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FM	VOL:1043	Secondary Storage Controller (SESCO)	Document number
CHAPTER:	-		SOF 24251
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TITLE:	Secondary Storage Controller (SESCO)
DEPARTMENT:	System Hardware
MAINTENANCE:	Helmut Schönwald
DATE:	131082

EINGANG
25. OCT. 1982
-CONF. MAN.

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Supersedes doc. no.		Date 821013
SOF.		Page -.-.-/1
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NPRI - STECKERBELEGUNG
- PORTBELEGUNG
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FM VOL: 1043 Secondary Storage Controller (SESC)	Document number
CHAPTER: -	SOF 24252
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	Eck, R. van	P&P
	Staalduinen, J.v.	DSS
	Thijssen, P.	DSS
	Tolsma	DSS/SDT
	Vries, E. de	SSS

Eiserfeld:

Messrs.:	Deis	3140
	Dietrich	329
	Ginsberg	3120
	Henrichs	249
	Hoevelaken, van	3150
	Kabbe	3120
	Klein	3150
	Kramer	249
	Ruby	219
	Schaffrath	3120
	Schmidt, H.W.	3230
	Schmücker	3140
	Schönwald	3140
	Werner	3120
	Technical Library(3X)	3150

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Eindhoven:

Mr. Schoot, H.v.d. C-ISA/TIS-CARD/MAIC

Prep. by: van Hoevalaken	A631043 (---)2	FMV 1043
Supersedes doc. no.		Date 821210
SOF.		Page ---/2

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FM VOL: 1043 Secondary Stoprage Controller (SESCO)
CHAPTER: -
SECTION: - Configuration Index
SUBJECT: -

Document number
SOF 24253
Distribution
Confidential

Change Order		82.161					
Page Number	Title	Doc.No	Sup.By	Sup.By	Sup.By	Sup.By	Sup.By
--.-./1	Title Page	24251					
--.-./2	Mailing List	24252					
--.-./3	Configuration Index	24253					
--.-./4	" "	24254					
10.0.-/1	Table of Contents	24255					
10.0.-/2	" " "	24256					
10.0.-/3	" " "	24257					
10.1.-/1	Scope	24258					
10.2.-/1	Applicable Documents	24259					
10.2.-/2	" "	24260					
10.3.1/1	External Interfaces	24261					
10.3.1/2	" "	24262					
10.3.1/3	" "	24263					
10.3.1/4	" "	24264					
10.3.1/5	" "	24265					
10.3.1/6	" "	24266					
10.3.1/7	" "	24267					
10.3.1/8	" "	24268					
10.3.1/9	" "	24269					
10.3.1/10	" "	24270					
10.3.1/11	" "	24271					
10.3.1/12	" "	24272					
10.3.1/13	" "	24273					
10.3.1/14	" "	24274					
10.3.1/15	" "	24275					
10.3.1/16	" "	24276					
10.3.1/17	" "	24277					
10.3.1/18	" "	24278					
10.3.1/19	" "	24279					
10.3.1/20	" "	24280					
10.3.1/21	" "	24281					
10.3.1/22	" "	24282					
10.3.1/23	" "	24283					
10.3.1/24	" "	24284					
10.3.1/25	" "	24285					
10.3.1/26	" "	24286					

Prep. by: van Hoevelaken

A631043 (--.-./3)2

FMV 1043

Supersedes doc. no.

Date 821210

SOF.

Page --.-./3

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FM VOL: 1043 Secondary Stoprage Controller (SESCO)
CHAPTER: -
SECTION: - Configuration Index
SUBJECT: -

Document number
SOF 24254
Distribution
Confidential

Change Order		82.161					
Page Number	Title	Doc.No	Sup.By	Sup.By	Sup.By	Sup.By	Sup.By
10.3.1/27	External Interface	24287					
10.3.1/28	" "	24288					
10.3.1/29	" "	24289					
10.3.1/30	" "	24290					
10.3.1/31	" "	24291					
10.3.1/32	" "	24292					
10.3.1/33	" "	24293					
10.3.1/34	" "	24294					
10.3.1/34.1	" "	24295					
10.3.1/35	" "	24296					
10.3.1/36	" "	24297					
10.3.1/37	" "	24298					
10.3.1/38	" "	24299					
10.3.1/39	" "	24300					
10.3.1/40	" "	24301					
10.3.1/41	" "	24302					
10.3.1/42	" "	24303					
10.3.1/43	" "	24304					
10.3.2/1	Performance	24305					
10.3.2/2	" "	24306					
10.3.2/3	" "	24307					
10.3.2/4	" "	24308					
10.3.3/1	Design Constraints	24309					
10.3.3/2	" "	24310					
10.3.3/3	" "	24311					
10.3.3/4	" "	24312					
10.3.3/5	" "	24313					
10.4.1/1	Quality Assurance	24314					
10.4.2/1	" "	24315					
10.4.2/2	" "	24316					
10.4.2/3	" "	24317					
10.4.2/4	" "	24318					
10.4.3/1	" "	24319					
10.4.4/1	" "	24320					
10.-.A/1	Appendix A	24321					
10.-.B/1	Appendix B	24322					

Prep. by: van Hoevelaken

A631043 (-.-.-/4)3

FMV 1043

Supersedes doc. no.

Date 821213

SOF.

Page -.-.-/4

Property of:

Philips Data Systems · Unternehmensbereich der Philips Kommunikations Industrie AG · 5900 Siegen 31

FM VOL: 1043 Secondary Storage Controller (SESCO)		Document number
CHAPTER: 10 Element Performance Specification		SOF 24255
SECTION: 0 Table of Contents		Distribution
SUBJECT: -		Confidential

0	<u>Table of Contents</u>
1	Scope
2	Applicable Documents
3	Requirements
3.1	External Interfaces
3.1.1	General
3.1.2	Interface Hardware-Software
3.1.2.1	General
3.1.2.2	I/O System Summary
3.1.2.3	Theory of Operation
3.1.2.3.1	Flexible Disk Control
3.1.2.3.2	SASI Control
3.1.2.3.3	DMA Control
3.1.2.3.4	Operator Panel Control
3.1.3	Interface Hardware - User
3.1.4	Logical Interfaces
3.1.4.1	EMM Bus Interface
3.1.4.2	Shugart Associates System Interface
3.1.4.3	SA450 Flexible Disk Interface
3.1.4.4	Operator Panel Interface
3.1.5	Electrical Interfaces
3.1.5.1	EMM Bus Interface
3.1.5.2	Shugart Associates System Interface
3.1.5.3	Flexible Disk Drive Interface
3.1.5.4	Operator Panel Interface
3.1.6	Mechanical Interfaces
3.1.6.1	Connector Pin Assignments
3.1.7	Thermal Interfaces
3.1.7.1	Operating Conditions
3.1.7.2	Component Limits

Prep. by: H. Schönwald	A611043 (10.0.-/1)2	FMV 1043
Supersedes doc. no. SOF.		Date 821013 Page 10.0.-/1
Property of:		

FM VOL:1043 Secondary Storage Controller (SESCO)			Document number
CHAPTER: 10 Element Performance Specification			SOF 24256
SECTION: 0 Table of Contents			Distribution
SUBJECT: -			Confidential
<p>3.1.7.3 Component T_a Related to Reliability</p> <p>3.2 Performance</p> <p>3.2.1 General</p> <p>3.2.2 Performance Characteristics</p> <p>3.2.3 Operability</p> <p>3.2.3.1 Reliability</p> <p>3.2.3.2 Maintainability</p> <p>3.2.3.2.1 Maintenance and Repair Cycles</p> <p>3.2.3.2.2 Diagnostics</p> <p>3.2.3.3 Useful Life</p> <p>3.2.3.4 Human Performance</p> <p>3.2.3.5 Safety</p> <p>3.2.4 Environment</p> <p>3.2.5 Storage, Transportability and Installation</p> <p>3.3 Design Constraints</p> <p>3.3.1 General</p> <p>3.3.2 Software Design Constraints</p> <p>3.3.3 Logical Design Constraints</p> <p>3.3.4 Electrical Design Constraints</p> <p>3.3.5 Mechanical Design Constraints</p> <p>3.3.6 Technological Design Constraints</p> <p>3.3.7 Thermal Design Constraints</p> <p>3.3.8 Test and Diagnostic Tools and Provisions</p> <p>3.3.8.1 Test Application Notes</p> <p>4 Quality Assurance</p> <p>4.1 Preliminary Qualification</p> <p>4.1.1 Calculation of the Failure Rate</p> <p>4.1.2 Component-Case-Temperatures</p> <p>4.2 Element Qualification</p> <p>4.2.1 Verification of the Logical Interface Functions</p> <p>4.2.2 Verification of the Performance Characteristics</p>			
Prep. by: H. Schönwald		A611043 (10.0.-/2)3	FMV 1043
Supersedes doc. no.			Date 821213
SOF.			Page 10.0.-/2
Property of: Philips Data Systems · Unternehmensbereich der Philips Kommunikations Industrie AG · 5900 Siegen 31			



FM	VOL. 1043	Secondary Storage Controller (SESCO)	Document number
CHAPTER:	10	Element Performance Specification	SOF 24257
SECTION:	0	Table of Contents	Distribution
SUBJECT:	-		Confidential

- 4.2.3 Test: Data Error Rate
- 4.2.4 Test Environmental Conditions
 - 4.2.4.1 Thermal Requirements
 - 4.2.4.2 Mechanical Requirements
 - 4.2.4.3 Component Case-Temperature-Limits
- 4.3 System Integration Test
- 4.4. Reliability Test

- Appendix A Recommended Initializing Parameters for FD
- Appendix B SASI Application Notes

Prep. by: H. Schönwald	A611043 (10.0.-/3)4	FMV 1043
Supersedes doc. no. SOF.		Date 821015 Page 10.0.-/3
Property of: Philips Data Systems · Unternehmensbereich der Philips Kommunikations Industrie AG · 5900 Siegen 31		

FM VOL:1043 Secondary Storage Controller (SESCO) CHAPTER: 10 Element Performance Specification SECTION: 1 Scope SUBSECT: -	Document number SOF 24258
	Distribution Confidential

1 Scope

This document specifies the functions of the Secondary Storage Controller (abbrev. SESCO) which is used within the P3000 System.

The SESCO shall provide for the following properties:

- adaptation of up to two 5,25" Flexible Disk Drives of the type Philips X3114
- a Shugart Associates System Interface (SASI) to connect SASI-devices internally and externally as well
- DMA-support for the Flexible Disk channel
- an Interface to control the Operator Panel

The communication between the host and the SESCO shall be done via the EMM-Bus. Because of its DMA-facility the SESCO will behave as a bus master.

Prep. by: H. Schönwald	A611043 (10.1.-/1)5	FMV 1043
Supersedes doc. no. SOF.		Date 821213 Page 10.1.-/1
Property of: Philips Data Systems · Unternehmensbereich der Philips Kommunikations Industrie AG · 5900 Siegen 31		

FM VOL 1043 Secondary Storage Controller (SESCO)		Document number
CHAPTER: 10 Element Performance Specification		SOF 24259
SECTION: 2 Applicable Documents		Distribution
SUBJECT: -		Confidential

2

Applicable Documents

/R0/

Data System Standards

- Vol 1: Electronic/Electrical Components
- Vol 2: Environmental Conditions
- Vol 3: Standardization on Packaging

/R1/

HPF VOL 2108, EMM-System Bus Specification

/R2/

The 8086 Family User's Manual, October 1979.

/R3/

NEC Catalog, 1982

/R4/

SASI - Shugart Associates System Interface
ANSI Doc. X3T9.3 No. 185, Rev. E

/R5/

HPF VOL 2109, Two-Sided 130mm Flexible Disk Cartridge

/R6/

HPF VOL 2134, mFD One Sided/Two Sided 96 tpi

/R7/

Standard ECMA-70, Data Interchange on 130mm Flexible
Disk Cartridge using MFM recording at 7958 ftprad on
both sides, January 1981.

/R8/

1st Draft Standard ECMA TC19/81/10 Data Interchange on
130mm Flexible Disk Cartridges using MFM at 7958
ftprad on both sides. 3.8 Tracks-per mm.

Prep. by: H. Schönwald	A611043 (10.2.-/1)6	FMV 1043
Supersedes doc. no.		Date 821015
SOF.		Page 10.2.-/1

Property of:
Philips Data Systems · Unternehmensbereich der Philips Kommunikations Industrie AG · 5900 Siegen 31



FM	VOL. 1043	Secondary Storage Controller (SESCO)	Document number
CHAPTER:	10	Element Performance Specification	SOF 24260
SECTION:	2	Applicable Documents	Distribution
SUBJECT:	-		Confidential

/R9/ XEBEC S1410 5 1/4" Winchester Disk Controller Owner's Manual

/R10/ AMD Multimode DMA Controller Description

/R11/ Intel Application Note A9-116

Prep. by: H. Schönwald	A611043 (10.2.-/2)7	FMV 1043
Supersedes doc. no.		Date 821015
SOF.		Page 10.2.-/2
Property of: Philips Data Systems · Unternehmensbereich der Philips Kommunikations Industrie AG · 5900 Siegen 31		

FM	VOL:1043	Secondary Storage Controller (SESCO)	Document number
CHAPTER:	10	Element Performance Specification	SOF24261
SECTION:	3	Requirements	Distribution
SUBJECT:	1	External Interfaces	Confidential

3 Requirements

3.1 External Interfaces

3.1.1 General

Figure 3.1.1-1 shows the specified external interfaces:

