark backward | (FSTB) |
| 0111 | Fast Search tape mark forward | (FSTF) |
| 1001 | Write a block forward | (WBFD) |
| 1101 | Read a block forward | (RBFD) |

The formats of the other commands will be given with the description. The control unit does not accept an invalid command, except for any invalid CIO command, which generates an interrupt and sets the program error bit in the status word.
Valid CIO start commands are only accepted when the control unit is in the inactive state, CIO stop and Test Status are always accepted. INR and OTR are accepted only in the Exchange state and SST is only accepted in the Wait state. The various states of the C.U. are shown on the other page.




A refused I/O command sets the condition register to "1" and an accepted command sets it to "0".
During the execution of any I/O command a non recognized device address sets the condition register to "3".
If any CIO start commands (except LOCK,UNLOCK and ~~REWIND~~) are attempted on anunlocked drive or any CIO command on a drive without a cassette, statusbit no.15 (not operable) is set and the C.U. is switched to the Wait state.

4.2.1.3.2. LOCK

This command is used to lock the cassette in the addressed drive and to put the tape-head in contact with the tape.
When this command is accepted:
- the condition register is set to "0"
- the C.U. switches to the Execute state
- the cassette is locked and pushing the retrieval knob has no effect any more.

The controller switches to the ~~inactive~~ wait status state, when the tape drive is ready. ~~No~~ interrupt is given with this command.

Status and error conditions:

~~No~~ statusbits will be set with this command. only if device without K7 bit 15

4.2.1.3.3. UNLOCK

This command is used to unlock the cassette in the addressed drive and to enable the retrieval knob.

When this command is accepted:
- the condition register is set to "0"
- the C.U. switches to the Execute state
- the cassette is unlocked and may be retrieved by pushing the retrieval knob.
- the controller switches to the ~~inactive~~ Wait state immediately
- ~~no~~ interrupt is given with this command

Status and error conditions:
~~No~~ statusbits will be set with this command. if there is not bit 15

4.2.1.3.4. ERASE FORWARD

This command erases the tape for a length of about 2.5 inches on the track being recorded of the addressed tape drive. (The length of a 256 character block is 2.5 inches).
When the command is accepted:
- the condition register is set to "0"
- the controller switches to the Execute state
- the selected cassette drive moves the tape 2.5 inches forward while erasing the tape.

Status and error conditions:
- if the track is file protected, the device does not start, the control unit switches to the Wait state and gives and interrupt signal. Bit no. 6 of the status word (Write unable) is set.
- if the device is not ready, the C.U. switches to the wait state, gives an interrupt and sets bit no. 15 of the statusword (not operable)
- when an erase is performed and the end of tape marker is passed, statusbit no. 10 (end of tape) will ~~not~~ be set, ~~But~~ End the signal will be stored internally in the controller.

4.2.1.3.5. REWIND

This command rewinds the tape for the track being up, it positions the tape just after the begin of tape hole.
The command is accepted if the control unit is in the inactive state and the tape is not in a rewind operation already.
When this command is accepted:

- the condition register is set to "0"
- the C.U. switches to the Execute state, resets the end of tape flipflop and initiates the tape rewind.
- after the C.U. has initiated the tape movement, it switches to the inactive state
- the selected tape unit moves the tape backward fast until the tape leader is encountered, then it stops and moves the tape forward at normal speed, until just after the begin-of-tape-hole.
- when the tape stops and if the C.U. is inactive it switches to the Wait-status and bit no. 5 of the status word is set.

Status and error conditions: - bit 15 if not operable

- no ~~status~~ (≠ procedure) or error condition is set when a rewind operation is performed on a drive which was on begin of tape already.

4.2.1.3.6. BACKWARD SPACE BLOCK

This command positions the tape backward in the ~~next~~ preceding interblock gap.
When this command is accepted:

- the condition register is set to "0"
- the C.U. switches to the Execute state
- the selected tape unit moves the tape backward until it is positioned in the next gap, no matter at what point of a block it started
- after the stop command to the drive has been given, the C.U. switches to the Wait state and generates an interrupt.

