

DataBoard 4680

Winchester Units Manual.

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CONTENTS

1.	INTRODUCTION
2.	DESCRIPTION
2.1	General
2.2	DataStore Versions
2.3	For ABC 800 and Facit DTC
2.3.1	4107 Winchester interface
2.3.2	4106 Minifloppy interface
2.3.3	4108 Standard 8" floppy interface
2.4	For DataBoard 4680 with OS-8
2.4.1	4105 Winchester interface
2.4.2	4106 Minifloppy interface
2.4.3	4108 8" floppy interface
3.	TECHNICAL DATA
3.1	Winchester disc unit
3.2	Winchester disc controller unit
3.3	Winchester disc interface for ABC800/DTC
3.4	Winchester disc interface for DataBoard with OS-8
3.5	Minifloppy unit with controller
3.6	Minifloppy interface
3.7	DataStore Base Unit
4	INSTALLATION
4.1	ABC 800/Facit DTC
4.1.1	Direct connection
4.1.2	Connecting in parallel to a DataDisc unit.
4.2	DataBoard 4680 with OS-8
5.	NEW DOS version 6.xx, GENERAL DISC HANDLING SYSTEM
5.1	General
5.2	New 5 1/4" mini floppy disc structure
5.3	New 8" floppy interface card select
App 1	HANDLING ABC800/FACIT DTC SYSTEM PROGRAMS
App 1 - 1	SYSDIR.SYS
App 1 - 2	SYS.BAC Reconfigure disc devices
	DEVDES.REL Optional default device parameters
App 1 - 3	UFD.ABS (.BAC) User File Directory Option
App 1 - 3.1	Description UFD
App 1 - 3.2	Running UFD
App 1 - 4	LIB.ABS (.BAC) Display file Library
App 1 - 5	BASICINI.SYS Error texts and selfstart option
App 1 - 6	PRESTART.BAC Setting self-start options
	ADDOPT.ABS Contains option file names
App 1 - 7	CMDINT.SYS DOS command interpreter
App 1 - 8	SYSTEM.ABS Help program, executing system programs
App 1 - 9	DOSGEN.ABS Format and Init discs or diskettes
App 1 - 10	DISCHK.ABS Check and repair disc errors
App 1 - 11	ERRCOPY.ABS Copy and remove bad sectors from file
App 1 - 12	COPYLIB.ABS Copy file, using library for selection
App 1 - 13	COPY.ABS Copy one file
App 1 - 14	DELETE.ABS Delete file, using library for selection
App 1 - 15	REPROT.ABS Change file protect status

1. INTRODUCTION

This guide describes the DataStore Winchester disc units for DataBoard 4680 systems (OS-8) and for ABC800 and Facit DTC.

Description

Technical data

Installation

System programs for ABC800/DTC.

The new Disc Operating System DOS version 6.xx is described in section 5 and a description of the system programs in detail is given in appendix 1.

The DOS 6.xx can handle several types of disc units simultaneously, including the Winchester disc.

The DOS 6.xx provides the possibility to use the User File Directory option, for added file access protection.

2. DESCRIPTION

2.1 General

The DataStore Winchester disc units are mass storage units with Winchester hard disc drives (Seagate) and the disc controller card mounted on the drive.

The units are self-contained with power, fan cooling, interfaces and cables to the computer system and optionally a back-up floppy disc drive. A DataBoard bus is included with two free memory slots and one free I/O slot (Two I/O-slots if no back-up floppy is included).

DataStore versions with a built-in mini-floppy drive are available and the system programs permits connection of other mass storage systems.

The DataStore units are designed in close cooperation with the Dataindustrier AB, which is the designer behind the DataBoard 4680 computer systems and the ABC80, ABC800, Facit DTC, Esselte office computer and the Monroe computers.

The Winchester disc is appropriate for heavy duty continuous usage in manufacturing and production environments as well as in office surroundings. The disc and the read/write heads are in a sealed area, eliminating wear due to contaminations, dust particles etc. The Seagate Winchester drive uses only 9.5 grams head load force and 0.5 micrometer flying height, but has the same size as a standard mini-floppy drive.

The disc controller used has automatic error detection with hardware 32 bit ECC polynomial and 5 bit burst error correction for safe data transfer. It includes internal diagnostics and automatic retries during disc access. Up to two Winchester drives can be connected to one controller.

Environment.

The Winchester unit contains a rotating disc and must not be exposed to vibrations or shocks, but is not sensitive to dust particles, as the unit is sealed.

If a mini-floppy is included in the system, the requirements on a clean and dust-free environment are high. Therefore users with bad environment are recommended to use the version without the back-up floppy.

2.2 DataStore Versions

The DataStore versions below are used in two possible configurations:

1. For ABC800 and Facit DTC
2. For the OS-8 operating system in DataBoard 4680.

DataStore 5/320

5 MBytes Winchester unit and one 320 KBytes back-up minifloppy.

DataStore 5

5 MBytes Winchester unit without back-up floppy. Space for up-grading with a minifloppy is included.

DataStore 5/640

5 MBytes Winchester unit and one 640 KBytes mini-floppy, using Double Track recording.

DataStore 5/C

A 5 MBytes Winchester drive prepared with cables and a power supply to replace one of the 8" floppy drives in a DataDisc 86/88 unit or a 7004 DataBoard 8" floppy disc unit.

2.3 For ABC800 or Facit DTC

2.3.1 4107 Winchester interface and Winchester disc format

The DataBoard 4107 Winchester interface is used and provides efficient disc handling, using an on-board Z80A processor and DMA.

The DMA enables simultaneous data transfer between the Winchester disc and the 4107 and between the 4107 and the ABC800/DTC.

The 4107 includes 6 sector buffers in RAM. Optionally more, if the 2K RAM chip in the 28 pin socket is replaced by a larger RAM chip(MOSTEK ByteWyde). No software change is needed when upgrading the RAM size. With 8K RAM, 30 sector buffers are available.

The buffers provide quick access with the following method:

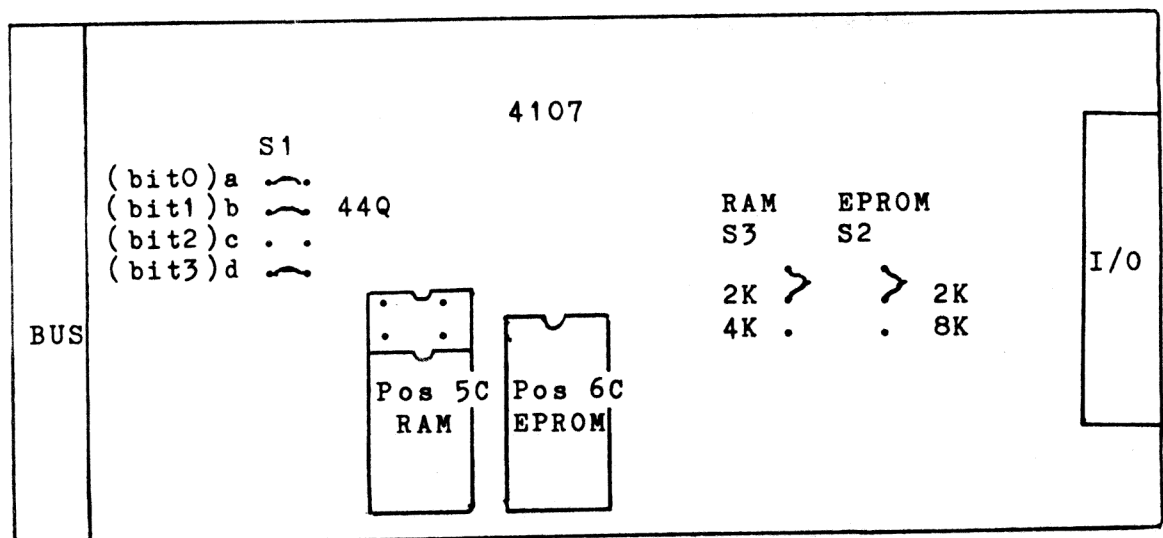
- a) Two consecutive sectors are always read into the buffers at each physical disc access.
- b) Often used sectors are kept in the buffers.

By this means the data transfer of large files, stored in contiguous sectors are done with less than 10 ms/ sector.