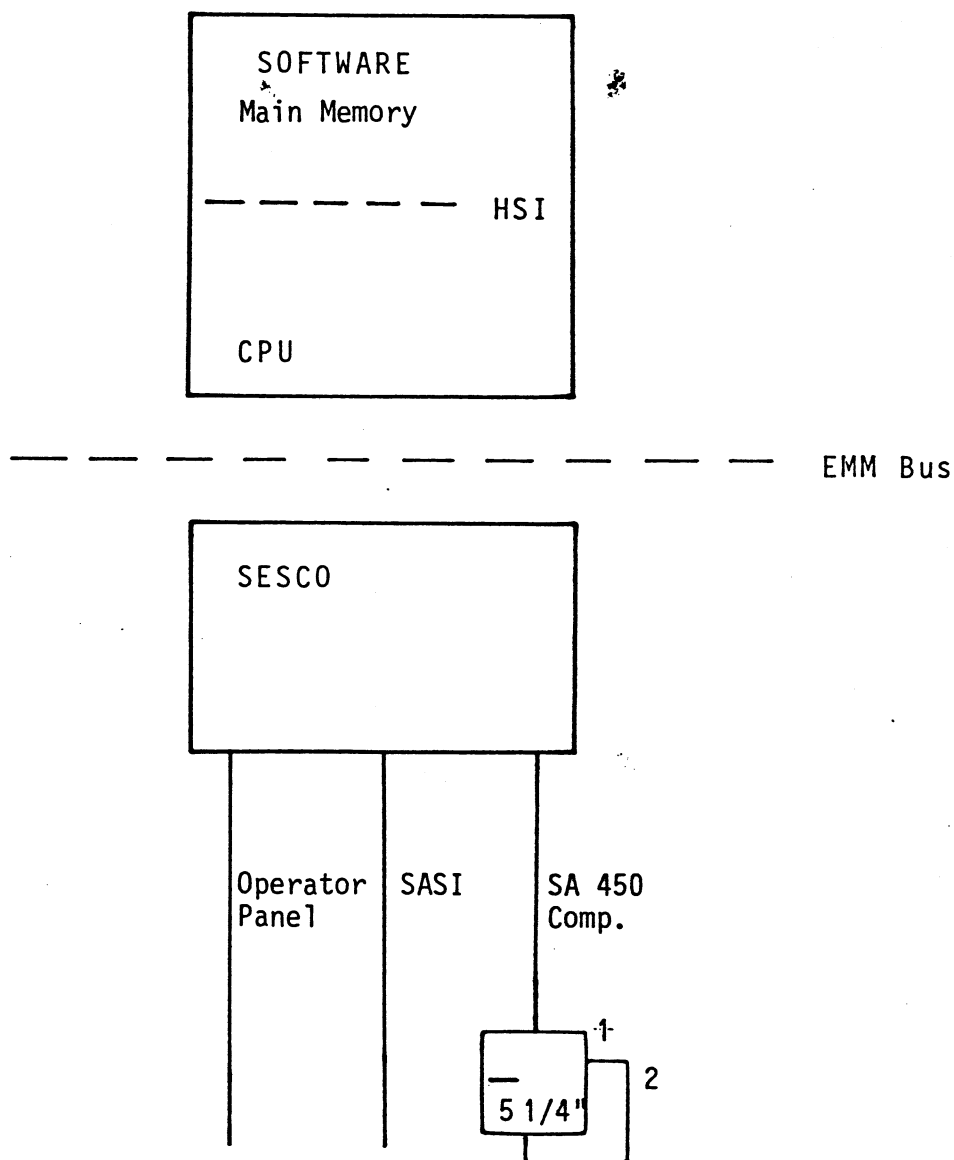


Figure 3.1.1-1

Prep. by: H. Schönwald	A611043 (10.3.1/1)8	FMV 1043
Supersedes doc. no. SOF.		Date 821013 Page 10.3.1/1
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FM VOL: 1043 Secondary Storage Controller (SESCO)
CHAPTER: 10 Element Performance Specification
SECTION: 3 Requirements
SUBJECT: 1 External Interfaces

Document number

SOF 24262

Distribution

Confidential

3.1.2 Interface Hardware-Software

3.1.2.1 General

The SESCO is represented at the Hardware-Software-Interface as a set of input and output ports (see figure 3.1.2.1-1). These ports/registers can be accessed via the EMM-Bus and may be summarized in different groups:

- Register set for Flexible Disk Control
 - . 8 bit Main Status Register, accessible at any time
 - . 8 bit Data Register which stores data, commands, parameters and FDC status information
 - . ports to control
 - .. the random logic round the FDC
 - .. additional device interface lines
 - .. lines supporting the inside test
- Register set for SASI Control
 - . 8 bit SASI Data Port for commands, data and status transfer
 - . 8 bit SASI Control Port
 - . 8 bit SASI Status Port
- Register set of the DMA-Controller
 - see /R10/
- Register for Operator Panel Control
 - . 8 bit register for switching the LED's

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A611043 (10.3.1/2)9

FMV 1043

Supersedes doc. no.

Date 821013

SOF.

Page 10.3.1/2

Property of:

Philips Data Systems · Unternehmensbereich der Philips Kommunikations Industrie AG · 5900 Siegen 31

FM VOL:1043 Secondary Storage Controller (SESCO)
CHAPTER: 10 Element Performance Specification
SECTION: 3 Requirements
SUBJECT: 1 External Interfaces

Document number
SOF 24263
Distribution
Confidential

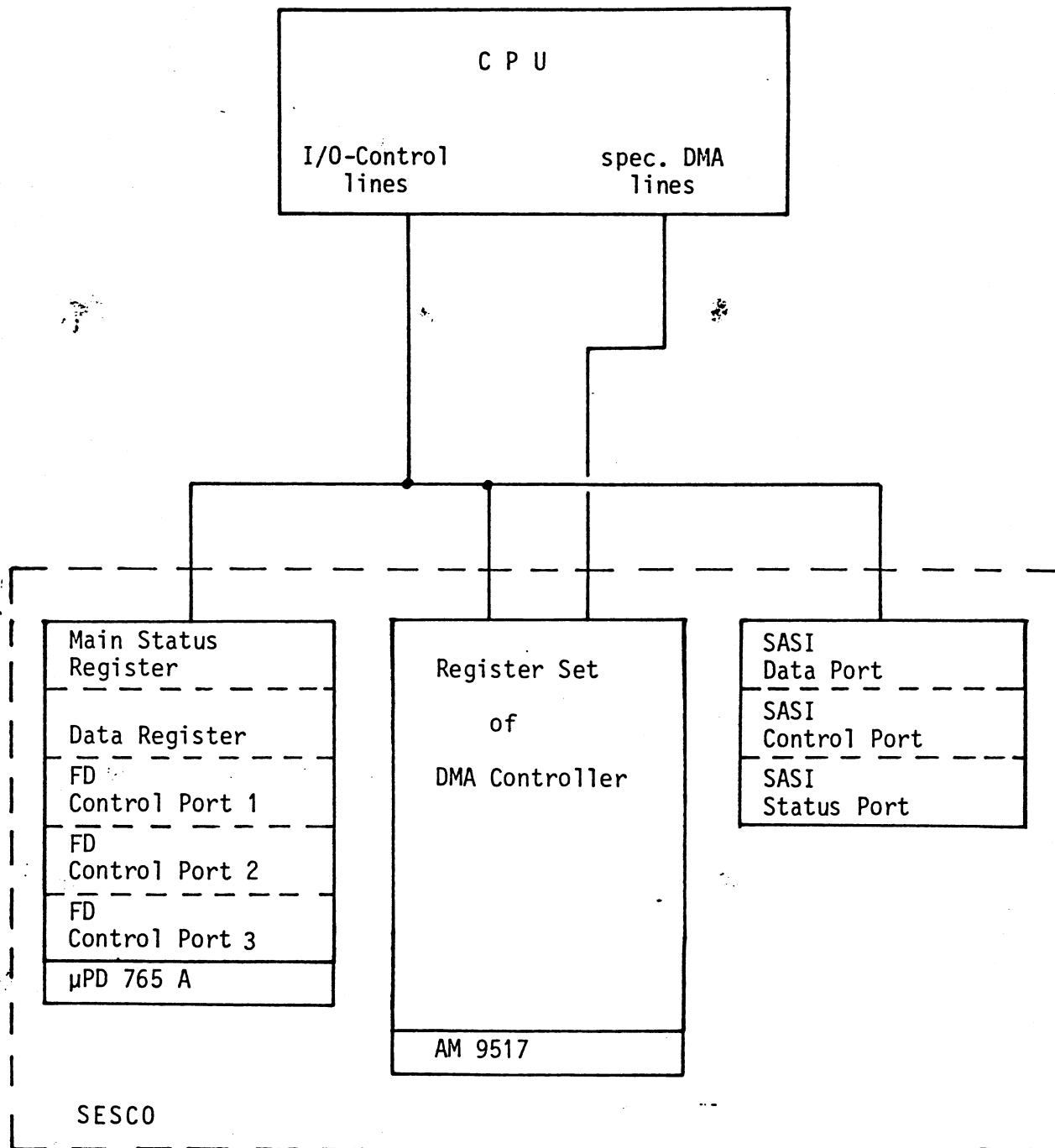


Figure 3.1.2.1-1

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A611043 (10.3.1/3)10

FMV 1043

Supersedes doc. no.

Date 821013

SOF.

Page 10.3.1/3

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FM VOL 1043 Secondary Storage Controller (SESCO)
CHAPTER: 10 Element Performance Specification
SECTION: 3 Requirements
SUBJECT: 1 External Interfaces

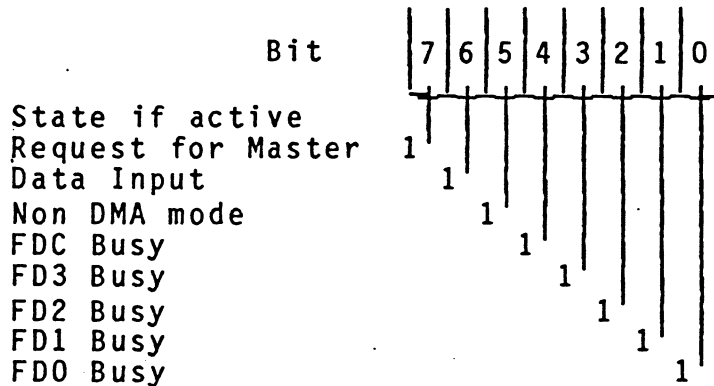
Document number
SOF 24264
Distribution
Confidential

3.1.2.2 I/O - System Summary

- Flexible Disk Control

ADDRESS	REGISTER/PORT
000A0	Main Status Register
000A2	Data Register
000A8	FD Control Port 1
000AA	FD Control Port 2
000AB	FD Control Port 3

MAIN STATUS REGISTER ADDR: 000A0



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A611043 (10.3.1/4)11

FMV 1043

Supersedes doc. no.

Date 821025

SOF.

Page 10.3.1/4

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FM VOL 1043 Secondary Storage Controller (SESCO)
CHAPTER: 10 Element Performance Specification
SECTION: 3 Requirements
SUBJECT: 1 External Interfaces

Document number
SOF 24265
Distribution
Confidential

FD CONTROL PORT 1
loadable only

ADDR: 000A8

Bit	7	6	5	4	3	2	1	0
Commands if active	1							
In Use 2		1						
In Use 1			1					
Motor on 2				1				
Motor on 1					x			
not used						1		
Enable Interface							x	
not used								0
Programmable FDC Reset								

FD CONTROL PORT 2
loadable only

ADDR: 000AA

Bit	7	6	5	4	3	2	1	0
Commands if active	1							
Write Precomp Inhibit 1								
not used		x						
not used			x					
not used				x				
not used					x			
not used						x		
Test LED on							0	
Read Write Test Reset								0

FD CONTROL PORT 3
readable only

000A8

Bit	7	6	5	4	3	2	1	0
State if active	1							
not used	x							
not used		x						
Interrupt FDC			0					
R/W Data Continuous				0				
FDC R/W Operation					0			
FDC Step Command Inward						1		
FDC Step Command Outward						0		
not used							x	
FDC Ready Test Drive 0								0

Control Port 1 and 2 are cleared to "0" after Master Reset.

Prep. by: H. Schönwald	A611043 (10.3.1/5)12	FMV 1043
Supersedes doc. no.		Date 821015
SOF.		Page 10.3.1/5
Property of: Philips Data Systems · Unternehmensbereich der Philips Kommunikations Industrie AG · 5900 Siegen 31		



FM VOL 1043 Secondary Storage Controller (SESCO)
CHAPTER: 10 Element Performance Specification
SECTION: 3 Requirements
SUBJECT: 1 External Interfaces

Document number
SOF 24266
Distribution
Confidential

- DMA Control

ADDRESS	REGISTER / PORT / COMMAND	LOAD ABLE	READ ABLE
00 60	BASE AND CURRENT ADDRESS REG CHANNEL 0	X	X
00 61	BASE AND CURRENT WORD COUNT REG CHANNEL 0	X	X
00 62	BASE AND CURRENT ADDRESS REG CHANNEL 1	X	X
00 63	BASE AND CURRENT WORD COUNT REG CHANNEL 1	X	X
00 64	BASE AND CURRENT ADDRESS REG CHANNEL 2	X	X
00 65	BASE AND CURRENT WORD COUNT REG CHANNEL 2	X	X
00 66	BASE AND CURRENT ADDRESS REG CHANNEL 3	X	X
00 67	BASE AND CURRENT WORD COUNT REG CHANNEL 3	X	X
00 68	STATUS/COMMAND REG	X	X
00 69	REQUEST REG	X	—
00 6A	WRITE SINGLE MASK REGISTER BIT	X	—
00 6B	MODE REG	X	—
00 6C	CLEAR BYTE POINTER FF	X	—
00 6D	READ TEMP REG/MASTER CLEAR	X	X
00 6E	_____	—	—
00 6F	WRITE ALL MASK REG BITS	X	—

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A611043 (10.3.1/6)13

FMV 1043

Supersedes doc. no.

Date 821015

SOF.