Status and error conditions:

- if the block was a tape-mark, statusbit no. 3 (tape mark) is set
- if no information is on the tape, the tape stops after transport of 500 mm and statusbit no. 4, (no data) is set.

- if the end-of-tape hole is passed during the operation, the end-of-tape flipflop is reset
- if BOT is passed. stop and come back (bit 5 set) BPT

4.2.1.3.6. FORWARD SPACE BLOCK

This command positions the tape forward in the next interblock gap.
When this command is accepted:
- the condition register is set to "0"
- the C.U. switches to the Execute state
- the selected tape unit moves the tape forward until it is positioned in the next gap, no matter at what point of a block it started
- after the stop command to the tape has been given, the C.U. switches to the Wait state and generates an interrupt.

Status and error conditions:
- if the block was a tape mark, statusbit no. 3 (tape mark) is set
- if no information is on the tape, the tape stop after transport of 500 mm and statusbit no. 4 (no data) is set
- if the end of tape hole is passed during the operation: bit 10 set
  ~~a) before or while data is being read, statusbit no. 10 (end of tape) is set~~
  ~~b) after data has been read, statusbit no. 10 will not be set, but the signal will be stored internally in the controller~~

4.2.1.3.8. FAST SEARCH TAPE MARK BACKWARD

This command moves the tape backward at high speed until a Tape Mark is encountered. Then the tape is stopped and is moved forward at normal speed until the tape is positioned in the gap after the Tape Mark.
When this command is accepted:
- the condition register is set to "0"
- the C.U. switches to the Execute state
- the selected tape drive moves the tape backward at high speed until the Tape Mark is read. Then it stops the tape and moves it forward until the tape is positioned in the gap after the Tape Mark. No data-check is performed.

- after the last stopcommand has been given to the drive, the C.U. switches to the Wait state and generates an interrupt.

Status and error conditions:
- when the tape mark has been found , statusbit no. 3 (Tape Mark) will be set after the command
- if no tape mark can be found, the tape stops after the begin of tape hole, and statusbit no. 5 (begin of tape) will be set – come back (BOT)
- if the end of tape hole is encountered, the end of tape flip flop is reset

~~– if BOT stop, come back (bit 5)~~

4.2.1.3.9. FAST SEARCH TAPE MARK FORWARD

This command moves the tape forward at high speed until a Tape Mark is encountered. Then the tape is stopped and is moved backward at normal speed, until the tape is positioned in the gap before the Tape Mark.

When this command is accepted :
- the condition register is set to "0"
- the C.U. switches to the Execute state
- the selected tape drive moves the tape forward at high speed until the Tape Mark is read. Then it stops the tape and moves it backward until the tape is positioned in the gap before the Tape Mark. No data check is performed.
- after the last stopcommand has been given to the drive, the C.U. switches to the Wait state and generates an interrupt.

Status and error conditions:
- when the tape mark has been found, statusbit no. 3 (Tape Mark) will be set after the command
- if no Tape Mark can be found, the tape stops:
  a) after 500 mm after the last block, or
  b) after the first data block after the end of tape hole, with statusbit no. 10 (end of tape) set.

## 4.2.1.3.10. WRITE A BLOCK FORWARD

This command writes a block of information on the tape.
When this command is accepted:

- the condition register is set to "0"
- the C.U. switches to the Execute state
- the selected tape drive turns on the write current, moves the tape forward and writes characters, taken from the BOU lines, after the start length. Before each character the controller switches to the Exchange state and issues an interrupt or a break signal, depending whether it is connected to a Programmed or a Multiplex channel. The written information is also read by the read head, to produce a cyclic check number, so that after reading the CRC-word at the end of the data, a data-check may be performed
- at the CIO stop command or at the End of Range signal, the tape is stopped in a position at least 17,3 mm after the postamble. After the stop command to the drive the C.U. switches to the Wait state and issues an interrupt signal.

why ?