The format used as standard on the winchester disc has 256 bytes sector and a cluster size of 32 sectors. The allocation of space on the disc in the bit-map is done in multiples of one cluster. The bit-map is in one sector (8x239 = 1912 clusters/disc x32 = 61184 sectors) and is in sector no. 14.

A logical disc device contains a maximum of 65535 sectors (about 16 M bytes), limited by the 16-bit format of the ABC800/DTC pointer. For larger winchester units, each physical unit will be divided into two or more logical devices, using an optional controller EPROM on the 4107 interface.

The 4107 interface shall as standard have the channel select code 36 dec=44 octal, but with the switches S1, card select codes 40Q to 57Q may be selected.



2.3.2. 4106 Mini-floppy interface

The 4106 DataBoard Minifloppy interface is used, which is standard for ABC800/DTC 5 1/4" mini-floppy. The 4106 includes its own Z80A microprocessor and is delivered with the A6 controller EPROM for Double Track minifloppy drives or with the A5 controller EPROM for Single Track minifloppy drives.

Double Track controller EPROM vers.6 (A6).

A6.xx Used with Double Track 5 1/4" drives only.
 Double Track (Single Track for reading only)
 Double Side/Single Side, Switch selected
 Double Density only!

The A6-controller EPROM provides a read-ahead buffer with 3 sectors on the 4106 board to minimize the average access time.

Using a double track drive and the A6 EPROM, DOS may simulate a single track drive structure, while READING only. See section 5.2 for details.

The A6 controller EPROM, version 6.10 or later, is automatically 'write-protecting' the disc when single track is selected on the interface switch.

Single Track controller EPROM Vers.5 (A5).

A5.xx Single Track only.
 Single Side/Double Side, Switch selected.
 Single Density/Double Density, Switch selected.

The A5 controller EPROM are only used with single track diskettes. If the used mini-floppy is a single track version, the A5 EPROM should be used in DataStore. The A5 EPROM provides a buffer with one sector only.

Can also read and write on diskettes, DOSGEN:ed with the old DOSGEN (versions lower than 6.00), but be careful as the library size is changed in DOS version 6.00 and later. Not more than 120 files may be created on an old diskette.

Jumpers and switches:

S1 Open Card Select 55 Q (Single Track standard)
Closed Card Select 54 Q (Double Track standard)

S2,S3 Close only one!

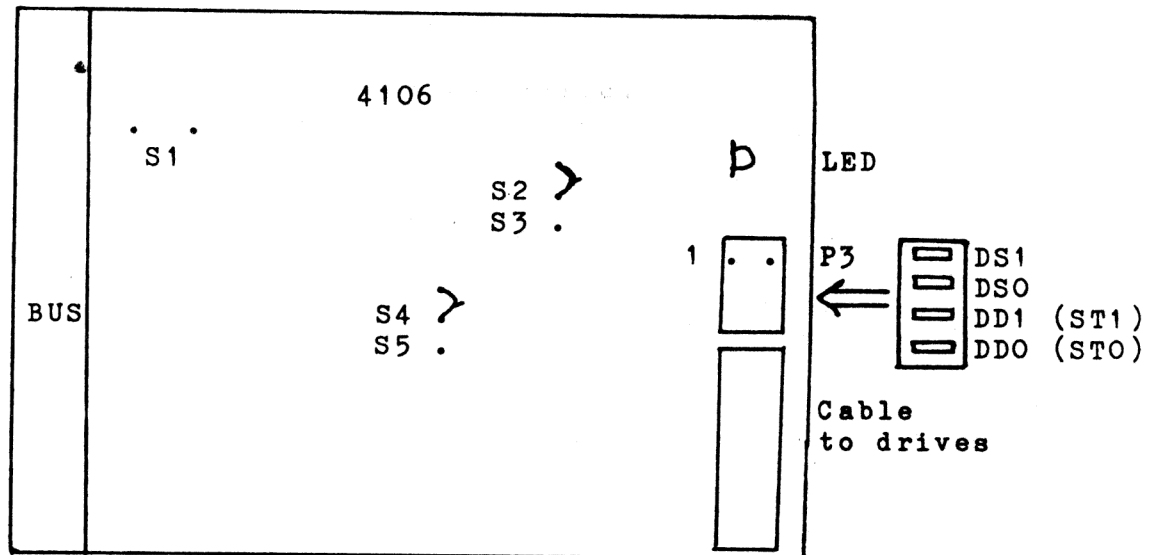
S2 Closed 500 ns precompensation (Standard)
S3 Closed 250 ns precompensation

S4,S5 Close only one!

S4 Closed Precomp. program controlled (Standard)
S5 Closed No precompensation

On the P3 connector (the 10 pin connector at the edge of the 4106) four switches can be connected. These are read by the controller EPROM and effects the storage format.

P3 connector		Closed switch gives:	
pin	pin	A5 EPROM	A6 EPROM
Drive 0	9	1 Double Density	Single Track
		5 Double Side	Double Side
Drive 1	10	2 Double Density	Single Track
		3 Double Side	Double Side



2.3.3 4108 Standard 8" Floppy interface

The 4108 DataBoard 8" standard disc interface includes its own Z80A microprocessor and is for ABC800/DTC delivered with the A8 controller EPROM.

The disc operating system only supports double density storage on the 8" floppy diskettes, but commands are available on the A8 controller EPROM to handle also single density. This can be done with special programs, e.g. to use standard IBM 3740 storage format.

A 3 sectors read ahead buffer is provided on the interface to minimize the average access time.

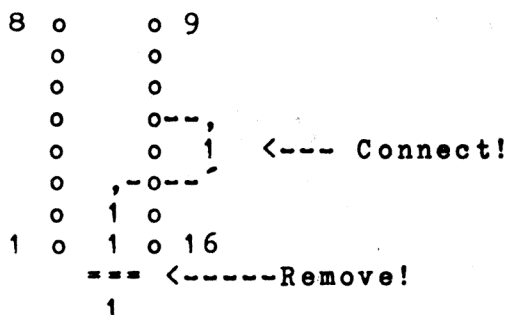
Jumpers and switches:

S1 Open Card select 55 Q

Closed Card select 54 Q

NOTE! To achieve the card select 56 Q, which is standard for the new DOS vers 6.xx, the switch S1 shall be closed and the card shall be modified by the following:

- Remove the connection from circuit 1C, pin 14 to circuit 1B, pin 9.
- Insert a wire from circuit 1C, pin 14 to circuit 1C, pin 12.



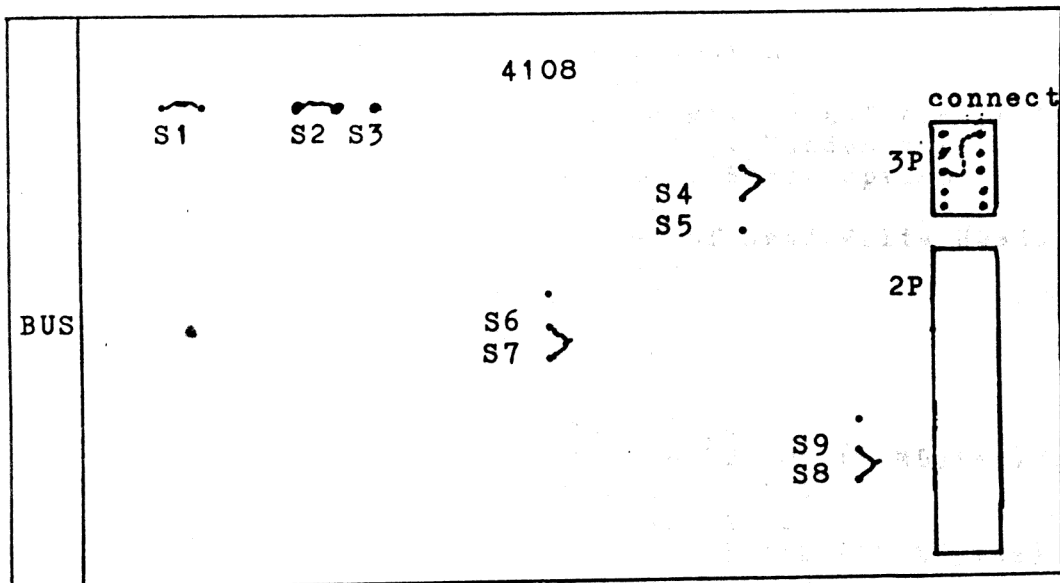
S2,S3 Close only one! S2 closed as default!
S2 Closed Use onboard EPROM 2716 (Default)
S3 Closed Use onboard EPROM 2732

S4,S5 Close only one! S4 closed as default!
S4 Closed 250 nsec precompensation
S5 Closed 125 nsec precompensation

S6,S7 Close only one! S7 closed as default!
S6 Closed Precompensation from track 43
S7 Closed Program controlled precompensation (Default)
NOTE! No precompensation is used by DOS.