Page 10.3.1/6

Property of:

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FM VOL: 1043 Secondary Storage Controller (SESCO)
CHAPTER: 10 Element Performance Specification
SECTION: 3 Requirements
SUBJECT: 1 External Interfaces

Document number
SOF 24267
Distribution
Confidential

Word Count and Address Register, ADDR: 60-67

Channel	Register	Operation	Signals							Internal Flip/Flop	Data Bus DB0-DB7
			CS	IOR	IOW	A3	A2	A1	A0		
0	Base & Current Address	Write	0	1	0	0	0	0	0	0	A0-A7
			0	1	0	0	0	0	0	1	A8-A15
	Current Address	Read	0	0	1	0	0	0	0	0	A0-A7
			0	0	1	0	0	0	0	1	A8-A15
	Base & Current Word Count	Write	0	1	0	0	0	0	1	0	W0-W7
			0	1	0	0	0	0	1	1	W8-W15
1	Base & Current Address	Write	0	1	0	0	0	1	0	0	A0-A7
			0	1	0	0	0	1	0	1	A8-A15
	Current Address	Read	0	0	1	0	0	1	0	0	A0-A7
			0	0	1	0	0	1	0	1	A8-A15
	Base & Current Word Count	Write	0	1	0	0	0	1	1	0	W0-W7
			0	1	0	0	0	1	1	1	W8-W15
2	Base & Current Address	Write	0	1	0	0	1	0	0	0	A0-A7
			0	1	0	0	1	0	0	1	A8-A15
	Current Address	Read	0	0	1	0	1	0	0	0	A0-A7
			0	0	1	0	1	0	0	1	A8-A15
	Base & Current Word Count	Write	0	1	0	0	1	0	1	0	W0-W7
			0	1	0	0	1	0	1	1	W8-W15
3	Base & Current Address	Write	0	1	0	0	1	1	0	0	A0-A7
			0	1	0	0	1	1	0	1	A8-A15
	Current Address	Read	0	0	1	0	1	1	0	0	A0-A7
			0	0	1	0	1	1	0	1	A8-A15
	Base & Current Word Count	Write	0	1	0	0	1	1	1	0	W0-W7
			0	1	0	0	1	1	1	1	W8-W15
3	Current Word Count	Read	0	0	1	0	1	1	1	0	W0-W7
			0	0	1	0	1	1	1	1	W8-W15

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Page 10.3.1/7

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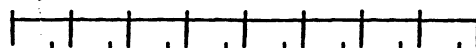
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CHAPTER: 10 Element Performance Specification
SECTION: 3 Requirements
SUBJECT: 1 External Interfaces

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Status Register, ADDR: 00 68

7 6 5 4 3 2 1 0 — Bit Number



State if active

1 Channel 0 has reached TC
1 Channel 1 has reached TC
1 Channel 2 has reached TC
1 Channel 3 has reached TC

1 Channel 0 request
1 Channel 1 request
1 Channel 2 request
1 Channel 3 request

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SECTION: 3 Requirements
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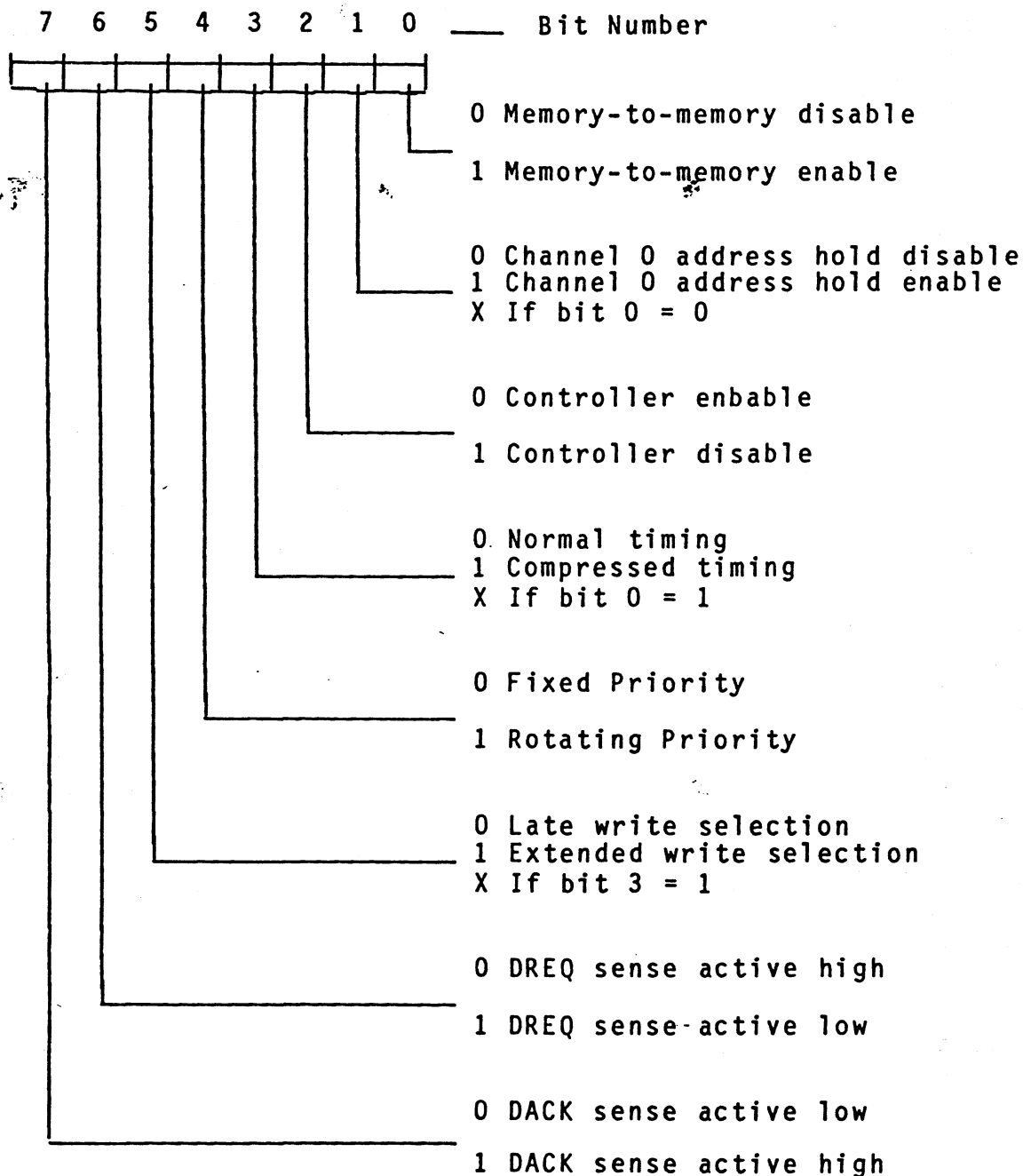
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Command Register, ADDR: 00 68



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Page 10.3.1/9

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SECTION: 3 Requirements
SUBJECT: 1 External Interfaces

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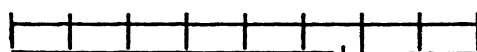
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Request Register, ADDR: 00 69 Loadable only

7 6 5 4 3 2 1 0 — Bit Number



Don't Care

00 Select channel 0

01 Select channel 1

10 Select channel 2

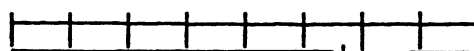
11 Select channel 3

0 Reset request bit

1 Set request bit

Write Single Mask Register Bit, ADDR: 00 6A Loadable only

7 6 5 4 3 2 1 0 — Bit Number



Don't Care

00 Select channel 0 mask bit

01 Select channel 1 mask bit

10 Select channel 2 mask bit

11 Select channel 3 mask bit

0 Clear mask bit

1 Set mask bit

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Date 821013

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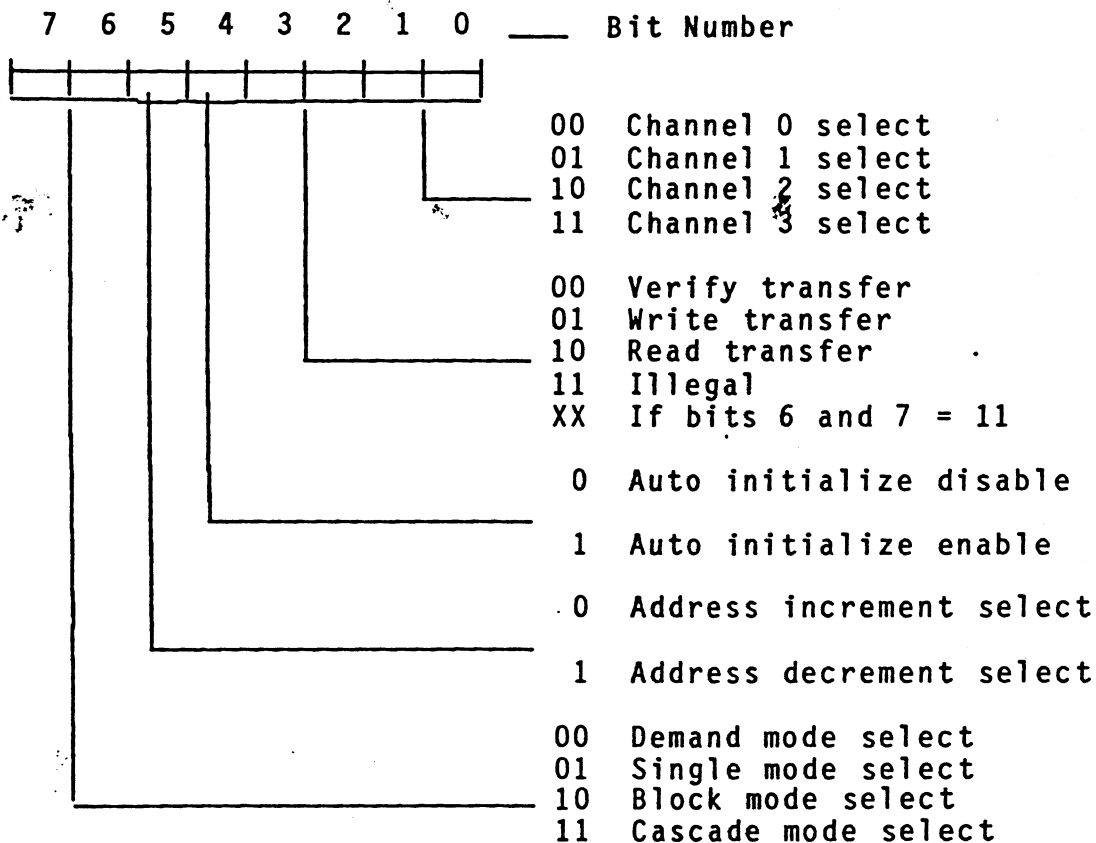
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SECTION: 3 Requirements
SUBSECT: 1 External Interfaces

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Mode Register, ADDR: 00 6B Loadable only



Clear Byte Pointer Flip-Flop, Software Command, during
write access to Address 00 6C the bit pattern on the data
bus are don't care.

Read Temporary Register, ADDR: 00 6D is not used

Master Clear, ADDR: 00 6D, this software instruction has
the same effect as the hardware reset.

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Page 10.3.1/11

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CHAPTER: 10 Element Performance Specification
SECTION: 3 Requirements
SUBJECT: 1 External Interfaces

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Write All Mask Register Bits, ADDR: 00 6F loadable only

7 6 5 4 3 2 1 0 — Bit Number



0 Clear Channel 0 mask bit

1 Set Channel 0 mask bit

0 Clear Channel 1 mask bit

1 Set Channel 1 mask bit

0 Clear Channel 2 mask bit

1 Set Channel 2 mask bit

0 Clear Channel 3 mask bit

1 Set Channel 3 mask bit

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Page 10.3.1/12

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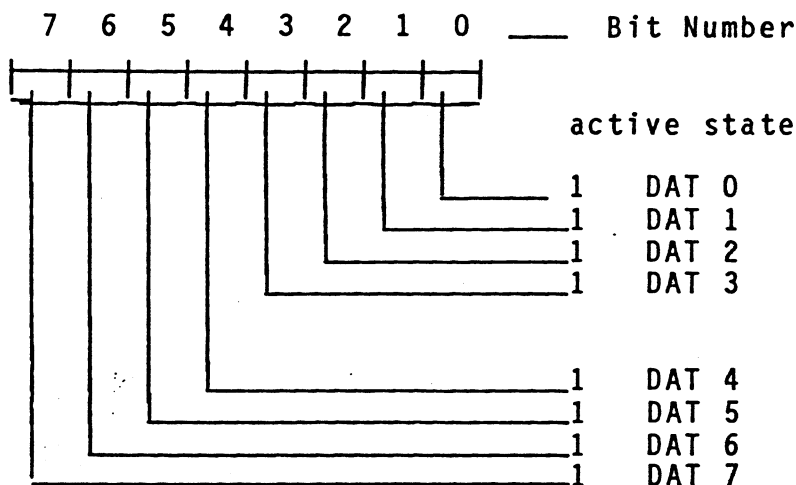
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SECTION: 3 Requirements
SUBJECT: 1 External Interfaces

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- SASI Control

Address	Port
0080	SASI Data Port
0082	SASI Control Port
0082	SASI Status Port

SASI DATA PORT, ADDR: 00 80



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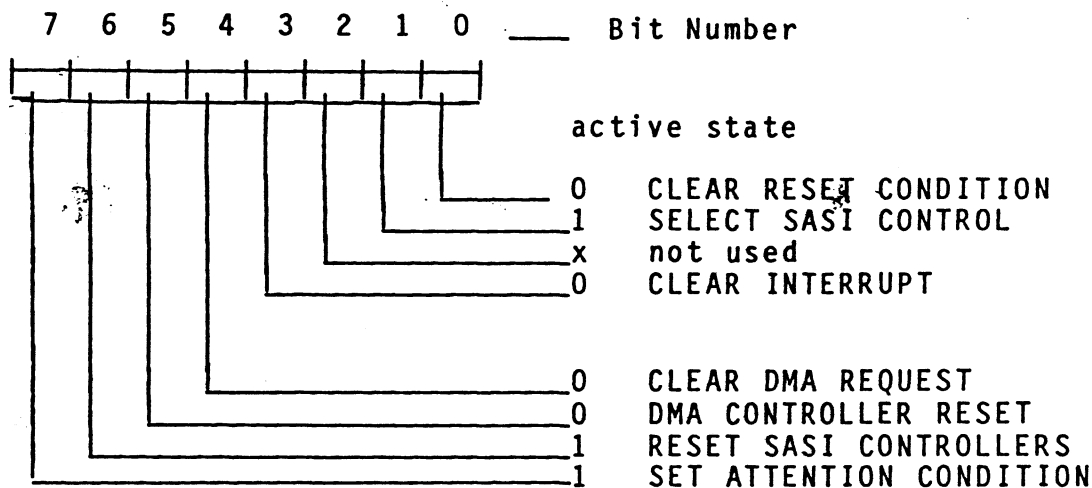
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SECTION: 3 Requirements
SUBJECT: 1 External Interfaces

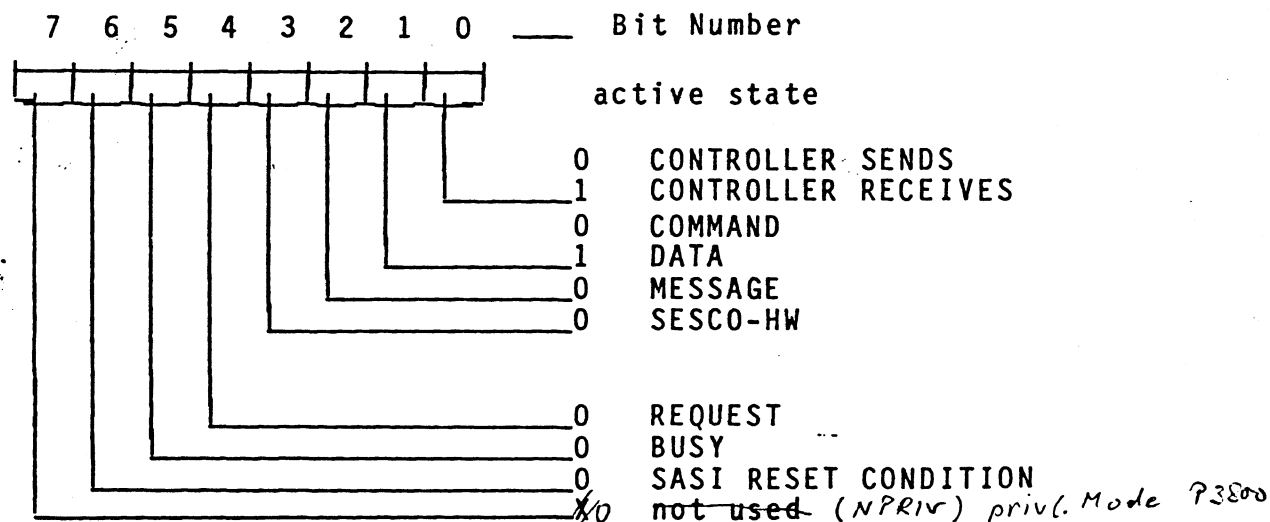
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SASI CONTROL PORT, ADDR: 00 82, cannot be read



This port is cleared to 00H after Master Reset.