17.8 mm after last block ?? Staat elders 34

Status and error conditions:

- if the CRC check fails, statusbit no. 13 (data error) is set
- if the information on the I/O bus is delayed too long, so that characters cannot be written according to the write clock, statusbit no. 14 (throughput error) is set
- if the end-of-tape hole is passed during the operation: bit 10 set
  a) before or while data is being written, status-bit no. 10 (end of tape) is set and memorized
  b) after data has been written, statusbit no. 10 will not be set, but the signal will be stored internally in the controller
- if the write command is attempted on a file protected cassette track, the command is accepted but not performed. In this case the C.U. switches to the Wait state, bit no. 6 (write unable) of the statusword is set and an interrupt signal is given.

## 4.2.1.3.11. READ A BLOCK FORWARD

This command reads a block of information from the appropriate track of the tape.

When this command is accepted:

- the condition register is set to "0"
- the C.U. switches to the execute state
- the selected tape drive moves the tape forward and reads the characters bit by bit as they pass the read head. After a character has been read, the C.U. switches to the Exchange state and issues an interrupt or a break signal, depending whether it is connected to a Programmed or a Multiplex channel. The information also produces a cyclic check number , so that after reading the CRC word at the end of the data, a data check may be performed.
- at the CIO stop command or at the End of Range signal, the transfer of data is stopped and the C.U. does not enter the Exchange state any more
- when the interblock gap is reached the tape is stopped and the C.U. switches to the Wait state and generates an interrupt signal

Status and error conditions:

- if bus cycle is delayed too long after an interrupt or a break signal, so that the next character is read before the previous one has been sent, statusbit no. 14 (Throughput error) is set
- if the CRC-check fails, statusbit no. 13 (data error) is set
- if the interblock gap is reached before the CIO stop or End of Range signal is given, or if the CIO stop or End of Range signal is given before the interblock gap is reached Statusbit no. 12 (Incorrect length) is set
- if the end-of-tape hole is during the operation: bit to set and memorized
  a) ~~before or while data is being read, statusbit no. 10~~ (end of tape) is set.

b) ~~after data has been read, statusbit no. 10 will not be set, but~~ the EOT signal will be stored internally in the controller

- if no data has been read for 500 mm the tape is stopped, bit no. 4 (no data) of the statusword will be set, the C.U. switches to the Wait state and generates an interrupt signal
- if the block was a Tape Mark, statusbit no. 3 (Tape Mark) is set..

4.2.1.3.12. CIO stop

Format:

| 0 | 1 | | | 4 | 5 | | 7 | 8 | 9 | 10 | 11 | | 15 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 1 | 0 | 0 | 0 | R1 | | | 1 | 0 | DN | X | U.A. | |

R1: The contents of the specified register is not significant.

DN: Device Number C.U.A.: Control Unit Address

This command stops all data transfer and stops tape movement as soon as possible. However the tape will be positioned properly in an interblock gap. The only commands that are affected by the CIO-stop are Write a block and Read a block forward. The CIO stop has to be programmed after the last character to be exchanged in case of Programmed Channel.

This command is always accepted and then :

- the condition register is set to "0"
- all data transfer is stopped and the tape is stopped in an interblock gap as soon as possible
- the C.U. switches to the Wait state and generates an interrupt signal. Status and error conditions: none.

4.2.1.3.13. TEST STATUS

Format:

| 0 | 1 | | | 4 | 5 | | 7 | 8 | 9 | 10 | 11 | | 15 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 1 | 0 | 0 | 1 | R1 | | | 1 | 0 | DN | C.U. | A. | |

R1: Specifies the register into which the statusbit is loaded.

DN: Device Number C.U.A.: Control Unit Address

This command tests whether the C.U. is busy or not. This fact is indicated in bit 15 of the status word.

This command is always accepted and then:

- the condition register is set to "0"
- the state of the C.U. is not changed
- bits 0 - 14 of the BIN lines are "0". Bit 15 is "1" if the CU is busy or "0" if the C.U. is ready. BIN-line information is loaded into R1. Status and error conditions: see above

4.2.1.3.14 Input to Register

Format:

| 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 1 | 0 | 0 | 1 | R1 | | | 0 | x | D.N. | | C.U.A. | | | |

R1: specifies the register into which the information is loaded.

X : don't care

D.N.: Device Number

CUA : Control Unit Address

This command transfers one character from the C.U. and loads it into the specified register.