S8,S9 Close only one! S8 closed as default!
S8 Closed L0 current to device on pin 2 (default)
S9 Closed L0 current to device on pin 16

On the 3P connector (the 10 pin connector),
pin 3P:9 and pin 3P:6 shall be connected.



2.4 For DataBoard 4680 with OS-8

2.4.1 4105 Winchester interface

The DataBoard 4105 winchester interface is non-intelligent and accessed from the OS-8 driver program via Direct Memory Access, using the 5102 DMA II with a maximum block size of 64 K Bytes.

The Winchester device name in OS-8 is XBC:

Note that a new version of the BOOT-PROM is needed on the DataBoard controller card to boot up the system from the winchester disc. To format and init the Winchester disc the DISKFORM and the DISKINIT version 3.20 or later are required.

The 4105 card select code shall be 45 Q.

A dipswitch on 4105 is used to set the parameters according to the table below:

Bits 0-1	Step. option
0	Normal
1	Half Step. Seagate/Texas type
2	Half Step. Tandon type
3	Buffered Step. option
Bits 2-3	Number of Read/Write Heads
0	2 Heads
1	4 "
2	6 "
3	8 "
Bits 4-7	Drive Type
0	Seagate ST 506 (5 MBytes)
1	RODIME RO 100
2	SHUGART SA 600
3	Seagate ST 412 (10 MBytes)
.	.
.	.
15	

2.4.2 4106 Minifloppy interface

See the chapter 2.3.2. Note that the old disc structure, (A5 controller EPROM, single track), corresponds to the earlier DataBoard minifloppy systems.

2.4.3 4108 8" Floppy interface

See chapter 2.3.3. The controller EPROM is not the same as for ABC800.

3. TECHNICAL DATA

3.1 Winchester disc unit.

Type: Seagate ST 506 (5 MBytes) or equivalent unit.

Discs: Two non-removable 5 1/4 inch.

Heads: Four heads with 9.5 gram head load force and 0.5 micrometer flying height.

Capacity: 5 MBytes formatted (ST 506)

Cylinders: 153 cylinders (=tracks/surface) on four surfaces.

Format: Formatted to 256 bytes/sector

Access: 3 ms access time track-to-track

Average: 95 ms average access time with half step option (ST 506) or 170 ms without half step option.

Transfer: 5 MBits/second transfer rate.

Filter: Self contained recirculation supplies clean air through a 0.3 micrometer filter.

Rotation: 3600 rpm rotational speed

Temperature: 4 to 50 degrees Celcius

3.2 Winchester disc controller unit.

Discs: Up to two Winchester disc drives may be connected to one controller.

Mounting: Mounted on the Winchester disc drive.

Functions: -Hardware 32 bit ECC polynomial with 5 bit burst error correction.

-Individual ECC fields for sector ID and sector data fields.

-Data separator

-Internal diagnostics.

3.3 Winchester disc interface unit for ABC800/Facit DTC.

Type: DataBoard interface 4107.
EPROM: Controller EPROM version W5.
Buffers: Standard: 6 sectors in the 2K RAM chip.
Option: 30 sectors in a user provided 8K RAM chip.(Mostek ByteWyde).

See the chapter 2.3.1 and App 1, sect 2 for the standard parameters used.

The 4107 is inserted in the DataStore unit.

3.4 Winchester disc interface for DataBoard with OS-8.

Type: DataBoard interface 4105.
Non-intelligent interface controlled by a software driver in the OS-8 operating system, using direct memory access. The 5102 DMA II card is required.

CS: Card Select shall be 45 octal (37 dec.)

IL: Interrupt shall be wired to interrupt level 6 on the control card.
(4105:pin 5A to control card: pin 7B)

Note! The 4105 shall be inserted in the I/O-bus of the computer, with the connection cable directly to the Winchester disc controller. The DataBoard bus in the DataStore unit is not used.

3.5 Minifloppy diskette unit with controller.

Type: BASF 6108 (320 KBytes)
BASF 6118 (640 Kbytes)
or equivalent units.

Diskettes: 5 1/4" softsectored, double sided.
40 tracks/side, single track (BASF 6108)
80 tracks/side, double track (BASF 6118)

Format: 256 bytes/sector.

Capacity: 320 KBytes formatted (BASF 6108)
640 KBytes formatted (BASF 6118)

Access: 12 ms access time track-to-track. (6108)
6 ms access time track-to-track. (6118)

Average: 240 ms average access time (BASF 6108)
158 ms average access time (BASF 6118)

Transfer: 250 KHz data transfer rate.

Rotation: 300 rpm rotational speed

3.6 Minifloppy interface unit

Type: DataBoard interface 4106
EPROM: Double Track: EPROM version A6.xx
Single Track: EPROM version A5.xx

See chapter 2.3.2 and App 1, sect 2 for the standard parameters used.

Jumper:	Name	State	Card select
	S1	Open	55 octal (Single track)
	S1	Closed	54 octal (Double track)

3.7 DataStore base unit.

Dimensions: Width: 470 mm
Height: 160 mm
Depth: 365 mm

Weight: With back-up floppy: 12.5 kg
Without back-up floppy: 11.3 kg

Back plane: Total: 2 memory slots
3 I/O slots
1 slot for connection cable

The number of free I/O-slots depends on the DataStore version. Each interface takes one I/O-slot.

Connection: ABC800/Facit DTC:
Connection cable (1 m) with adapter card, including the DOS EPROM, and with a termination card.

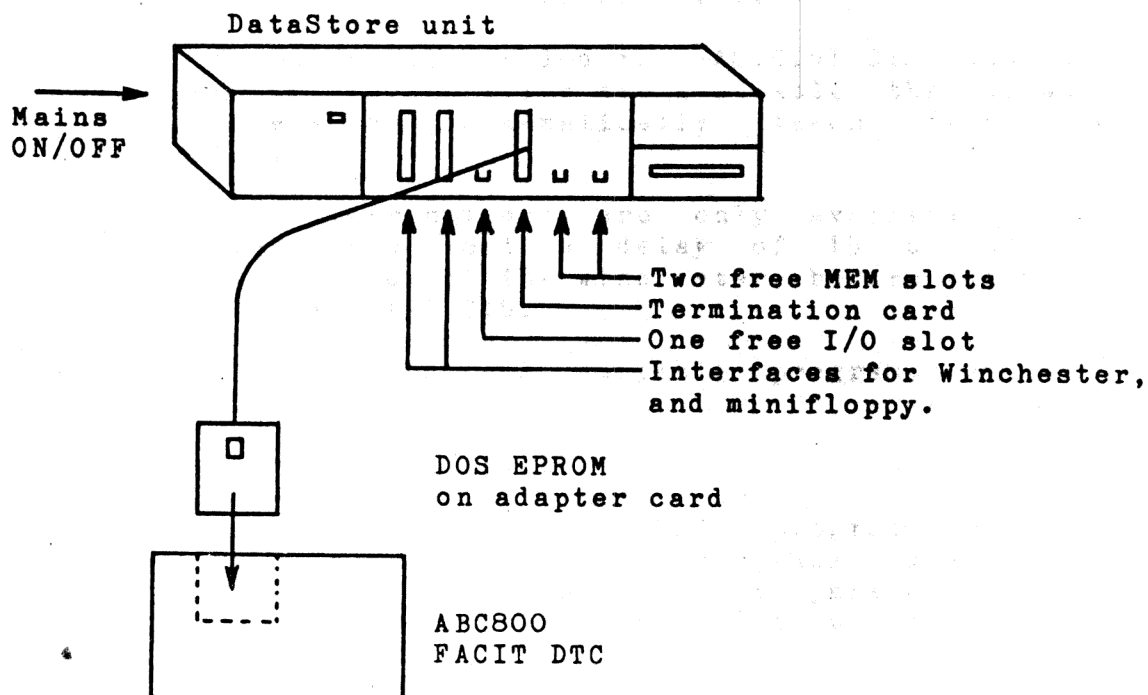
DataBoard (for OS-8):
Separate connection cables for the Winchester and the minifloppy units.
Cable length: 1 m.
Including adapter card and termination card.