SASI Status Port, ADDR: 00 82, cannot be written



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Date 821015

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Page 10.3.1/14

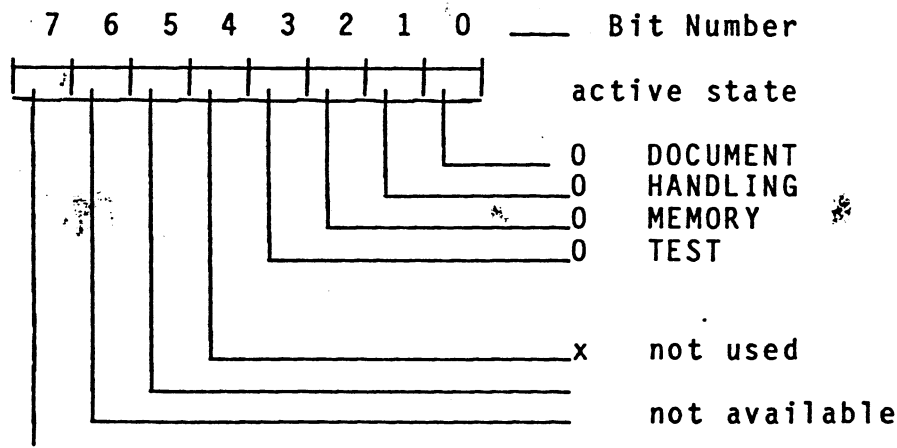
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OPERATOR PANEL CONTROL PORT, ADDR: 00 88 loadable only



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Page 10.3.1/15

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CHAPTER: 10 Element Performance Specification
SECTION: 3 Requirements
SUBJECT: 1 External Interfaces

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3.1.2.3 Theory of Operation

Because of the gathering of functions within the SESCO

- Flexible Disk Control
- SASI Control
- DMA Control
- Operator Panel Control

each of these sub functions will separately be treated in the following chapters.

3.1.2.3.1 Flexible Disk Control

Command Set

For the command set see the corresponding chapter in /R3/.

Command Handling

Before issuing any command to the Flexible Disk Controller all relevant control port bits have to be set on a proper value.

Command execution is done in three phases

- Receiving of a command and the concerning parameter string to perform a particular operation.
- execution phase
Executing the required function. Data exchange can be performed by DMA or by host I/O-operations dependent on whether DMA - or non DMA-mode has been specified.

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Page 10.3.1/16

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SECTION: 3 Requirements
SUBJECT: 1 External Interfaces

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In case of DMA-mode selected data transfer will be performed via channel 2 of the DMA controller.

- result phase

At the end of the execution phase the interrupt line NIR7 will be activated. Status information should be picked up by the host. See also /R3/!

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Page 10.3.1/17

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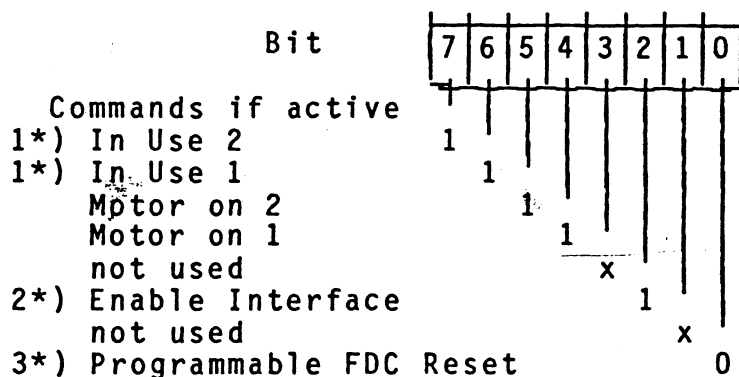
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SECTION: 3 Requirements
SUBJECT: 1 External Interfaces

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FD CONTROL PORT 1

ADDR: 00A8

Output Port, cannot be read



The port is cleared to "0" after Master Reset!

Notes:

- 1*) Causes the LED of corresponding drive to be switched on.
- 2*) Applies to the drive interface lines
 - STEP
 - HEAD SELECT (Head 1 selected)
 - WRITE ENABLE
 - WRITE DATA
- 3*) Reset for the controller chip.
Should be activated for a time > 4 msec.

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Page 10.3.1/18

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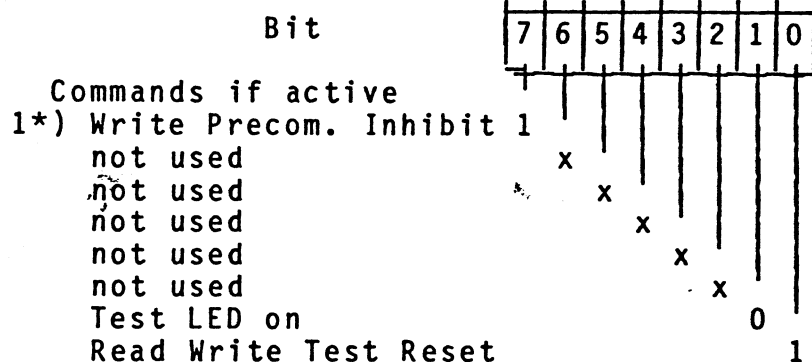
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CHAPTER: 10 Element Performance Specification
SECTION: 3 Requirements
SUBJECT: 1 External Interfaces

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FD CONTROL PORT 2

ADDR: 00AA

Output Port, cannot be read



The port is cleared to "0" after Master Reset!

Notes:

- 1*) Must be set in case of 5 1/4" Flexible Disk Cartridge
48 tpi.

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A611043 (10.3.1/19)26

FMV 1043

Supersedes doc. no.

Date 821015

SOF.

Page 10.3.1/19

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CHAPTER: 10 Element Performance Specification
SECTION: 3 Requirements
SUBJECT: 1 External Interfaces

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FD Control Port 3

Address: 000A8, Input Port

	Bit	7	6	5	4	3	2	1	0
States if active									
not used		0							
not used			0						
Interrupt FDC				0					
1*) R/W Data Continuous					0				
2*) FD Read/Write Operation						0			
3*) FD Step Command Test inward							1		
FD Step Command Test outward							0		
not used								0	
FD Ready Test Drive 0									0

Notes:

- 1*) Latched Read/Write Data signal
- 2*) Active during execution of a read or write operation
- 3*) Signals an executed head movement.

(see also chapter 3.3.8).

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Supersedes doc. no. SOF.		Date 821013 Page 10.3.1/20
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CHAPTER: 10 Element Performance Specification
SECTION: 3 Requirements
SUBJECT: 1 External Interfaces

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3.1.2.3.2 SASI Control

Communication via SASI must be done in accordance to the rules described in /R4/. In the terminology of this specification the SESCO will behave as an INITIATOR without the ability of arbitration.

From the host's point of view the SASI-Bus is represented by a set of three ports.

- SASI Data Port
- SASI Control Port
- SASI Status Port

Whenever the host wishes to start up any device via the SASI-Bus it sets the bit "Select SASI Controller" and write the TARGET DEVICE ID, it wants to communicate with, into the SASI Data Port. In parallel the "Set Attention Condition" - bit may be set.

Thereafter the host has to wait for an interrupt (or the bit "Request" in SASI Status Port being set respectively) to start up the Command Phase.

After the selected device has signalled its BUSY interrupt 4 of the EMM-Bus will be activated to wake up the host.

If data exchange is part of the command execution this will be performed either by host I/O - operations dependent on the relevant bits in the SASI Status port or by DMA. In case of DMA channel 3 will control the data transfer.

If the selected device is ready to send any status information an interrupt to the host will be generated which should induce the host to start the Status Phase.

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A611043 (10.3.1/21)28

FMV 1041

Supersedes doc. no.

SOF.

Date 821015

Page 10.3.1/21

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CHAPTER: 10 Element Performance Specification
SECTION: 3 Requirements
SUBJECT: 1 External Interfaces

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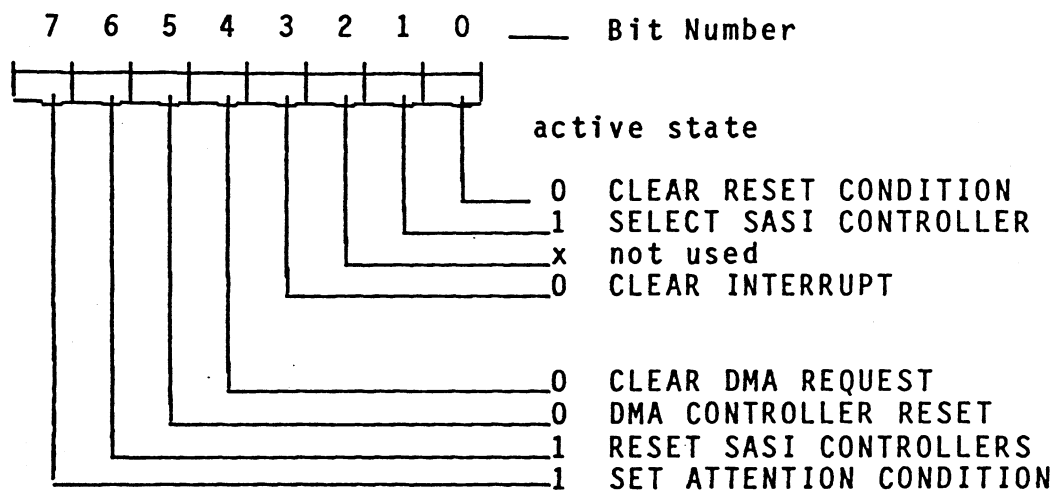
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SASI Data Port

Address 80H: Input/Output Port

During a Command -, Data Out - or Message Out Phase this port is used to transfer the corresponding bytes from SESCO to TARGET. During a Status -, Data In or Message In Phase this port is used to transfer the corresponding bytes from TARGET to SESCO.

SASI Control Port ADDR: 00 82, cannot be read



This port is cleared to 00H after Master Reset.

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FMV 1041

Supersedes doc. no.

Date 821013

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Page 10.3.1/22

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CHAPTER: 10 Element Performance Specification
SECTION: 3 Requirements
SUBJECT: 1 External Interfaces

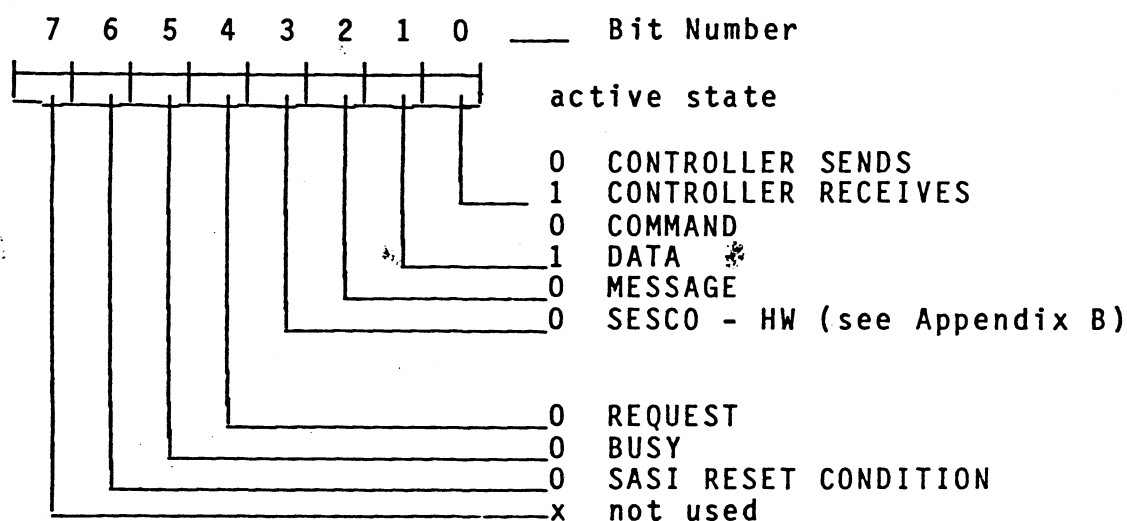
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SASI Status Port ADDR: 00 82, cannot be written



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A611043 (10.3.1/23) 30

FMV 1041

Supersedes doc. no.