When this command is accepted:

- the condition register is set to "0"
- the 8 bit contents of the CU buffer is sent to the right half of R1 via BIN-lines 8-15
- the C.U. switches to the Execute state
- the C.U. deserializes (assembles) the next character, after which it gives an interrupt signal and switches to the Exchange state.

Status and error conditions:

- if the INR command was given too late to transfer a character, the C.U. switches to the Wait state, sets status bit nr. 14 (throughput error) and generates an interrupt signal.

* This command is issued by Multiplex when connected on this channel

4.2.1.3.15 Output from Register

Format:

| 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 1 | 0 | 0 | 0 | R1 | | | 0 | x | 0 | X | C.U.A. | | | |

R1 : specifies the register from which the information is taken

X : don't care

~~D.N.: Device Number~~

CUA : Control Unit Address

This command takes one character from the specified register and transfers it to the C.U..

When this command is accepted:

- the condition register is set to "0"
- the right half of R1 is transferred to the 8-bits buffer of the C.U. via BOU-lines 8-15
- the C.U. switches to the Execute state
- the C.U. serializes the transferred character after which it gives an interrupt signal and switches to the Exchange state.

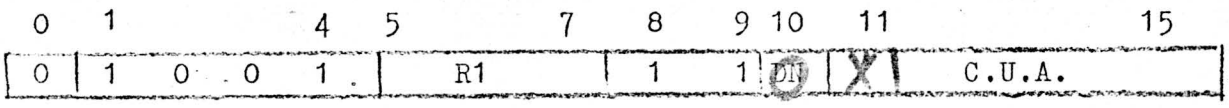
Status and error conditions:

- if the OTR command was given too late to keep in step with the write clock, the C.U. switches to the Wait state, sets status bit nr. 14 (throughput error) and generates an interrupt signal.

* command simulated by Multiflex

4.2.1.3.16 Send Status

Format:




R1 : specifies the register into which the status information is loaded.

D/N.: Device Number ~~X~~ Don't Care

CUA : Control Unit Address

This command transfers the status information of the addressed tape drive to the specified register.
When this command is accepted:
- the condition register is set to "0".
- the status of the addressed drive is transferred via the BIN-lines to the specified register.
- the C.U. switches to the inactive state.

Status and error conditions:
The status word consists of the following bits.
The description is valid when the bit is "1".
Reserved bits are always "0".

| | | |
|---|---|---|
| bit nr. | 0 | Reserved |
| | 1 | Has been not ready |
| | 2 | Reserved |
| | 3 | Tape Mark |
| | 4 | No data |
| | 5 | Begin of Tape |
| | 6 | Write Unable |
| | 7 | A-side |
| | 8 | Reserved |
| | 9 | Device Number |
| | 10 | End of Tape |
| | 11 | Program Error |
| | 12 | Incorrect Length |

13 Data Error

14 Throughput Error

15 C.U. Busy or Not operable

1. Has been not ready

The C.U. switches from the Inactive state to the Wait state, sets bit nr. 1 and generates an interrupt signal when a tape drive changes from not ready to ready. E.g. when a cassette is inserted.

3. Tape Mark

This bit is set when a one word datablock containing zeroes is detected during read, space or search commands.
If the word does not contain zeroes, the data error bit is set.

4. No data

When the tape is read and no data is encountered for 500 mm of tape, this status bit will be set and the tape movement is stopped.

5. Begin of tape

After a rewind operation this bit is set and also if a tape hole is passed in backward direction while the internal end of tape flipflop was not set.

6. Write Unable

When a write or erase command is given for a tape of which the operated track (A or B) is file protected, because no write-enable plug has been fitted, status bit nr. 6 is set.

7. A-side

This bit is set when the A-side of the cassette is up. When the B-side is up, this bit is "0".

10. End of tape

When a tape hole is passed in forward direction, ~~other than in rewind operation~~, ~~before or while writing or reading data this bit is set. If the hole is passed in forward direction after writing or reading data this bit is not set, but an internal flipflop will be set.~~ & until passed again in backward direction or K7 removed

11. Program Error

When the C.U. receives an invalid code from the Multiplex channel or if an invalid CIO-start command is given, this statusbit is set. No data will be exchanged on an invalid command.