AC power: 220V 50Hz
Start-up current: 220V / 0.6 A
Continuous current: 220V / 0.25 A

4. Installation

4.1 Installation, ABC800/Facit DTC

4.1.1 Direct connection



1. Switch power off on all units.
2. Remove the DataStore front plate and take out the connection cable with adapter card.
3. Connect the adapter card in the ABC800/Facit DTC bus connector and the other end of the cable, through a termination card, to the slot marked with a red spot in the DataStore unit.
4. NOTE! Remove the transport protection disc from the minifloppy. It is a paper sheet protecting the minifloppy heads during transport and should be restored if the DataStore unit shall be transported.
5. Connect the DataStore and ABC800/DTC power cable.
6. Turn the power on the DataStore unit before turning the power on the ABC800/DTC. The Winchester disc needs about 15 seconds warm-up time.

7. Press the ABC800/DTC reset button.
If a disc or diskette, with BASICINI.SYS is on-line, the system may display a message and/or execute a start-up program. If BASICINI.SYS is not available only ABC800 will be displayed. The message depends on the contents of the BASICINI.SYS file, but may be:

**** Super -DOS System ****

Please enter time

'YY-MM-DD HH.MM.SS':.....

If loading of options is enabled in BASICINI.SYS and the ADDOPT.ABS and DEVDES.REL files are available, the default device parameters are automatically taken from the DEVDES.REL file.

If DEVDES.REL or other options are only available on a Winchester drive, note that a delay of 15 seconds is required after power-on of the Winchester, before the reset to activate the BASICINI.SYS.

8. Check the system by running a suitable program, which could be LIB.BAC.
9. SYS.BAC from non-default device.

If a system, where the SYS.BAC program or the DEVDES.REL,ADDOPT.ABS,BASICINI.SYS programs are only available on a device with non-default parameters, the device table must be temporarily patched to be able to load the SYS.BAC program.

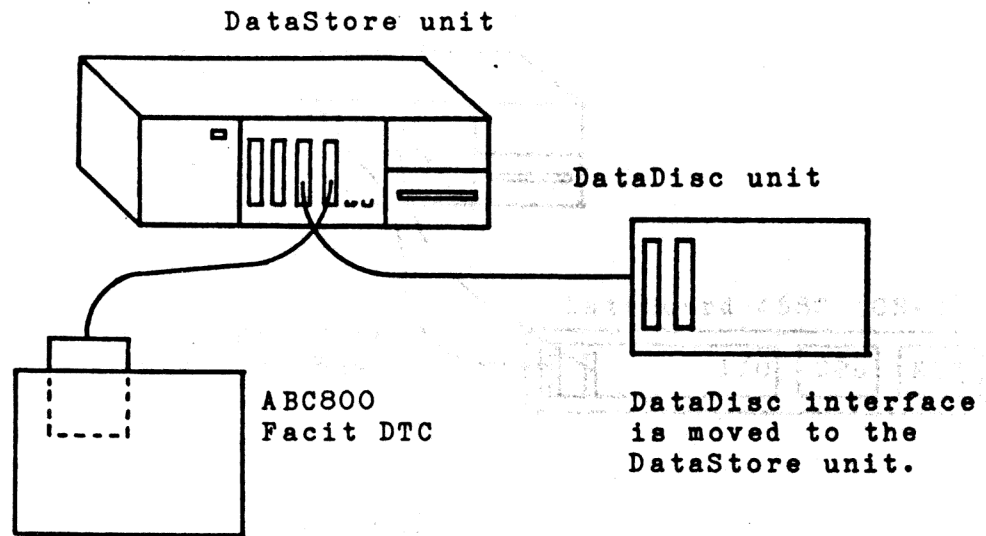
In address 606B Hex (=24683 dec), the address to the device table can be found.

A=PEEK2(24683) ! Base address to device table

The default device table is listed in app 1, sect 2.2 under the description of the SYS program. The offset given in the table shall be added to the base address above to access the different bytes in the table. New values can be stored in the table, using POKE statements.

NOTE! It is essential that correct values are used, to avoid serious errors.

4.1.2. Connecting the DataStore in parallel to a DataDisc unit.



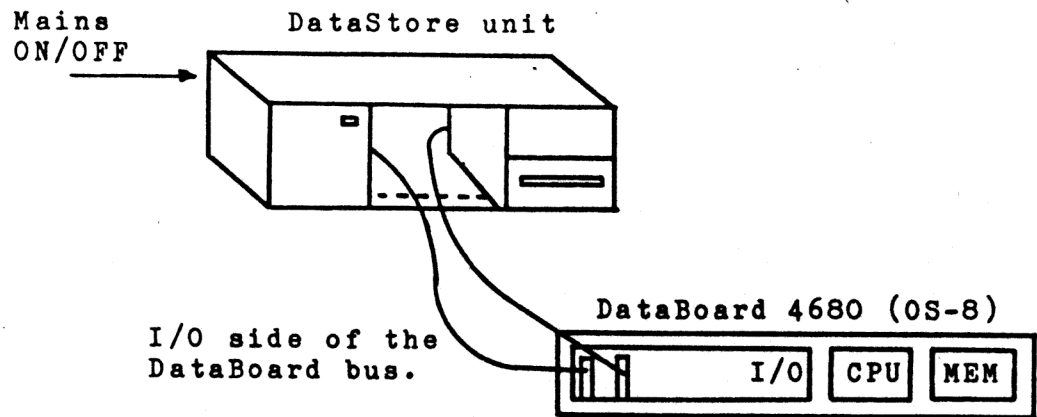
To connect a DataDisc unit as backup to the DataStore system, move the DataDisc interface card to an I/O-slot in the DataStore unit.

An extra long cable is needed from the DataDisc interface to the diskette drive in the DataDisc unit.

The DataBoard bus in the DataDisc unit is not used.

Note the card select code of the interface. Compare section 2.3.

4.2 Installation, DataBoard 4680 with OS-8.



1. Switch power off all units.
2. Remove the DataStore front plate and take out the connection cables and the interface cards. The connection cables are connected to the winchester and minifloppy units internally in the DataStore unit.
3. Insert the interface cards in the I/O slots of the DataBoard computer and connect the correct cables.

4105 is the winchester interface, which shall be in an I/O slot, wired for DMA and interrupt level 6. CS = 45 Q.

4106 is the minifloppy interface, requiring only the standard I/O bus connections, however with interrupt level 6 wired.
4. The 5102 DMA II card is required in the DMA position

APPENDIX 1 - SYSTEM PROGRAMS

The system code (ABC) program is a basic startup program in BASIC. It is designed to be run on an ABC/DCT system, if possible, to allow the user to enter commands in BASIC mode.

The program is designed to be run on an ABC/DCT system, if possible, to allow the user to enter commands in BASIC mode.

APPENDIX 1

ABC/DCT DOS vers. 6.xx

Appendix 1 contains a description of the system programs for the version 6 of the disc operating system for ABC800/DTC.

HANDLING DOS 6.xx ABC800/FACIT DTC SYSTEM PROGRAMS

System programs are generally machine code (.ABS) programs, started from DOS. A short start-up program in BASIC is delivered with each program, making it possible to start the system programs with a normal RUN command in BASIC mode.

When starting a system program from BASIC, the program asks for the parameters, otherwise given in the DOS command line.

1. SYSDIR.SYS

System file, stored on disc by DOSGEN, when initiating a new disc. It contains pointers to the library and bit-map sectors and the short volume name, which may be defined at DOSGEN. SYSDIR.SYS is write protected. The disc operating system is, however, accessing the disc direct without using the SYSDIR file.