Date 821213

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Page 10.3.1/23

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CHAPTER: 10 Element Performance Specification
SECTION: 3 Requirements
SUBJECT: 1 External Interfaces

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3.1.2.3.3 DMA Control

The SESCO is equipped with a DMA-Controller of the AM 9517 type which offers four independent channels. Two of these channels will be used to control DMA operations of SESCO internal sub-functions

- Channel 2 is connected to the Flexible Disk Controller
- Channel 3 is connected to the SASI Control logic.

Channel 0 combined with channel 1 may be used by the host to accomplish memory-to-memory transfer.

For all details concerning programming of the DMA-Controller see /R10/.

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CHAPTER: 10 Element Performance Specification
SECTION: 3 Requirements
SUBJECT: 1 External Interfaces

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3.1.2.3.4 Operator Panel Control

Operator Panel Control will be done via one write only register at address 0088H. This Operator Panel Control Port is used to set/reset the LED's on the Operator Panel.

After Master Reset the port is cleared to "0"!

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FMV 1041

Supersedes doc. no.

SOF.

Date 821015

Page 10.3.1/25

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CHAPTER: 10 Element Performance Specification
SECTION: 3 Requirements
SUBJECT: 1 External Interfaces

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3.1.3 Interface Hardware - User

There is a test LED on the SESCO board to indicate the result of
an inside test performed by the host.

This LED will be switched on during Master Reset!

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FMV 1041

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Page 10.3.1/26

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CHAPTER: 10 Element Performance Specification
SECTION: 3 Requirements
SUBJECT: 1 External Interfaces

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3.1.4 Logical Interfaces

Logical interfaces according to figure 3.1.1-1 are:

- EMM Bus Interface
- Shugart Associates System Interface (SASI)
- SA 450 Flexible Disk Interface
- Operator Panel Interface

3.1.4.1 EMM Bus Interface

In the environment of the EMM Bus the SESCO operates as an 8 bit master which is adapted to the lower half of the EMM Bus data lines. Beyond the standard signals, the SESCO connects three special lines

- DMA Request 1 (NDRQ1)
- DMA Acknowledge 1 (NDACK1)
- Terminal Count 1 (NTC1)

which allow external controlling of DMA channel 1.

Two interrupt lines are assigned to the SESCO of which interrupt 7 supports Flexible Disk Control and interrupt 4 belongs to SASI Control.

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A611043 (10.3.1/27)34

FMV 1041

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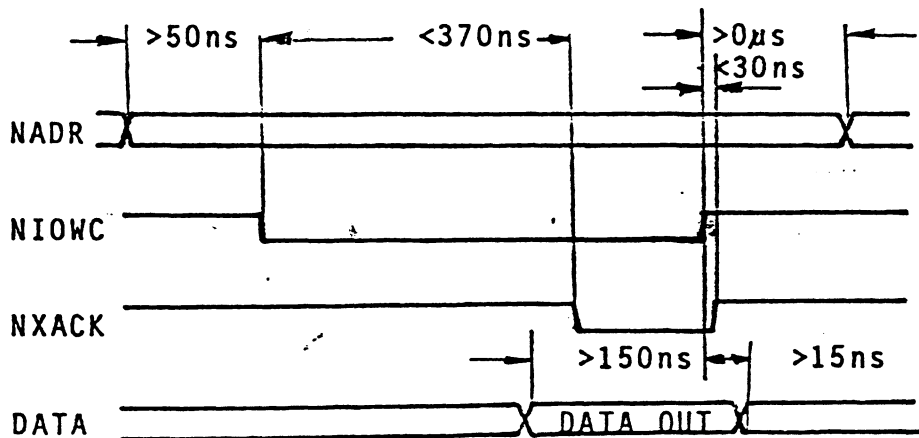
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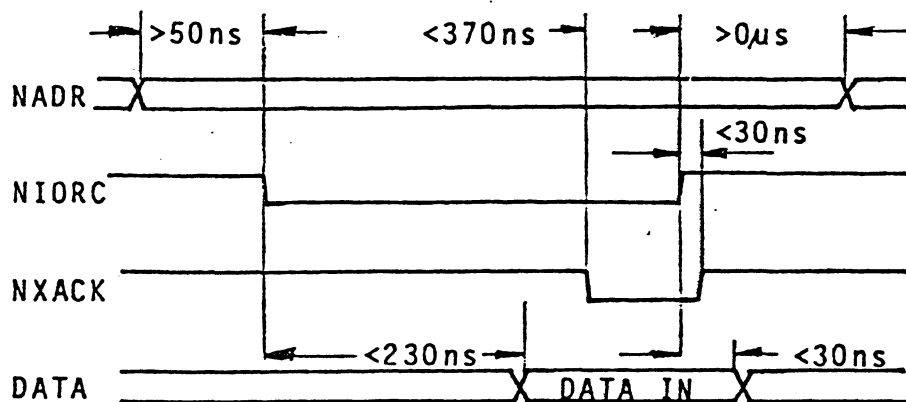
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SECTION: 3 Requirements
SUBJECT: 1 External Interfaces

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- I/O Operations on the EMM Bus



I/O-Write Timing



I/O-Read Timing

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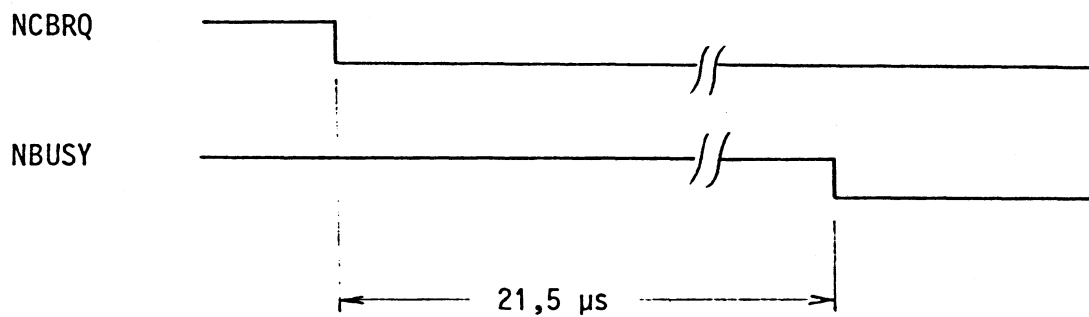


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CHAPTER: 10 Element Performance Specification
SECTION: 3 Requirements
SUBJECT: 1 External Interfaces

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- DMA Operations on the EMM Bus

To achieve an online data transfer between the Flexible Disk Drive and the memory via the EMM Bus timing considerations below have to be observed.



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A611043 (10.3.1/29)36

FMV 1041

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Page 10.3.1/29

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CHAPTER: 10 Element Performance Specification
SECTION: 3 Requirements
SUBJECT: 1 External Interfaces

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3.1.4.2 Shugart Associates System Interface

The SESCO will offer access to the SASI-Bus so that the host is represented at SASI as an INITIATOR with BUS DEVICE ID "1" which is the lowest priority on the bus.

For all details concerning SASI see /R4/!

3.1.4.3 SA 450 Flexible Disk Interface

The SESCO is able to control up to two Flexible Disk Drives of the Philips X3114 type with SA 450 interface and the following options

- 3 select lines
- ready line
- 2 in use lines
- mechanical head load
- ejector
- 2 motor on lines
- no doorlock/unlock

The Philips 12 NC-No. 8708 000 00 599 is assigned to the above characterized drive.

For all details concerning the interface to the Flexible Disk Drive see /R6/!

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A611043 (10.3.1/30)37

FMV 1041

Supersedes doc. no.

Date 821015

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Page 10.3.1/30

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CHAPTER: 10 Element Performance Specification
SECTION: 3 Requirements
SUBSECT: 1 External Interfaces

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3.1.4.4 Operator Panel Interface

The Operator Panel is connected to the following SESCO internal lines:

DAT 0 - DAT 4
NMR
NWRDI
~~NWRHX~~

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A611043 (10.3.1/31)38

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Page 10.3.1/31

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CHAPTER: 10 Element Performance Specification
SECTION: 3 Requirements
SUBJECT: 1 External Interfaces

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3.1.5 Electrical Interfaces

The power consumption of the SESCO at +5V \pm 5% will be

2,9 A max.
1,9 A typ.

3.1.5.1 EMM Bus Interface

The SESCO is connected to the following bus lines:

bus signal	type	fan in	fan out
NADRO - NADR7	Transceiver 3-state	H: 0,02 mA L: -0,4 mA	H: - 15 mA L: 48 mA
NADR8 - NADR15	Driver 3-state	—	H: - 15 mA L: 24 mA
NDATO - NDAT7	Transceiver 3-state	H: 0,02 mA L: -0,4 mA	H: - 15 mA L: 48 mA
NIOWC, NIORC	Driver, Receiver 3-state	H: 0,02 mA L: -0,2 mA	H: - 15 mA L: 24 mA
NMWC, NMRC	Driver 3-state	—	H: - 15 mA L: 24 mA
NXACK	Driver, Receiver Open Coll.	H: 0,02 mA L: -0,4 mA	L: 60 mA
NBPRI	Receiver	H: 0,04 mA L: -0,8 mA	—
NBPRQ	Driver	—	H: -0,4 mA L: 8 mA
NCBRQ	Driver Open Coll.	—	L: 60 mA
NBUSY	Driver, Receiver Open Coll.	H: 0,02 mA L: -0,4 mA	L: 60 mA
NBCLK	Driver	—	H: -1,0 mA L: 20 mA
NDRQ1	Receiver	H: 0,02 mA L: -0,4 mA	—
NDACK1, NTC1	Driver Open Coll.	—	L: 60 mA
RSLN	Receiver	H: 0,02 mA L: -0,4 mA	—
NIR4, NIR7	Driver Open Coll.	—	L: 60 mA

For references see /R1/1

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Supersedes doc. no.		Date 821025
SOF.		Page 10.3.1/32
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FM VOL.1043 Secondary Storage Controller (SESCO)
CHAPTER: 10 Element Performance Specification
SECTION: 3 Requirements
SUBJECT: 1 External Interfaces

Document number

SOF 24293

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3.1.5.2 Shugart Associates System Interface

The SESCO is connected to the following SASI lines:

signal	type	fan in	fan out
NDB0 - NDB7	Driver, Receiver O.C.	H: 0,02 mA L: -0,2 mA	L: 48 mA
NACK, NATN, NSEL, NBSY, NRST,	Driver Open Coll.	—	L: 48 mA
I/O, C/D, NMSG, NREQ, NBSY, NRST, NSEL,	Receiver	H: 0,02 mA L: -0,4 mA	—

For references see /R4/!

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A611043 (10.3.1/33)40

FMV 1042

Supersedes doc. no.

Date 821013

SOF.

Page 10.3.1/33

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FM VOL: 1043 Secondary Storage Controller (SESCO)
CHAPTER: 10 Element Performance Specification
SECTION: 3 Requirements
SUBJECT: 1 External Interfaces

Document number
SOF 24294
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3.1.5.3 Flexible Disk Drive Interface

The SESCO will provide for an electrical interface to the Flexible Disk Drive in accordance to /R6/.

Termination of the SESCO driven signals must be done at the physically last connected drive (see figure 3.1.5.3-1).

Transmitter/Receiver Characteristics

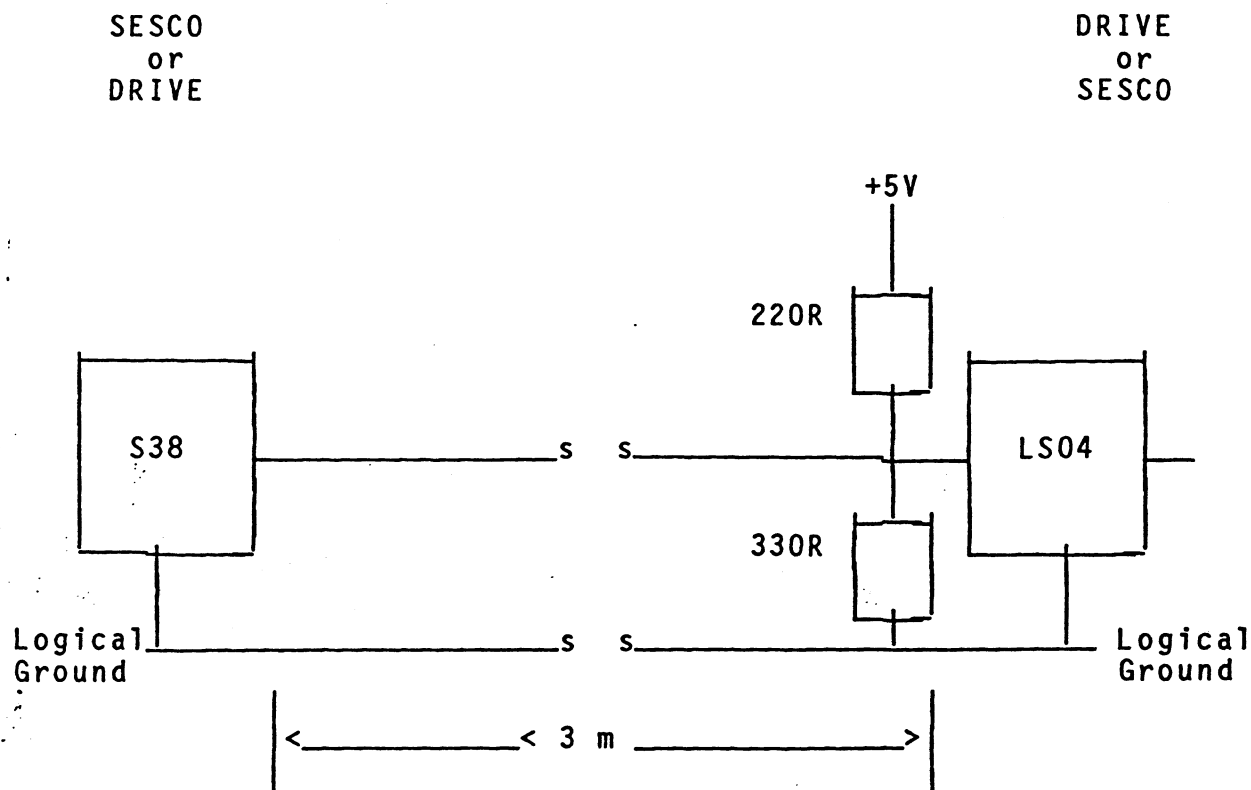


Figure 3.1.5.3-1

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A611043 (10.3.1/34) 41

FMV 1042

Supersedes doc. no.