12. Incorrect length

This bit is set when reading whenever the physical block length on the tape is different from the block length as stated in the multiplex channel.

13. Data Error

This bit is set when the CRC data check at the end of a block indicates an error. The check is only performed after the commands Read a block forward, Write a block forward, Search

14. Throughput error

If the serialization or deserialization during write or read commands is ended before the previous character has been exchanged with the CPU, this bit is set.
When a throughput error occurs:

a. when reading, no more data transfers are done, the tape is stopped in the interblock gap and the CU switches to the Wait state.

b. When writing, data transfer is stopped, the interblock gap is produced and the CU switches to the Wait state.

15. (Device) C.U. busy or Not operable

This bit is set if the C.U. is not in the Inactive state, or Device rewinding when it receives a Test status command, or when a command cannot be executed, due to the status of the cassette drive. E.g. cassette not inserted, no power, cassette not locked.

4.2.2. Element-user interface

User operation of the cassette system can simply be described as cassette insertion and retrieval.
Cassette insertion actuates a switch, which notifies the system that a cassette is in place.
After the system has locked the drive, the cassette cannot be retrieved. Only when the cassette has been unlocked again, it may be retrieved by pushing the retrieval knob.
The locked state is indicated by means of a light on the tape drive.
When a system reset (Master Clear) is given, all cassettes should be unlocked.

4.2.3 Logical interfaces

4.2.3.1 Interfaces drives-controller.

The 2 drives will be connected in ~~parallel~~ to the controller. The logical interface to each drive has been specified in Applicable document no. 2 (Purchase spec Philips ELA Drive dated 72 06 29.)

4.2.3.2 Interface controller CPU

This interface consists of the I/O bus and the interrupt line and break-line. The I/O bus interface has been described in Applicable document no. 3 (Element Performance Specification Element 3: Central Processor Section 6: Functional Performance. Chapter 4: Input/Output System and Chapter 5: Multiplex Channel. dated 25 11 1970).

The interrupt and break lines are single lines on which asynchronous signals are sent from the controller to the CPU. The interrupt signal will be deactivated when an ~~I/O~~ (SST) command is issued. The break signal will be deactivated as soon as a data transfer between CU and CPU is performed.

4.2.3.3. Logic levels

On all logic interfaces the voltages levels will be

"0" : >0V, < +0, 4V

"1" : >+2,4V, <+5,25V

On the controller-drive interface the load currents are specified in the referenced document.

On the controller - CPU interface the load currents are:

4.2.4 Electrical Interfaces

The power requirements for the drives are specified in the Purchase Specification Philips ELA drive (Applicable document no. 2). The +24V has to be supplied within the drive cabinet. The +5V may be taken from the controller cabinet.
The power supply for the control unit and I/O extender card will be:
+5V $\pm$5% 7.5A max.
The I/O extender will take about 2.2A and the drives take 1A so the controller may take 4.3A max.
The input to the power supplies will be 240, 220, 115 or 100V $\pm$10% single phase.
Voltage is not required to be changeable in the field. Frequency may be 50 Hz or 60 Hz $\pm$5%. Within the above tolerances the equipment should function normally. No damage may occur when voltage varies between zero and 115% of the nominal value and when it exceeds 115% to a maximum of 2KV during 100 /usec at a maximum frequency of 1 Hz.
Safety requirements as stated in VDE, UL, CSA and ECMA documents should be fulfilled.

4.2.5 Mechanical Interfaces

4.2.5.1 Drive cabinet

The drive dabinet will contain a maximum of 2 drives. The dimensions and fixations of the drives are described in (see applicable document no. 4). The drive cabinet has to fit in a 19" rack and will be max 3U high ($5\frac{1}{4}$"). The connector to fit in the drive will be supplied with it.

4.2.5.2. Controller cabinet

The controller cabinet will be hold the controller cards, I/O-extender and power supply. The controller and extender cards must have the normal Sagittaire card dimensions as described in Applicable document no. 5 (Sag. element: All control units. Baseline 3: Element design Specifications. Type of page: 4 Description of physical implementation. Dated: 15-6-1971).