2. SYS.BAC, DEVDES.REL

The SYS.BAC is not available in ABC/DTC-Net systems.

Program which displays available device names and enables the user to re-configure the disc devices. The modified parameters may be stored on disc in the relocatable machine code file DEVDES.REL, which may be loaded at power-on or reset as an option, provided options loading is enabled. (Section 6).

Start by:

RUN SYS

Display of default values:

** System Devices **

Ver 6.00 1982-05-13

Copyright 1982 Dataindustri AB

Highres mem

<info if included>

System device names:

PR: V24: DRO: DR1: DR2: UFD: MFO:
MF1: MF2: MOO: MO1: SFO: SF1: SF2:
HDO: HD1: HD2: HD3: NUL: CAS: CON:

Disc Device Parameters:

Type Cont.type CS Clu-size

*HD-: W5/W8 44Q 32 (Remote) If set!
MF-: A6/A8 54Q 4 (Biased, Remote) If set!
MO-: A5 55Q 1 (Biased, Remote) If set!
SF-: A8/A6 56Q 4 (Biased, Remote) If set!
DR-: will be converted to HD-:

Do you want to change par (Y/N):

The user may re-configure the drive parameters. Press RETURN to keep the default parameters, which is the standard parameters.

NOTE! Be sure to use the correct parameters. Writing will destroy existing files if the wrong parameters are used.

Save parameters in DEVDES.REL:

Note that the DEVDES.REL file at delivery contains dummy, in-active data. If these shall be kept, save a copy of DEVDES.REL before storing parameters in it. After changing parameters, the following question is given:

Do you want to save parameters on disc (Y/N)?

Save on device: :DEVDES.REL

with the cursor after 'device'. The user should give a device name or only 'return'. If only 'return' is given, the devices are searched for an old DEVDES.REL file. If not found, an error message is given.

Cluster size:

The cluster size is the number of sectors per bit in the bit map on the disc. The bit map always has 1912 bits. ($8 \times (256 - 17)$). The cluster size must be 1, 2, 4, 8, 16 or 32 sectors/bit. The minimum possible cluster size depends on the total number of sectors on the disc unit.

Card select code:

The card select code must be different for the device types. It is given in octal code. Note! that the 8" floppy interface card select code shall be 56Q. In earlier DOS versions another code was used (54Q). Change the code-plug on the 4108 interface if necessary.

Biased sector addressing mode:

The old biased disc addressing mode may be temporarily set. The standard disc addressing mode in DOS vers. 6.xx is direct addressing. Biased addressing can not be used on the Winchester devices.

Remote/Local:

For compatibility with the ABC/DTC-Net system a disc drive may be defined as 'remote' in the central ACB/DTC-Net system. (Also called ABC-Multiuser-system).

Controller type:

The controller type depends on the device type and on which controller EPROM is used on the disc interface. The version of the EPROM is used to indicate the type.

The A6 and A8 controller EPROMs are equal from the DOS system point of view.

The W5 and W8 controller EPROMs are equal from the DOS point of view.

The A6 5 1/4" controller EPROM shall use the cluster size 4 if double track recording is used, as the diskette will contain more than 2500 sectors.

The DR-: device names, used in most programs, are automatically directed to one of the device types HD-:, MF-:, MO-: or SF-: as selected by the user.

Controllers:

W5 5 1/4" Winchester interface 4107.
W8 8" Winchester interface 4xxx.
Old biased addressing can NOT be used.
As standard with device name HDx:,
card select 44Q and cluster size 32.

A8 8" Standard floppy disc interface 4108
Single or Double Density.
Single or Double Sided storage.
As standard with device name SFx:,
card select code 56Q (NOTE new!)
and cluster size 4.
DOS uses sector 14 for the bitmap.

A6 5 1/4" Double Track Mini-floppy.
Double Density only !!
Single or Double Sided storage.
Can only read single track diskettes.
As standard with device name MFx:,
card select 54Q and cluster size 4.
DOS requires the bitmap in sector 14.
Interface 4106.

A5 5 1/4" Single Track Mini-floppy.
Single or Double Density storage.
Single or Double Sided storage.
As standard with device name MOx:,
card select 55Q and cluster size 1.
DOS always uses sector 6 for the bitmap.
Interface 4106 or 4076.

Below is a typical device table:

Offset 0: 4 Pointer to the device, DR-: will be
O converted to. Default to HD-:
D Devices DRO:, DR1:, DR2:
R

4: 36 =0 + 44Q O=W5/W8 Winchester, 44Q=Card Select
5 Cluster size = 32 sectors (=2**5)
H Devices HDO:, HD1:, HD2:, HD3:
D

8: 108 =64 + 54Q 64=A6 controller EPROM, 54Q=CS
2 Cluster size = 4 sectors (2**2)
M Devices MFO:, MF1:, MF2:
F

12: 173 =128 + 55Q 128=A5 controller, 55Q=CS
O Cluster size =1 (2**0)
M Devices MOO:, MO1:
O (Note alphabetic 'O')

16: 110 =64 + 56Q 64=A6/A8 floppy controller, 56Q=CS
2 Cluster size = 4 sectors
S Devices SFO:, SF1:, SF2:
F

Four bytes are used for each device:

Byte 1: Type and card select code.

Byte 2: Cluster size, Addressing mode, Remote/Local

Bytes 3-4: Device name

Type: (in the bits 6 and 7)

- 0 = W5/W8 Winchester drive
- 64 = Double Track, A6 Mini-floppy controller EPROM
or A8 Standard 8" floppy controller EPROM.
- 128 = Single Track, A5 Mini-floppy controller EPROM

Cluster size: In powers of 2. 0 = Cluster size 1
 1 = 2
 ... etc
 5 = 32

Addressing mode: (Not for the Winchester)

- 64 = (bit 6) for old biased disc addressing mode.

Remote/local: For ABC/DTC Net systems.

- 128 = (bit 7) if the device is remote(in the central system)

DEVDES.REL, initiation of the device parameters:

The default parameters are initiated from the DOS-EPROM at power-on or reset. However, the parameters are taken from the DEVDES.REL file, if it is available on a connected disc together with the BASICINI.SYS and ADDOPT.ABS files, provided that options loading has been enabled with PRESTART (Section 6).

Note that a Winchester disc is not available until 15 seconds after power-on. Give a new system reset after this time if the DEVDES.REL file on the Winchester drive shall be used.

To start up a system, which does not have the SYS.BAC or DEVDES.REL file on a non-standard device, the device table can be modified to be able to read in the SYS.BAC program for execution. In address 606B Hex (=24683 Dec), the base address to the device parameter table in RAM can be found. The base address is read by PEEK2(24683), to which the offset in the table is added. Using POKE., the device table may be modified, but it is not recommended, as it is essential that the parameters are correct, to avoid serious disc errors.