Date 821013

SOF.

Page 10.3.1/34

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Philips Data Systems · Unternehmensbereich der Philips Kommunikations Industrie AG · 5900 Siegen 31

FM VOL. 1043 Secondary Storage Controller (SESCO)
CHAPTER: 10 Element Performance Specification
SECTION: 3 Requirements
SUBJECT: 1 External Interfaces

Document number
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3.1.5.4 Operator Panel Interface

The Operator Panel is connected to the following internal bus lines:

signal	type	fan in	fan out
DAT 0 - DAT 4	Transceiver 3-state	H: 0,02 mA L: -0,4 mA	H: - 15mA L: 48 mA
NWRDI, NWRHX	Driver	—	H: -0,4 mA L: 8 mA
NMR	Driver	—	H: -0,4 mA L: 8 mA

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A611043 (10.3.1/34)41.1

FMV 1042

Supersedes doc. no.

Date 821015

SOF.

Page 10.3.1/34.1

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FM VOL 1043 Secondary Storage Controller (SESCO)
CHAPTER: 10 Element Performance Specification
SECTION: 3 Requirements
SUBJECT: 1 External Interfaces

Document number

SOF 24296

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3.1.6 Mechanical Interfaces

The hardware elements of the SESCO are allocated on a standard double euro PCB.

Except for SASI the cables of all supported interfaces can be plugged into a connector concerned, for SASI there are two connectors

- "SASI intern" to support the internal - that means allocated in same cabinet as the SESCO - devices
- "SASI extern" to plug in a cable for connection of SASI - Devices allocated in other cabinets

Note: In case of no external SASI-Device connected, a Terminator Print has to be plugged into the "SASI extern" connector!

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A611043 (10.3.1/35)42

FMV 1042

Supersedes doc. no.

Date 821015

SOF.

Page 10.3.1/35

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Philips Data Systems · Unternehmensbereich der Philips Kommunikations Industrie AG · 5900 Siegen 31

FM VOL:1043 Secondary Storage Controller (SESCO)
CHAPTER: 10 Element Performance Specification
SECTION: 3 Requirements
SUBJECT: 1 External Interfaces

Document number
SOF 24297
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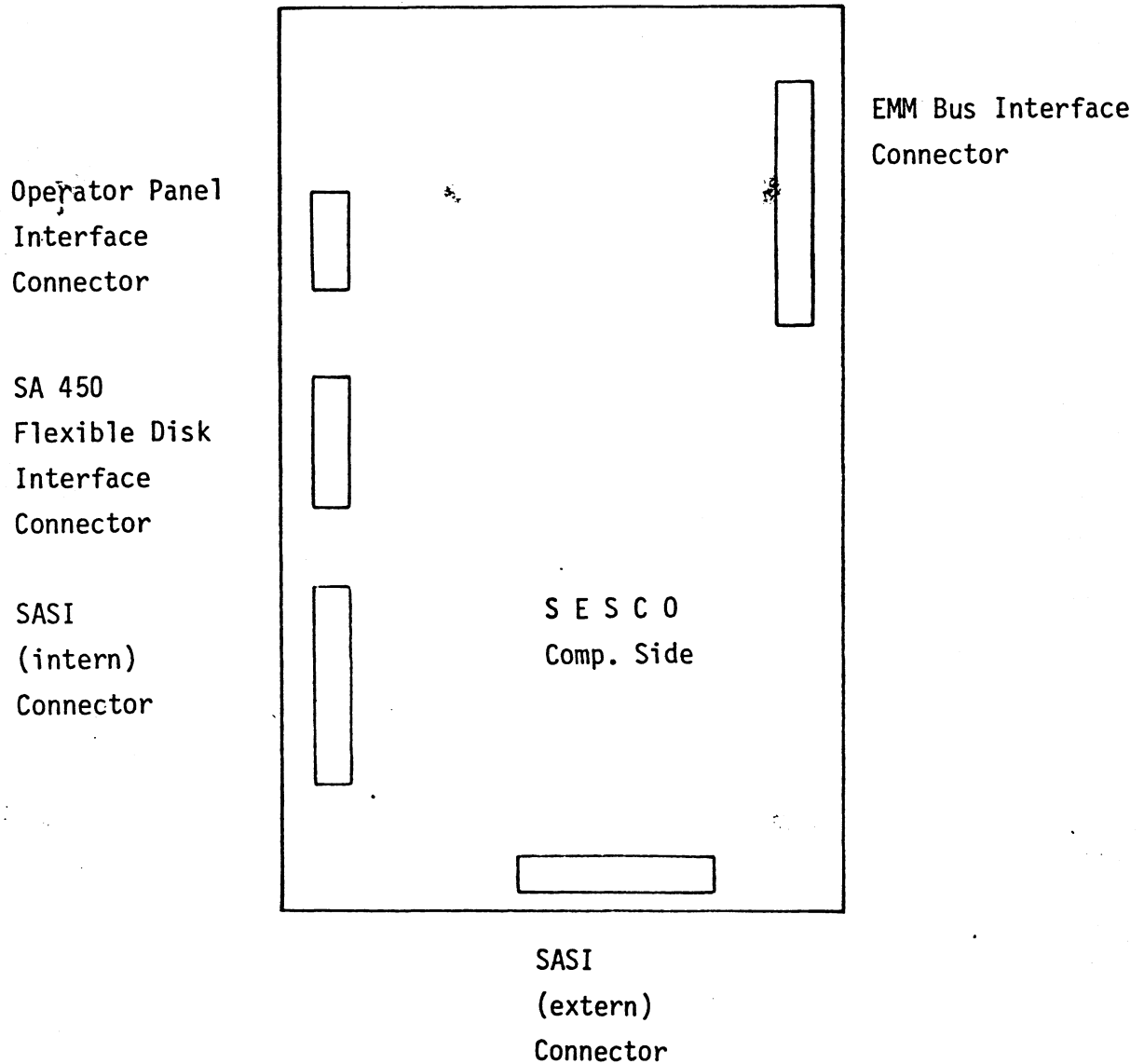


Figure 3.1.6-1

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A611043 (10.3.1/36)43

FMV 1042

Supersedes doc. no.

Date 821013

SOF.

Page 10.3.1/36

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Philips Data Systems · Unternehmensbereich der Philips Kommunikations Industrie AG · 5900 Siegen 31

FM VOL 1043 Secondary Storage Controller (SESCO)
CHAPTER: 10 Element Performance Specification
SECTION: 3 Requirements
SUBJECT: 1 External Interfaces

Document number

SOF 24298

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3.1.6.1 Connector Pin Assignments

In the connector descriptions below a Berg connector may alternatively be used instead of a Piercing connector marked with (*). The key of these Berg connectors must be inserted into the most significant pin of row "b".

- EMM Bus Connector

Euro, 96 pol

	c	b	a
1	+5V	+5V	+5V
2	0V	+5V	
3	0V	0V	0V
4			
5	NCBRO	NBCLK	NBUSY
6	NDACK1		NDRQ1
7	NTC1		
8			
9			NIR4
10	NIR7	RSLN	
11	0V	0V	0V
12	NDAT2	NDAT1	NDATO
13	NDAT5	NDAT4	NADT3
14		NDAT7	NDAT6
15			
16			
17			
18	0V	0V	0V
19	NADR2	NADR1	NADRO
20	NADR5	NADR4	NADR3
21	NADR8	NADR7	NADR6
22	NADR11	NADR10	NADR9
23	NADR14	NADR13	NADR12
24			NADR15
25			
26			
27			NIOWC
28	NMWC		NIORC
29	NMRC		NXACK
30	NBPRO		NBPRI
31			+12V
32			-12V

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A611043 (10.3.1/37)44

FMV 1043

Supersedes doc. no.

Date 821015

SOF.

Page 10.3.1/37

Property of:

Philips Data Systems · Unternehmensbereich der Philips Kommunikations Industrie AG · 5900 Siegen 31

FM VOL:1043 Secondary Storage Controller (SESCO)
CHAPTER: 10 Element Performance Specification
SECTION: 3 Requirements
SUBJECT: 1 External Interfaces

Document number
SOF 24299
Distribution
Confidential

- SASI - Connectors

SASI (intern)

SASI (extern)

Piercing, 50 pol*

Berg, 5 pol
Berg, 49 pol

(b)		(a)	
1	0V	NDB0	2
3	0V	NDB1	4
5	0V	NDB2	6
7	0V	NDB3	8
9	0V	NDB4	10
11	0V	NDB5	12
13	0V	NDB6	14
15	0V	NDB7	16
17	0V		18
19	0V		20
21	0V		22
23	0V		24
25	0V		26
27	0V		28
29	0V		30
31	0V		32
33	0V		34
35	0V	NBSY	36
37	0V	NACK	38
39	0V	NRST	40
41	0V	NMSG	42
43	0V	NSEL	44
45	0V	C/D	46
47	0V	NREQ	48
49	0V	I/O	50

b		a
1	+5V	+5V
2	+5V	
3	//////////	
1	0V	NDB0E
2	0V	NDB1E
3	0V	NDB2E
4	0V	NDB3E
5	0V	NDB4E
6	0V	NDB5E
7	0V	NDB6E
8	0V	NDB7E
9	0V	
10	0V	
11	0V	
12	0V	
13	0V	
14	0V	
15	0V	
16	0V	
17	0V	
18	0V	NBSYE
19	0V	NACKE
20	0V	NRSTE
21	0V	NMSG
22	0V	NSELE
23	0V	C/D
24	0V	NREQ
25	//////////	I/O

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A611043 (10.3.1/38)45

FMV 1043

Supersedes doc. no.

Date 821213

SOF.

Page 10.3.1/38

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FM VOL:1043 Secondary Storage Controller (SESCO)
CHAPTER: 10 Element Performance Specification
SECTION: 3 Requirements
SUBJECT: 1 External Interfaces

Document number
SOF 24300
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Flexible Disk Drive Connector

Piercing, 34 pol*

(b)		(a)	
1	OV	2	NURDY
3	OV	4	NINU1
5	OV	6	NMOT2
7	OV	8	NIND
9	OV	10	NUS1
11	OV	12	NUS2
13	OV	14	NUS3
15	OV	16	NMOT1
17	OV	18	NDIR
19	OV	20	NSTP
21	OV	22	NWRDA
23	OV	24	NWREN
25	OV	26	NTRO
27	OV	28	NWRP
29	OV	30	NREDA
31	OV	32	NHDS
33	OV	34	NINU2

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A611043 (10.3.1/39)46

FMV 1043

Supersedes doc. no.

Date 821013

SOF.

Page 10.3.1/39

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FM VOL. 1043 Secondary Storage Controller (SESCO)
CHAPTER: 10 Element Performance Specification
SECTION: 3 Requirements
SUBSECT: 1 External Interfaces

Document number
SOF 24301
Distribution
Confidential

Operator Panel Connector

Piercing, 16 pol*

1	DATIVO	0V	2
3	DATIV1	0V	4
5	DATIV2	0V	6
7	DATIV3	0V	8
9	NWRDI	0V	10
11	NWRHX	0V	12
13	DATIV4	NMR	14
15	+5V	+5V	16

alternatively may be used

Berg, 15 pol

1	DATIVO	0V	2
3	DATIV1	0V	4
5	DATIV2	0V DATIV5	6
7	DATIV3	0V DATIV6	8
9	NWRDI	0V DATIV7	10
11	NWRHX NSYSID	0V NPRIV	12
13	DATIV4	NMR	14
15	+5V		16

(3800)

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A611043 (10.3.1/40)47

FMV 1043

Supersedes doc. no.

Date 821013

SOF.

Page 10.3.1/40

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FM VOL: 1043 Secondary Storage Controller (SESCO)
CHAPTER: 10 Element Performance Specification
SECTION: 3 Requirements
SUBJECT: 1 External Interfaces

Document number

SOF 24302

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3.1.7 Thermal Interfaces

The Thermal Operating Conditions are specified in accordance with DSS VOL 2, Standard 10 "Subassemblies".

This implies that the controller shall operate as a Built-in Unit inside an equipment according to DSS VOL 2, Standard 2, Class 2 "Standard Office Environments".

Furthermore, the Reliability (see also 3.2.3.1) is related to a normalized Ambient Component Temperature, $T_a = 40^\circ \text{C}$ in accordance with DSS VOL 1.

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A611043 (10.3.1/41)48

FMV 1043

Supersedes doc. no.

Date 821013

SOF.