4.3.1. Performance Characteristics

- The controller must be able to handle rewind operations on the two drives simultaneously or a rewind operation on one drive and any other command on the other.
- If an interrupt has to be given after an end of rewind it will remain pending until the C.U. is in the inactive state. ~~during~~ for 40. µs max scanning period
- No waiting time will be included in the commands to wait for the end of the action, except with LOCK and Search commands. (E.g. after the Forward signal has been deactivated, the C.U. does not wait until tha tape has stopped before it enters the Wait state. In case of read, the next command immediately starts the tape again. In case of write, the next command has to wait until the stop-time has ended, but the command will be accepted).
- The C.U. must make sure that a delay of 20 ms is taken into account between a forward and backward movement of the tape or vice versa without raising the C.U.-busy signal. In between two the same movements this delay will not be apllied.

4.3.2. Compatibility

The recording of information on the cassette tape should be in accordance with Applicable document no. 4 (ECMA 34). However, the recording on track 1 of the tape will be done in the same way as on track 2. (point 7.4 of ECMA 34).

For the Hardware-Software interface no compatibility is required with any standard and this will be as described in chapter 4 section 2.1.

4.3.3. Reliability.

Reliability of the whole cassette system can be split up in reliability of the cassette drive and of the controller. For the drive this will be as described in the Purchase Specification. For the controller this will be : an MTBF of at least 6000 operating hours under worst-case conditions as specified in this document.

### 4.3.4. Maintainability

The Mean Time To Repair for the cassette drive is specified in the Purchase Spec. For the controller this will be less than 1 hour To facilitate maintenance, the following requirements must be fulfilled:

- distance between components will allow to attach a normal size measuring clip to the DIL packages without touching other components (other DIL's, capacitors etc). A clearance of 1 mm between clip and component will be provided
- wrapped wires and jumper wires will not be stretched taut
- it must be possible to use an extender card for measuring purposes
- it must be possible to measure power supply voltages in working condition
- coordinates must be indicated on the card, as well as first and last pin number of every connector
- card number and type will also be indicated on the card

### 4.3.5. Environmental Conditions

These are equal for cassette drive and controller and are given in the Purchase Specification Philips ELA cassette drive

### 4.3.6. Storage, transportability and installation .

No addtional requirements concerning these aspects are given above the specifications in other chapters.

### 4.4.1. Logical Design Constraints

The logic design will be made using TTL circuits, which are normally available through at least 2 suppliers.
In case the controller will be microprogrammed, the control store may be MOS. In the design, calculating logic cycle time and circuitry timing, worst-case rules will be applied regarding voltage and temperature conditions.

### 4.4.2. Electrical Design Constraints

To ensure a world-wide acceptance, the design will fulfil all known requirements regarding safety and radiation as stated in documents of UL, CSA, VDE, ECMA etc. If all of these requirements cannot be fulfilled at the same time, because some of them are contradictory, provisions have to be made that at little or no extra cost the cassette system may be made to fulfil one requirement or the other, depending to what country the equipment is shipped.

### 4.4.3. Mechanical Design Constraints

Apart from requirements already given, no additional constraints are imposed.

4.5.1. Element Qualification

To qualify the cassette system at element level the following procedures should be executed:

- all I/O commands should be executed properly while checking status and error conditions
- with every I/O command all mentioned status and error conditions will be enforced and statusbits, ending of commands etc will be checked
- test programs, which check all I/O commands will run under extreme conditions of supply voltage and temperature

4.5.2. System Integration Test

The cassette drives and controller will be built into a Sagittaire system and will run by means of standard system software.
The configuration of the Sagittaire system will contain at least: line printer, paper tape reader, paper tape punch and teletype.
All of these devices should be working simultaneously together with the cassette. Writing and reading of the cassette will be checked and interference to or from the cassette will also be checked upon.

4.5.3. Reliability testing

a) Of each cassette drive and controller used in test procedures a record will be kept, stating all failures and errors during test
b) Of all cassette systems in the field also a record will be kept in order to be able to verify the required MTBF figures and to modify the equipment if necessary.