3 UFD.BAC or UFD.ABS (Optional utility.)

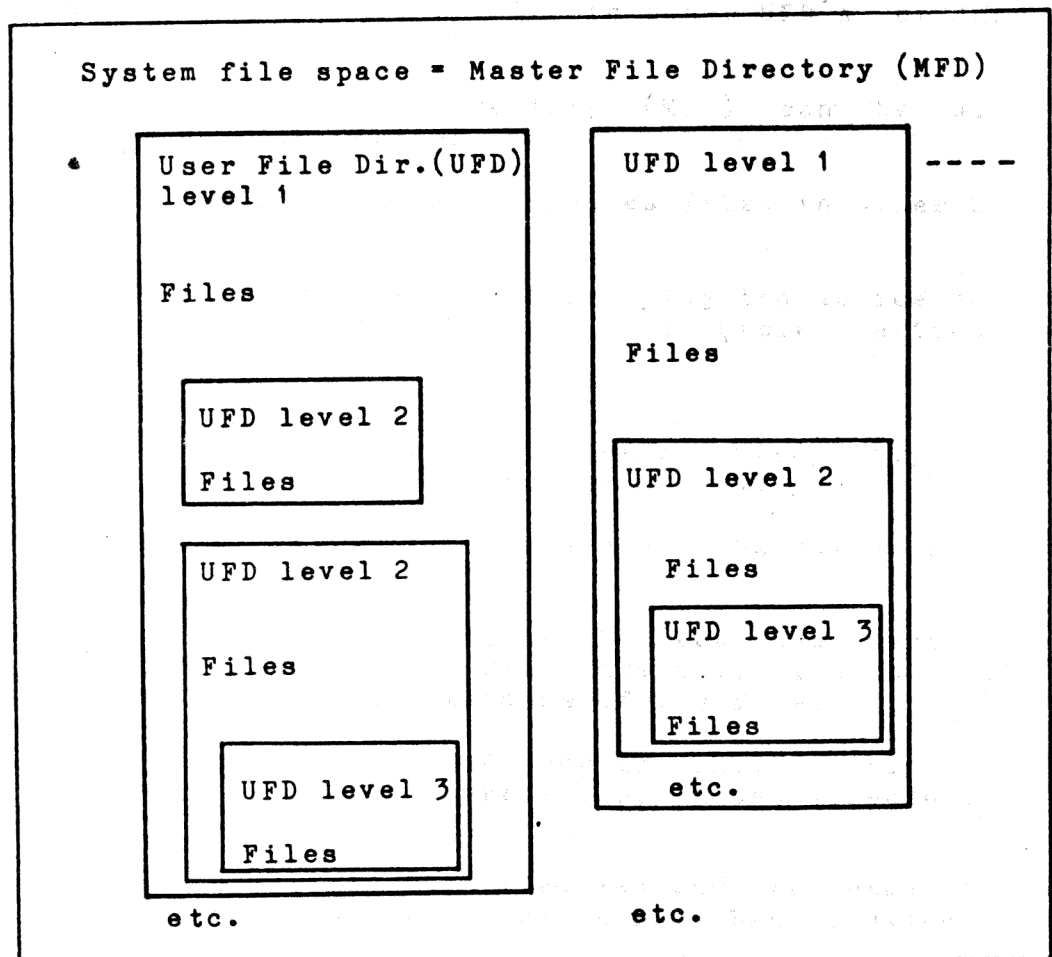
3.1 UFD - User File Directory Description.

The optional UFD program is used to subdivide a disc device into subdirectories in several levels. All types of disc or diskette devices can be subdivided into directories, using the UFD program.

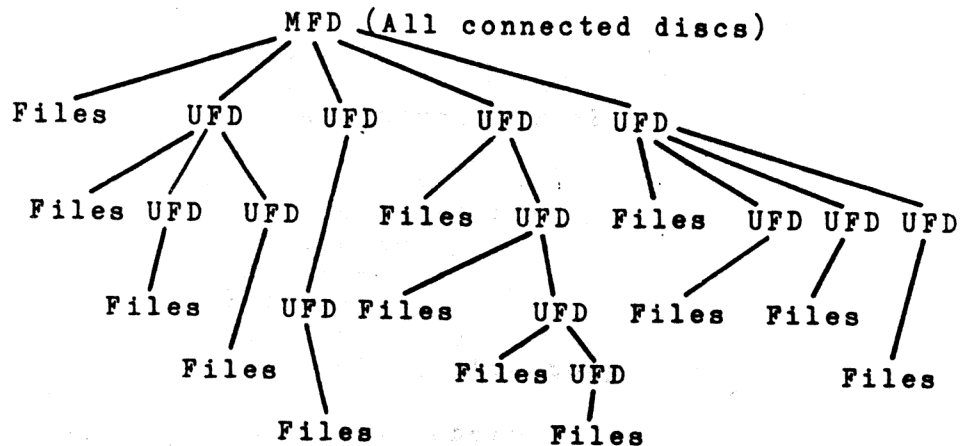
A directory can be described as a file, sub-divided into several files, with a separate library. The minimum allocated space for a directory is 18 sectors (or the cluster size, if it is larger). Each directory can have other subdirectories etc. etc.

A User File Directory is treated as an extra device with a separate file library. File accesses are not permitted directly between different User File Directories. The device name of the current directory is always UFD:, independant of the directory name.

The UFD program is used to Create, Delete or Rename User File Subdirectories at different levels or to enter into or exit from a UFD (User File Directory)



To access a file in a user file directory, the user must first enter into the corresponding directory, using the UFD program. The user enters the tree - like structure from above, step - by - step. The 'MFD' and the first level 'UFD's can be entered directly from any UFD-level, if the UFD program is available in the master file directory.



Files can be created, modified and deleted under the current UFD without any conflict with files in other UFD's or MFD on any device.

Files in the master file directory (MFD) can be directly addressed from all directories.

Files in a UFD may have the same name as files in other UFD or MFD.

If a file access is done without specifying the device name the system searches for the file on all accessible devices. the search order is:

- 1 - Current UFD
- 2 - Other devices in the order: HD(0 - 3), MF(0 - 2), MO(0-1), SF(0 - 2).

If only the current UFD shall be searched, the device name UFD: must be given.

Files are copied in both directions between the master file directory and the current user file directory with the COPYLIB or COPY program. A real copy is done of the file.

Listing the library with the LIB program, while within a UFD, only lists the files in the current UFD, if the directory UFD: is given.

The LIB listing only lists the filenames and the name of all subdirectories at a lower level, which have been created within the current UFD.

3.2 Running UFD

The program UFD is started by:

```

RUN  UFD          or by:  BYE          or by:  BYE
                        UFD          UFD,Opt  Name

```

Display:

```

** User File Utility **
Ver 6.00 1982-05-18
Copyright 1982 Dataindustrier AB

```

```
L - List current directory
M - Assign master file directory
F - Assign father directory
R - Rename current directory
C - Create a new directory
D - Delete current directory
none Assign to an existing directory
```

```
Give option (L,M,F,R,C,D,none):
Filename?      <Directory name
                may include device spec.>
```

Option: Function:

L Display current directory name and the names of
the father directories up to the "MFD".

M Return to MFD (Master File Directory).

F Return to the Father directory, i.e. to the next
higher level.

R Rename the current directory. The program asks
for the new name. Extension must not be specified.
UFD will set it to ".Ufd".

C Create a new directory under the current directory
and enter this new directory.
The program asks for the new directory name.
A new directory requires at least 18 consecutive
sectors on a disc for the directory library.
If the cluster size is larger, the minimum size
will be the cluster size

Delete the current User File Directory and
return to the father directory. This requires
that no files are left in the current directory.
Delete the files before deleting the UFD.
The files can be copied to the master file
directory if they shall be saved.

one Enter into an existing user file directory if
only RETURN is given as option. The program
asks for the name of the directory.

4. LIB.BAC or LIB.ABS

Display the file library of a disc unit.

All file names or
selected file names on
all connected disc units or on
a selected disc unit or on
the current user file directory

may be displayed or listed on the printer.

The space left on the disc is displayed in number of sectors.

Start by:

```

RUN LIB      or by:  BYE      or by:  BYE
                LIB      LIB,Opt Dir:File
ex:

```

Display:

```

** Library list **
Ver 6.00 1982-05-18
Copyright 1982 Dataindustri AB
Directory to list? <Give Device: or Device:Filename>
S - Size
N - Filenumber
F - File status
P - Printer output
none - Filenames only
Options (S,N,F,P,none) ?

```

Device: (In 'Directory to list')

- Device or directory name.
ex. HDO: or MFO: or UFD:.
To display files, only from the given directory.
The current UFD is always called UFD:.
- RETURN only.
To display files from all accessible directories
in the default search order.(UFD:,other devices).

Filename: (In 'directory to list')

- The beginning of the filenames to list. All files which begin with the characters given are listed.
- The beginning of the extensions of the files to list. The dot '.' must be given before the characters. All files with an extension, beginning with the given characters are listed.
- Both the beginning of the name and the extension may be given.

```
Ex:  Filename(s):  MY.BA
      Displays all files, of the form MY?????.BA?
```

Options: Functions:

Answer a combination of the options. Ex: SP.

- S List also file sizes. The size is given in sectors.
- N List also the physical file number in octal notation. The physical file number is a direct file pointer in the disc library.
- F List also the file status, as one letter in front of the filenames.
The status can be: S Write protected.
D Delete protected.
- P Direct the listing to the system printer. If a non-default printer option shall be used, it should be initiated before running LIB.
- none Default option, achieved by RETURN only, is to list filenames only on the display.