Page 10.3.1/41

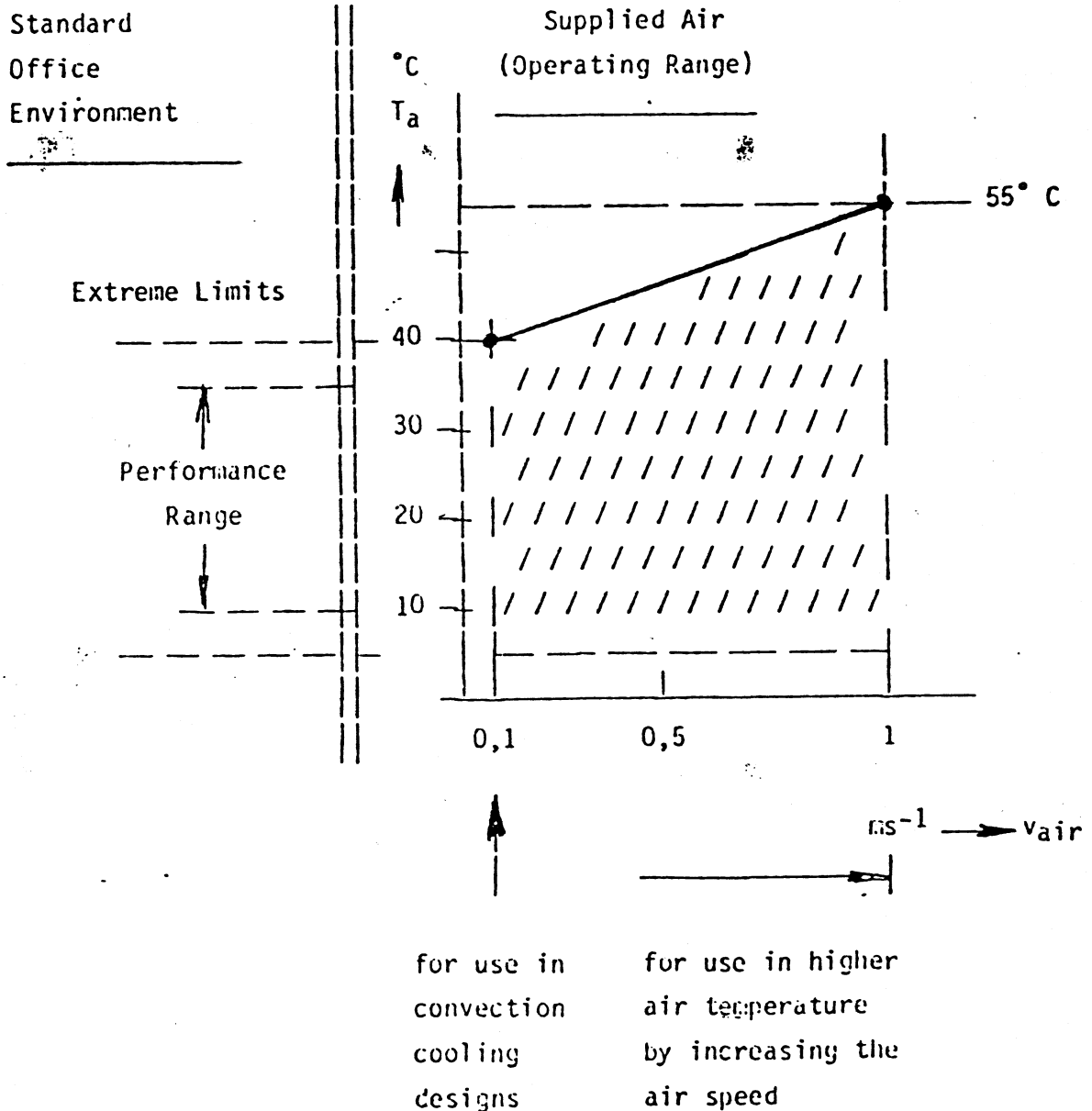
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FM VOL: 1043 Secondary Storage Controller (SESCO)
CHAPTER: 10 Element Performance Specification
SECTION: 3 Requirements
SUBJECT: 1 External Interfaces

Document number
SOF 24303
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3.1.7.1 Operating Conditions



Prep. by: H. Schönwald

A611043 (10.3.1/42)49

FMV 1043

Supersedes doc. no.

Date 821013

SOF.

Page 10.3.1/42

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Philips Data Systems · Unternehmensbereich der Philips Kommunikations Industrie AG · 5900 Siegen 31

FM VOL 1043 Secondary Storage Controller (SESCO)
CHAPTER: 10 Element Performance Specification
SECTION: 3 Requirements
SUBJECT: 1 External Interfaces

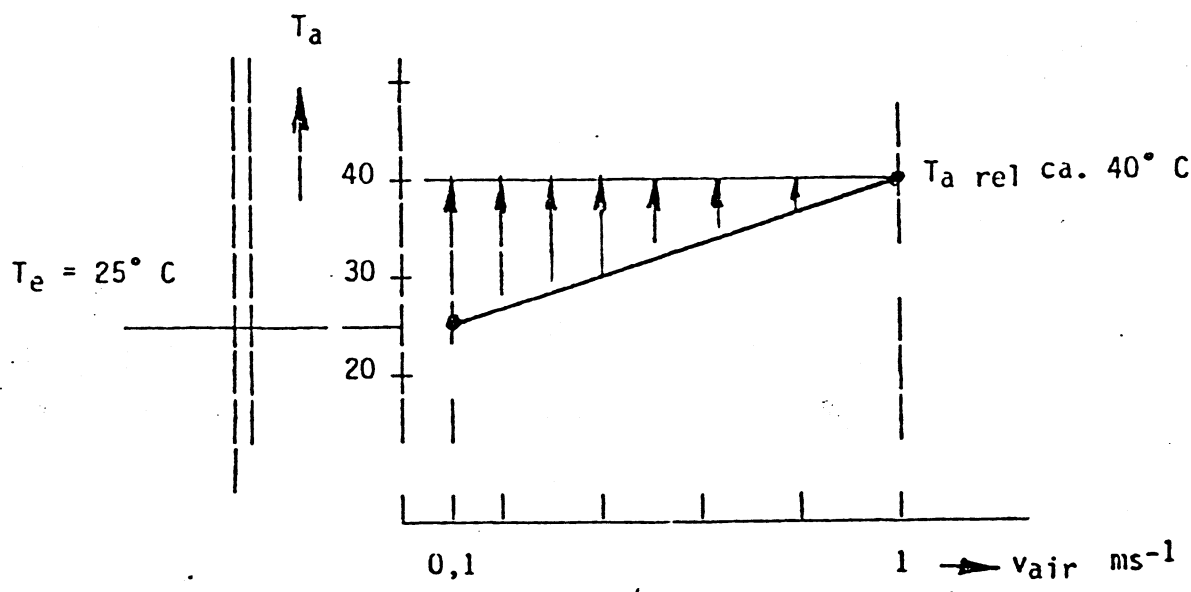
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3.1.7.2 Component Limits

Within the operating range, the controller has to meet the specified performance, the ambient T of any component shall not be higher than 60°C and the Component Junction Temperature may not exceed 125°C .

Exceptions, e.g. components with allowed higher T_j , must be handled separately; they may not influence other components.

3.1.7.3 Component T_a Related to Reliability



$T_e = 25^{\circ}\text{C}$ = normal operating environment

$T_a \text{ rel}$ = expected T_a at any component

Prep. by: H. Schönwald	A611043 (10.3.1/43)50	FMV 1043
Supersedes doc. no. SOF.		Date 821015 Page 10.3.1/43
Property of: Philips Data Systems · Unternehmensbereich der Philips Kommunikations Industrie AG · 5900 Siegen 31		

FM VOL: 1043 Secondary Storage Controller (SESCO)
CHAPTER: 10 Element Performance Specification
SECTION: 3 Requirements
SUBJECT: 2 Performance

Document number

SOF 24305

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3.2 Performance

3.2.1 General

3.2.2. Performance Characteristics

Concerning Flexible Disk Control the SESCO will offer the complete command set of the Controller uPD 765A which enables the host to access 5,25" flexible disk cartridges of the types:

- two sided, double density, 48 tpi
- one sided, double density, 96 tpi
- two sided, double density, 96 tpi

(for references see /R5/, /R7/, /R8/!)

Characteristics of the Read/Write Channel are:

- Data Rate
 - . MFM 250 k bit/sec
 - . FM 125 k bit/sec
 - Read Data Window Size > 20% of the average bit cell
 - Interpretation Time 30 us (according to ECMA 70)
 - Data Late Tolerance \pm 10%
 - Write Precompensation
 - . Tracks 0 - 42: none
 - . Tracks 43 - 79: 250 ns
- Precompensation can be disabled

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Supersedes doc. no. SOF.		Date 821013 Page 10.3.2/1
Property of: Philips Data Systems · Unternehmensbereich der Philips Kommunikations Industrie AG · 5900 Siegen 31		

FM VOL:1043 Secondary Storage Controller (SESCO)
CHAPTER: 10 Element Performance Specification
SECTION: 3 Requirements
SUBSECT: 2 Performance

Document number

SOF 24306

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A DMA - channel is assigned to the Flexible Disk Controller to achieve high speed data transfer in parallel to host processing.

Concerning SASI Control the SESCO behaves as an INITIATOR without the ability of arbitration. During a Data In - or Data Out Phase data exchange between host and TARGET may be performed as DMA controlled or programmed by I/O-operations.

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A611043 (10.3.2/2)52

FMV 1043

Supersedes doc. no.

Date 821013

SOF.

Page 10.3.2/2

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FM VOL 1043 Secondary Storage Controller (SESCO)
CHAPTER: 10 Element Performance Specification
SECTION: 3 Requirements
SUBJECT: 2 Performance

Document number

SOF 24307

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3.2.3 Operability

3.2.3.1 Reliability

The SESCO shall meet a failure rate of

$$f = 0,025 \cdot 10^{-3} \text{ h}^{-1}$$

or a MTBF of 40.000 hours, respectively.

3.2.3.2 Maintainability

The Mean Time To Repair (MTTR) in the workshop should not exceed 30 minutes.

3.2.3.2.1 Maintainance and Repair Cycles

Not applicable.

3.2.3.2.2 Diagnostics

By means of the execution of a diagnostic program on the system it should be possible to test the functions of the SESCO. The SESCO should enable the host to test its functions with the aid of a self-test program (Inside Test) which is started by Power On or a special command test.

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A611043 (10.3.2/3)53

FMV 1043

Supersedes doc. no.

SOF.

Date 821015

Page 10.3.2/3

Property of:

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FM VOL 1043 Secondary Storage Controller (SESCO)
CHAPTER: 10 Element Performance Specification
SECTION: 3 Requirements
SUBJECT: 2 Performance

Document number
SOF 24308
Distribution
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Test and Diagnostics of PCB's

To test the correct functioning of the SESCO and to diagnose errors on the level of components use shall be made of testers like Gen Rad or P488 in the production. For repair in the service workshop it must be possible to use the system.

For that the design of the SESCO has to be done in such a way that it fits in a Pinbed-Adaptation-facility of the used testers as well as in the system by using an extension adaptor.

3.2.3.3 Useful life

The useful life time shall exceed 15.000 power on hours or seven years which ever occurs first.

3.2.3.4 Human Performance

Not applicable.

3.2.3.5 Safety

3.2.4 Environment

See DSS VOL 2 Standard 10, Sub-assemblies

3.2.5 Storage, Transportability and Installation

See DSS VOL 2.

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A611043 (10.3.2/4)54

FMV 1043

Supersedes doc. no.

Date 821015

SOF.

Page 10.3.2/4

Property of:

Philips Data Systems · Unternehmensbereich der Philips Kommunikations Industrie AG · 5900 Siegen 31

FM VOL:1043 Secondary Storage Controller (SESCO) CHAPTER: 10 Element Performance Specification SECTION: 3 Requirements SUBJECT: 3 Design Constraints		Document number SOF 24309 Distribution Confidential
<div style="margin-bottom: 10px;"> 3.3 <u>Design Constraints</u> </div> <div style="margin-bottom: 10px;"> 3.3.1 <u>General</u> </div> <p>General design constraints are:</p> <ul style="list-style-type: none"> - Adaptation of up to two 5,25" Flexible Disk Drives of the X3114 type to a system equipped with the EMM Bus. - Control of the SASI Bus in such a manner that any kind of TARGET DEVICE which fulfills the SASI specification (/R4/) can be connected to the system. - DMA support for data exchange between <ul style="list-style-type: none"> • host and flexible disk drive • host and SASI - Adaptation of the Operator Panel - All hardware elements should be allocated on a PCB of Double Euro Format (160mm x 233,4 mm). <div style="margin-bottom: 10px;"> 3.3.2 <u>Software Design Constraints</u> </div> <p>The SESO should applicate the instruction set of the Flexible Disk Controller uPD 765A without restrictions.</p> <div style="margin-bottom: 10px;"> 3.3.3 <u>Logical Design Constraints</u> </div> <p>The SESO should behave as an 8 bit master of the EMM-Bus, all requirements of the bus specification should be fulfilled.</p>		
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Supersedes doc. no. SOF.		Date 821213 Page 10.3.3/1
Property of: Philips Data Systems · Unternehmensbereich der Philips Kommunikations Industrie AG · 5900 Siegen 31		

FM VOL 1043 Secondary Storage Controller (SESCO)
CHAPTER: 10 Element Performance Specification
SECTION: 3 Requirements
SUBSECT: 3 Design Constraints

Document number

SOF 24310

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3.3.4 Electrical Design Constraints

DSS VOL 2 must be applied

3.3.5 Mechanical Design Constraints

DSS VOL 3 must be applied

3.3.6 Technological Design Constraints

The design shall be based on the uPD 765 Flexible Disk Controller
and the AMD 9517A-4 DMA Controller or equivalents.

3.3.7 Thermal Design Constraints

DSS VOL 2 must be applied.

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A611043 (10.3.3/2)56

FMV 1043

Supersedes doc. no.

Date 821015

SOF.

Page 10.3.3/2

Property of:

Philips Data Systems · Unternehmensbereich der Philips Kommunikations Industrie AG · 5900 Siegen 31

FM VOL 1043 Secondary Storage Controller (SESCO)
CHAPTER: 10 Element Performance Specification
SECTION: 3 Requirements
SUBJECT: 3 Design Constraints

Document number

SOF 24311

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3.3.8 Test and Diagnostic Tools and Provisions

In order to start each application session from a defined situation the SESCO will be tested by an Inside Test Facility running on the host processor. The program will be started by:

Power On
a special command test

At the beginning of the Inside Test procedure an LED will be switched on

- by hardware in case of Power On
- by software in case of the command Test.

After the test has been performed a test status will be sent to the Operator Panel or to the system software and in case of an error free test the LED will be switched off.

3.2.8.1 Test Application Notes

The principle aim of the Inside Test is to get go/no go information about the SESCO.

Because the SESCO contains an accumulation of functions independent of each other these subfunctions have to be treated by the test.

Prep. by H. Schönwald

A611043 (10.3.3/3)57

FMV 1043

Supersedes doc. no.

Date 821015

SOF.

Page 10.3.3/3

Property of:

Philips Data Systems · Unternehmensbereich der Philips Kommunikations Industrie AG · 5900 Siegen 31



FM VOL 1043 Secondary Storage Controller (SESCO)
CHAPTER: 10 Element Performance Specification
SECTION: 3 Requirements
SUBJECT: 3 Design Constraints

Document number
SOF 24312
Distribution
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Flexible Disk Control

Some control lines have been defined, some signals have been fed back and a few device status lines are available on FD Control Port 3:

control line	port/bit
Read Write Test Reset	2/0
Enable Interface	1/2
FD Read Test Drive 0	3/0
FD Step Command Test	3/2
FD R/W Operation	3/3
FD R/W Continuous	3/4
Interrupt FDC	3/5

Ready Test

The ready line of drive 0 can be interrogated directly. The result can be cross checked against the contents of the FDC's status byte 3.