Under DOS, the LIB options and parameters may be given in the command line.

After displaying 20 lines on the screen, the listing halts and continues one line each time the operator presses any key.

To stop the listing, press RETURN or CTRL-C.

Listing of the library of a single track diskette, using a double track drive, may be done as the program checks the bit-map and library and temporarily uses single track commands if a double track structure is not found. Note that the switch on the interface must be set to single track.

The listing produced by LIB is structured as in the following example:

** Library list 6.00 82-05-18 **

Drive HDO: UFD:MYDIR .Ufd
MYFILE .TXT MYFILE .BAK DOTS .BAC

Remaining space 60007 sectors of 61184

Drive HDO:

SYSDIR .SYS	LIB .BAC	LIB .ABS
SYS .BAC	UFD .BAC	UFD .ABS
DOSGEN .ABS	CMDINT .ABS	DISKCHK .ABS
ERRCOPY .ABS	DELETE .ABS	BASICINI .SYS
PRESTART .BAC	COPYLIB .ABS	COPY .ABS
REPROT .BAC	SYSTEM .ABS	ASMZ .ABS
OBJUPD .ABS	ESTAB .ABS	DEBUG .ABS
EDIT .ABS	PROM .ABS	PASCAL .ABC
PASCOMP .COD	FORT80 .ABS	MYDIR .Ufd
YOURDIR .Ufd		

Remaining space 60007 sectors of 61184

Drive MFO:

SYSDIR .SYS	LIB .BAC	LIB .ABS
SYS .BAC	DOSGEN .ABS	UFD .BAC
UFD .ABS	CMDINT .SYS	COPYLIB .ABS
HISDIR .Ufd	HERDIR .Ufd	

Remaining space 573 sectors of 1220

5. BASICINI.SYS

The file BASICINI.SYS contains BASIC error text lines and can be provided with a selfstart routine, which automatically is executed at power-up or reset. The first sector of the BASICINI file contains the selfstart option as well as pointers for the text strings in the following sectors. This sector is loaded into DOS-buffer 0 (0F500H-0F5FFH or from 62720 dec) if available at reset. The sector is kept in the ABC800/DTC memory during normal program execution.

5.1 BASIC Error Text strings.

The system checks if the BASICINI.SYS file is available at power up or reset. If not, all Basic errors are displayed as error numbers only.

5.2 Selfstart option.

The first sector of BASICINI.SYS contains:

- 1 - If a jump instruction is stored in the first three bytes (=0C3 Hex), the ABC800/DTC executes the jump and the machine code routine that can follow in the sector.
- 2 - Note that the first part of the sector also contains pointers for the error text. The pointers follows directly after the three byte area, reserved for the jump instruction.
- 3 - If no jump instruction is found, ABC800/DTC tries to decode and execute the first characters in the second part of the sector as a BASIC command line in list format. The command line must be terminated by a carriage return (0D Hex). The program PRESTART.BAC may be used to store a command line in BASICINI.SYS.
- 4 - If none of the above is found, a normal start-up of the BASIC interpreter is done.

5.3 Option system loading.

For the ABC/DTC-Net system, see the RAMOPT.SYS program.

Using the PRESTART.BAC program and the ADDOPT.ABS file, optional code may be loaded to the memory of the ABC800/DTC at power-up or reset. This loading is initiated by BASICINI.SYS if enabled by the PRESTART.BAC program.

6. PRESTART.BAC, ADDOPT.ABS

The PRESTART and ADDOPT are not used in the ABC/DTC-Net system. See instead the SETSTART and RAMOPT.SYS program in ABC/DTC-Net.

PRESTART.BAC

The PRESTART.BAC program is used to store SELF-START-conditions in the BASICINI.SYS file:

- Enable/Disable loading of options from the ADDOPT.ABS file at power-on or reset. (Enabled at delivery with the DEVDES.REL option in ADDOPT.ABS).
- Giving a BASIC command line, to be executed at power-on or reset. Loading of options will be done before the command is executed.

ADDOPT.ABS

The ADDOPT.ABS files may contain a list of options, in the form of relocatable object file names. These will be loaded to the ABC800/DTC memory at reset or power-on if:

- BASICINI.SYS and ADDOPT.ABS files are available on disc.
- Options loading is enabled in the BASICINI.SYS.
- The files, listed in ADDOPT.ABS are available on disc.

Note that for self-start from a Winchester drive, a second reset must be given 15 seconds after power-on, as the Winchester drive is not available until after this time.

The ADDOPT.ABS contains the option DEVDES.REL at delivery.

The first sector in ADDOPT.ABS may contain a list of max 20 optional file names. These files shall be relocatable object files and the names shall be normalized as described below. An End-Of-Options mark ends the list. ADDOPT.ABS contains program code in the sectors following (1,...), which must not be changed.

ADDOPT.ABS, sector 0 has the following structure:

Byte 0 : The value 255 decimal (OFF Hex)

Blocks of 12 bytes, each with one file name:

After all blocks, one byte with the value 254 decimal (OFE Hex) indicates the End-Of-Options in the file.

Each option block contains the following information:

Offset	Description
-----	-----
0	Drive no. (0=DRO:,1=DR1:, etc. 255=Scan drives)
1 - 8	File name with 8 UPPER case characters, including trailing blanks.
9 - 11	Extension with 3 UPPER case characters, including trailing blanks. No period shall be included.

Below is a program to list the options in ADDOPT.ABS:

```

10 ; "LIST OPTIONS FROM ADDOPT.ABS" : ;
20 OPEN "ADDOPT.ABS" AS FILE 1
30 GET #1, A$ COUNT 1
40 IF A$ <> CHR$(255) ; "WRONG 1:ST BYTE" : GOTO 250
50 ; "First byte = CHR$( " ASCII(A$) )"
60 !
100 FOR I=1 TO 20 ! Max 20
110 ! Drive:
120 GET #1, E$ COUNT 1
130 IF E$=CHR$(254) GOTO 250 ! End-Of-Options
140 D$="DR"+NUM$(ASCII(E$))+":" ! Drive number
150 IF E$=CHR$(255) D$=" " ! Scan drives
160 !
170 ! Filename and Extension
180 GET #1, A$ COUNT 11
190 F$=LEFT$(A$,8)+". "+RIGHT$(A$,9) ! Filename+ext
200 !
210 ; D$ F$;
220 ; ' Format=CHR$( ' ASCII(E$) ' )+" " A$ "'
230 NEXT I
240 !
250 ; "END BYTE=" ASCII(E$) ". NO MORE OPTIONS"
260 CLOSE 1
270 END

```

Below is a program to store options into the file ADDOPT.ABS. Note that the program overwrites the old list of options in ADDOPT.ABS. Any old options which shall be kept must be rewritten with this program. The user must include the options file names in the correct format in the program. If a change is made in the program to input the filenames from the terminal, take care to convert the filenames to the correct format.

The DEVDES.REL option is used as example in the program.

Take care not to change more than the first sector (253 bytes) in the ADDOPT.ABS file.

Note that the loading of options at reset or power-on is controlled by BASICINI.SYS and may be enabled or disabled by PRESTART.BAC.

```
10 ; "STORE OPTIONS IN ADDOPT.ABS" : ;
20 OPEN "ADDOPT.ABS" AS FILE 1 ! Note USE OPEN!
30 PUT #1,CHR$(255) ! First byte in the sector
40 !
50 ! Block 1
60 PUT #1,CHR$(255) ! Drive. 255= Scan drives
70 PUT #1,"DEVDES " ! Filename 8 upper case char.
80 PUT #1,"REL" ! Extension 3 upper case char.
90 !
100 ! Block 2
110 PUT #1,CHR$(0)+"FILENAME"+"EXT"
120 ! Block 3
130 PUT #1,CHR$(255)+"FILE "+"BAS"
140 !
150 ! etc.
160 !
170 ! End-Of-Options
180 PUT #1,CHR$(254)
190 CLOSE 1
200 END
```

7. CMDINT.SYS

This is the command interpreter program, decoding direct commands running under DOS (The disc operating system). Machine code (.ABS) programs are loaded and executed, using CMDINT.SYS.