The drive signals "ready" if a diskette has been inserted and the spindle motor is running.

Step Command Test

After execution of a positioning command bit 2 of FD Control Port 3 indicates whether the FDC has been issued at least one step pulse

- . bit 2 = 0 step outward
- . bit 2 = 1 step inward.

Prep. by: H. Schönwald	A611043 (10.3.3/4)58	FMV 1043
Supersedes doc. no. SOF.		Date 821015 Page 10.3.3/4
Property of: Philips Data Systems · Unternehmensbereich der Philips Kommunikations Industrie AG · 5900 Siegen 31		



FM VOL1043 Secondary Storage Controller (SESCO)
CHAPTER: 10 Element Performance Specification
SECTION: 3 Requirements
SUBSECT: 3 Design Constraints

Document number

SOF 24313

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- Read Write Test

The purpose is to detect, whether the FDC is able to receive read data pulses during an active read phase or to output write data pulses during an active write phase.

"Read Write Operation" (bit 3, FD Control Port 3) indicates that the SESCO is performing a read or write.

Only during this phase "R/W Data Continuous" may be evaluated according to the following sequence:

Set Read Write Test Reset
Reset Read Write Test Reset
Wait for minimal 8 usec
interrogate R/W Data Continuous.

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A611043 (10.3.3/5)59

FMV 1043

Supersedes doc. no.

SOF.

Date 821015

Page 10.3.3/5

Property of:

Philips Data Systems · Unternehmensbereich der Philips Kommunikations Industrie AG · 5900 Siegen 31

FM VOL:1043 Secondary Storage Controller (SESCO)
CHAPTER: 10 Element Performance Specification
SECTION: 4 Quality Assurance
SUBJECT: 1 Preliminary Qualification

Document number
SOF 24314
Distribution
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4 Quality Assurance

4.1 Preliminary Qualification

4.1.1 Calculation of the Failure Rate

Calculation of the failure rate to be expected, must be done by
using the Part Count Method.

4.1.2 Component Case Temperatures

Pre-check of the permitted Component Case Temperatures as given
in chapter 4.2.4.3.

Prep. by: A. Henrichs	A611043 (10.4.1/1)60	FMV 1043
Supersedes doc. no. SOF.		Date 821025 Page 10.4.1/1
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FM VOL.1043 Secondary Storage Controller (SESCO)
CHAPTER: 10 Element Performance Specification
SECTION: 4 Quality Assurance
SUBJECT: 2 Element Qualification

Document number

SOF 24315

Distribution

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4.2 Element Qualification

4.2.1 Verification of the Logical Interface Functions

Verification of the logical interface functions has to be done by
a HSI-Test according to the HSI-Requirements as given in chapter
3.1.2

4.2.2 Verification of the Performance Characteristics

Verification of the performace characteristics according to
chapter 3.2.2.

additionally:

Test of 3 units representing the FEMU status under variation of
the following parameters:

- DC Voltage at SESCO and Drive Logic
nominal value $\pm 5\%$
- Disk Speed $\pm 3\%$

(only single parameter variations may be executed at one time).

Prep. by: A. Henrichs	A611043 (10.4.2/1)61	FMV 1043
Supersedes doc. no. SOF.		Date 821025 Page 10.4.2/1
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CHAPTER: 10 Element Performance Specification
SECTION: 4 Quality Assurance
SUBJECT: 2 Element Qualification

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4.2.3 Test: Data Error Rate

Number of test specimen 5.

Concerning the subfunction Flexible Disk Control each unit has to be tested for FM and MFM recording.

Test is according to MIL Std. 781B Plan III.

Decision Risk's 10%; DR = 2:1

4.2.4 Test Environmental Conditions

4.2.4.1 Thermal Requirements

Operating Test according to the Thermal Interface Requirements as given in chapter 3.1.7.

Test at least 2 points of the curve.

- T = 40°C free convection

A

- T = 55°C V air ≤ 1ms 1

A

Duration: 16 hours each point

Number of specimen: 1

Prep. by: A. Henrichs

A611043 (10.4.2/2)62

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Page 10.4.2/2

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4.2.4 2 Mechanical Requirements

Test mechanical requirements according to DSS VOL 2, Std. 10.

Vibration: 0,2mm from 10 to 60 Hz
3 g from 60 to 150 Hz

Sweep rate 1 octave/min
10 sweeps each axis

Shock: 25 g/6 ms

Number of specimen 1

Prep. by: A. Henrichs

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4.2.4.3 Component Case-Temperature-Limits

Test of the Component Case-Temperature Limits (as Reliability Criteria)

Component (Component Group)	T Environment-Case
LS - TTL in Plastic Packages	25° C
S - TTL in Plastic Packages	40° C
S - TTL in Ceramic Packages	50° C
N-MOS/H-MOS, (RAM PROM, MP'S) in Ceramic Packages	35° C (45° C) allowed for 10% of this component group

Test under convection cooling conditions

Number of specimen: 1

Prep. by: A. Henrichs

A611043 (10.4.2/4)64

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Page 10.4.2/4

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SECTION: 4 Quality Assurance
SUBJECT: 3 System Integration Test

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4.3 System Integration Test

Requirements have to be specified according to the kind of system.

Prep. by: A. Henrichs

A611043 (10.4.3/1)65

FMV 1043

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Date 821015

Page 10.4.3/1

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FM VOL 1043 Secondary Storage Controller (SESCO)
CHAPTER: 10 Element Performance Specification
SECTION: 4 Quality Assurance
SUBJECT: 4 Reliability Test

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4.4 Reliability Test

See chapter 4.2.4.3

Prep. by A. Henrichs

A611043 (10.4.4/1)66

FMV 1043

Supersedes doc. no.

Date 821015

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FM VOL. 1043 Secondary Storage Controller (SESCO)
CHAPTER: 10 Element Performance Specification
SECTION: -
SUBJECT: A Appendix

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Appendix A

Recommended Initializing Parameter for FD

To control a Flexible Disk Drive of the type X3114 the following parameters are recommended for uPD 765A programming:

Step Rate	SRT:	0D H	
Head Unload Time	HUT:	0F H	
Head Load Time	HLT:	01 H	
Gap Length	GLP:	0F H	Track 0
		14 H	Tracks > 0

Format 1

Prep. by: H. Schönwald

A611043 (10.-.A/1)67

FMV 1043

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Page 10.-.A/1

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FM VOL:1043 Secondary Storage Controller (SESCO)
CHAPTER: 10 Element Performance Specification
SECTION: -
SUBJECT: B Appendix

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Appendix B

SASI Application Notes

Note 1: By testing the bit "SESCO - HW" in SASI Status Port after Power On - Reset, it is possible to recognize whether a SASI-Adaptor or a SESCO is available in a P3000 system:

Bit 23 = 1: SASI - Adaptor

Bit 23 = 0: SESCO

Note 2: The Reset Line of SASI may be activated by any connected TARGET DEVICE, e.g. because of power on/off switching of the private power supply. To inform the host about that activation of the Reset Line will be latched in the SASI Status Port (SASI Reset Condition = 0). The following implementation recommendations should be observed:

- Clear Reset Condition before selection of the TARGET DEVICE!
- Ask for SASI Reset Condition at the beginning and the end of the Status In Phase!

If any Reset has happened in the meantime repeat the last command!

Dependent on SASI TARGET a Reset during command execution may lead to time out.

Prep. by: H. Schönwald

A611043 (10.-.B/1)68

FMV 1043

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Interfacepassung : FLOPPY

SA 450

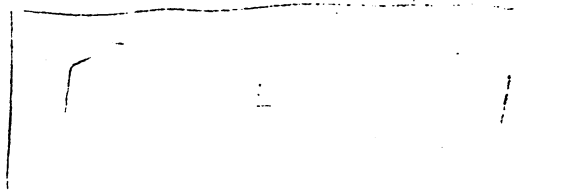
SA 850

CDC 9406

WFD

XEBEC

SIGNAL	PIN	(J2) 8" FLOPPY			
—	2	<u>a1 bn</u> Low Current -	<u>bn</u>	<u>a5</u>	10 V
—	4	-			
—	6	-			
—	8	-			
—	10	<u>a5 WS</u> Two Sided -	<u>WS</u>	<u>a25</u>	50 V ✓
—	12	<u>a6 gn</u> Door Opened -	<u>gn</u>		
32	14	<u>a7 gc</u> Side Select -	<u>gc</u>	<u>a20</u>	40 V ✓
4	16	<u>a8 gr</u> In Use -	<u>gr</u>		
—	18	<u>a9 rs</u> Head Load -	<u>rs</u>	<u>a2</u>	4 V ✓
8	20	<u>a10 bl</u> Index -	<u>bl</u>	<u>a4</u>	8 V ✓
2	22	<u>a11 rt</u> Ready -	<u>rt</u>	<u>a14</u>	28 V (Ready 1) ✓
—	24	-			
10	26	<u>a13 blgr</u> Drive Select 0 -	<u>blgr</u>	<u>a10</u>	20 V ✓
12	28	<u>a14 WSbl</u> Drive Select 1 -	<u>WSbl</u>	<u>a11</u>	22 V ✓
14	30	<u>a15 gobl</u> Drive Select 2 -	<u>gobl</u>	<u>a12</u>	24 V ✓
—	32	<u>a16 gcSW</u> Drive Select 3 -	<u>gcSW</u>	<u>a13</u>	26 V ✓
18	34	<u>a17 gers</u> Direction -	<u>gers</u>	<u>a7</u>	24 V ✓
20	36	<u>a18 gegn</u> Step -	<u>gegn</u>	<u>a6</u>	22 V ✓
22	38	<u>a19 blrt</u> Write Data -	<u>blrt</u>	<u>a9</u>	28 V ✓
24	40	<u>a20 gcWS</u> Write Enable -	<u>gcWS</u>	<u>a8</u>	26 V ✓
26	42	<u>a21 gegr</u> Track 00 -	<u>gegr</u>	<u>a3</u>	6 V ✓
28	44	<u>a22 gert</u> Write Protect -	<u>gert</u>	<u>a18</u>	36 V ✓
30	46	<u>a23 grbn</u> Read Data -	<u>grbn</u>	<u>a1</u>	2 V ✓
—	48	-			
—	50	-			



HAVE EDDIE DRAW THIS PICTURE

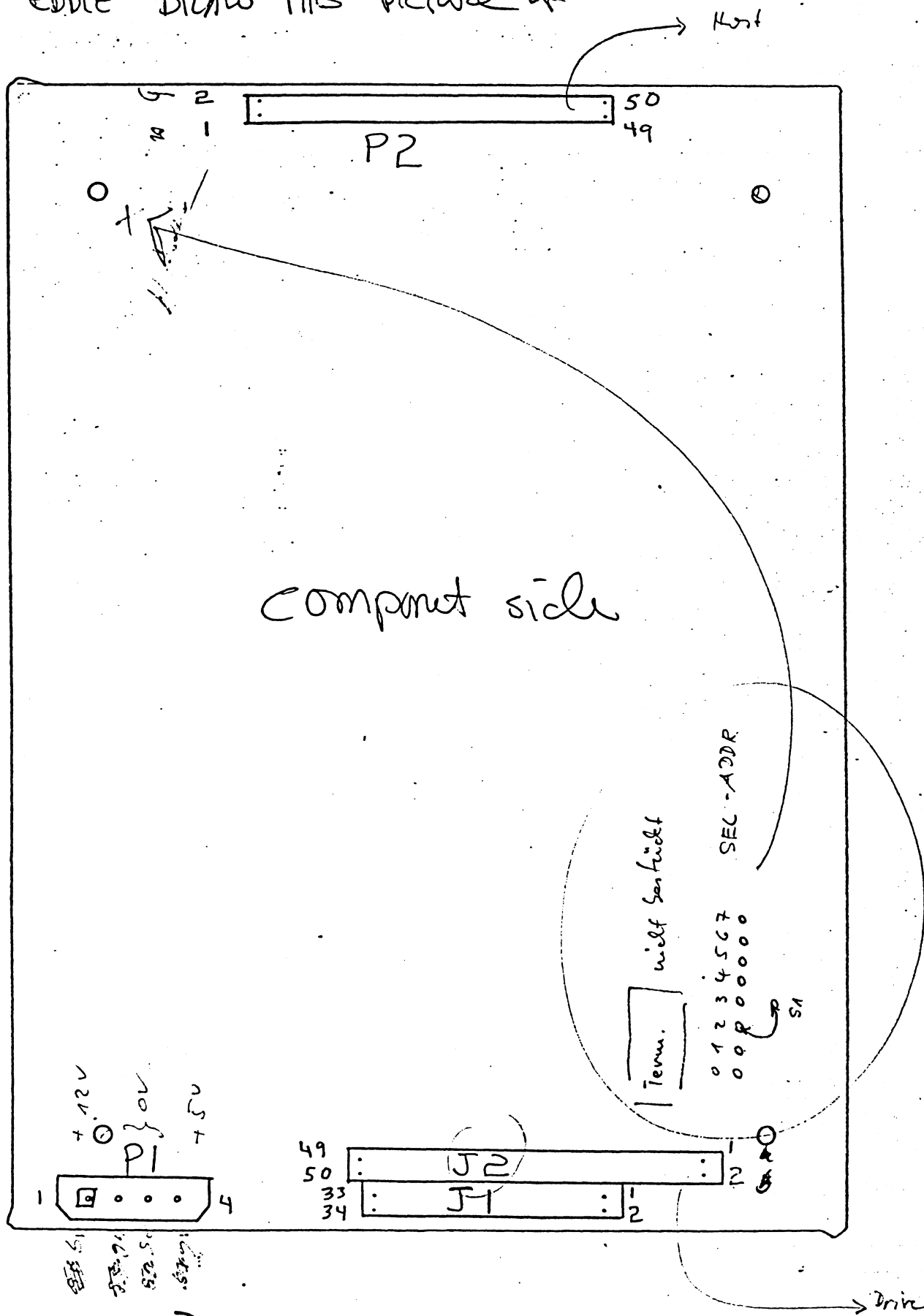


FIGURE 3. CASE, CONNECTOR, AND LOCATION

~~CABLE AND CONNECTOR~~