CMDINT.SYS is loaded and executed from BASIC with the command:

BYE

The disc operating system displays:

```
** Disc operating system Ver. 6.06 **  
Ver 6.00 1982-05-18  
Copyright 1982 Dataindustrier AB
```

The first version number is the DOS version, the second is the version of the CMDINT.SYS program.

This requires that the CMDINT.SYS file is available. Otherwise the system stays in BASIC mode.

Re-entry to BASIC from DOS is done with the command.

\$BAS

After entering DOS the name of any .ABS file is given to load and start the .ABS program. Switches and/or parameters can be given in the command line. Switches are one or more alphanumeric characters separated from the program file name with only a comma. Parameters are file names or other text strings separated from the program name and/or the switches by one or more spaces.

The .ABS program is responsible for decoding the switches and/or parameters which are available in the DOS command buffer (from OCOBOH and up.). However after loading the .ABS program, DOS automatically tries to interpret the parameters as file names and create a logical file table of 16 bytes for each parameter, starting at address OFD40H and up.

The logical file tables are configured as:

- 1 byte Drive number 0-31 or OFF Hex (unspecified)
- 1 byte Always OFF Hex
- 8 bytes File name
- 3 bytes Extension, if given (otherwise space)
- 3 bytes Device name, if given (Otherwise space)

The CMDINT. SYS is loaded at the address 0C000H-0C6FFH. Useful addresses are:

- 0C100H Entry. Display prompt.
- 0C103H Reentry without prompt.
- 0C106H Entry to a routine, loading and starting an .ABS file given in the command line. RETURN (=0DH) must follow the command line.
- 0C109H Entry to a routine, displaying text. Register HL in the Z80 processor shall point to the text string. The last character in the text string shall be "RETURN" (=0DH) or "EOT" (=03H).
- 0C000H Entry to a routine for reading a string of text from the keyboard. Register HL shall point to the buffer, where to store the string. Register C shall be the maximum number of characters to read. Reading is done until a RETURN is typed or until the maximum number of characters are read. Each character is echoed on the screen.

The DOS revision number, taken from the address 606FH, is displayed when starting CMDINT. The DOS type is indicated in the address 6070H:

0	ABC800
1	ABC80
2	RAM-OS
3	ABC/DTC-NET Central (Multiuser)
4	ABC800 - NET Terminal --
5	ABC80 - NET Terminal --

8. SYSTEM.ABS

SYSTEM.ABS is not available in ABC/DTC-Net systems.

The SYSTEM.ABS is a help file for executing system programs from DOS.

The program displays a menu on the screen of the most often used system programs, leaving the user to select one program for executing.

Start by:

BYE
SYSTEM

The display is as in the example below, depending on which system programs were included when the SYSTEM.ABS program was generated.

- | | | | |
|----|---------------|---|----------------------------|
| 1. | LIB | - | Library |
| 2. | DISKCHK | - | Checks the discs |
| 3. | DOSGEN | - | Formats and init the discs |
| 4. | ERRCOPY | - | Copies erroneous files |
| 5. | COPYLIB | - | Copy more than one file |
| 6. | COPY | - | Copy one file |
| 7. | DELETE | - | Delete files |
| R | Return to DOS | | |

Options(1-7,R) ?

Select one by giving the number. Answer RETURN only, to redisplay the select list.

After executing the system program, the system returns to the SYSTEM.ABS program.

9. DOSGEN.ABS

DOSGEN are used to format and/or initiate the Winchester disc as well as 8" and 5 1/4" diskettes.

Start by:

BYE
DOSGEN

or BYE

DOSGEN device:

or BYE

DOSGEN,F device:

Display:

** DOSGEN **

Ver 6.00 1982-06-07

Copyright 1982 Dataindustrier AB

Device?

Shall formatting be done (Y/N)?

The disc inwill be cleared

completely at initiation. Is this OK? <Y/N>

Absolutely sure ??? <Y/N>

If formatting is selected and the A5 controller EPROM is used on a minifloppy device, the following question is asked: (The A6 controller EPROM always uses double density.)

Single or Double Density ? (S/D)

'Device:' is a disc/diskette device name (Ex. HDO:).

9.1. Formatting AND initiating a disc.

Formatting means that the entire disc is erased, the disc is subdivided into sectors (soft sectors) and sector headings are written. Dummy data is written into all sectors on the disc and sectors, in which writing were not successful, are marked as not-usable in the lock-out map.

The Winchester disc is formatted at delivery, as well as 8" diskettes, while the 5 1/4" diskettes must be formatted by the user.

The DOSGEN,F command also does the initiation below.

9.2 Initiate a disc/diskette, but do no formatting.

DOSGEN does the following:

- Erases all files on the disc/diskette and clears the library, the bit-map and the lock-out map.
- Reads all sectors on the disc, marking bad sectors in the lock-out map and the bit-map to prevent further use of these sectors. Bad sectors are reported. During reading, the sector numbers are displayed on the screen.
- Writes the library, the bit map, the lock-out map and the SYSDIR.SYS file on the disc/diskette.

Optionally a name may be given after the device in the command line for starting DOSGEN. This name shall have the format of a file name (Name=8 characters, extension=3). This name is stored in the SYSDIR.SYS file on the disc.

10. DISKCHK.ABS

The DISKCHK.ABS program checks the entire disc and repairs repairable errors. All errors are reported.

It checks the lock-out map, the bit map, the library sectors and the record index blocks for each file on the disc. All sectors belonging to any file is checked, but free disc space is not checked.

Errors are displayed, if found, and the operator may select to repair the sectors or not. Some hard errors can not be repaired within the file. Use the ERRCOPY program to copy the file and remove sectors with hard errors.

Repairable errors are:

1. Lock-out map errors. Repaired.
2. Bit-map errors. Repaired.
3. Files, not properly closed. Closed.
4. Bad UFD header sectors. Repaired.
5. Sectors with CRC hard errors from the disc controller are repaired by writing back the data, which could be read from the sector, but with the correct check-sum. This may be wrong data, but is the best possible.
6. Record format error in a RIB, Record Index Block. This can not be repaired, but the operator can select to delete the entire file, whose RIB is bad.
7. Bad filename in the library. Can not be repaired, but the operator may delete the file.

Non-Repairable errors are:

1. All hard errors, but a CRC error from the disc controller.
2. Data errors, which can not be detected by the system.
3. Record Format Errors. See below.

Warnings are:

Record Format Errors in a data record. This might not be a real error and is not repaired. It can be the result of unsuccessful write attempts, which have been re-written in another disc position. It may also be un-used sectors in a file, which has not been properly closed. Diskchk closes open files, but records with in the last cluster, after the last allocated sector can still cause 'record format error' messages.

Start the DISKCHK program by:

BYE
DISKCHK

Display:

** DISKCHK **
Ver 6.00 1982-05-19
Copyright 1982 Dataindustrier AB

Device to check:..... <give device!>
W - Display also warnings.
D - Display filenames during check.
N - No repairing. No changes on disc/diskette.
Y - Correct all failures found.
F - Fast check, Warnings will not be checked.
Options (W,D,N,Y,F,none) : <give options!>

The default options when only RETURN is given (none) is:

- Check all filespace on disc.
- Do not display warnings.
- Do not display the filenames.
- Display errors and ask operator to select repair or not.

During testing, the operator can break and exit to DOS by typing CTRL-C. The keyboard is checked each time any display appears.

A temporary pause in the DISKCHK listing of errors and filenames is achieved by keeping any key pressed.

Be patient, testing takes a few minutes.

Under DOS the parameters may be given in the command line.

Example:

DISKCHK,WD HDO:

11. ERRCOPY.ABS

ERRCOPY is not available in ABC/DTC-Net systems.

Copy a file and remove sectors with non-repairable errors as well as sectors with 'Record Format Errors'.

Note!. If a sector is removed, the position of the data following this sector will be changed in the file.

Start by:

ERRCOPY Device:Filename.ext

or

ERRCOPY Device:Filename.ext,Device:Newfilename.ext

Example:

ERRCOPY MYFILE.TXT

which moves the file MYFILE.TXT within the current directory to a new disc position.

If ERRCOPY is started without parameters, the program asks for parameters:

Device?

Copy to device?

Erroneous file?

Copy to file?

12. COPYLIB.ABS

COPYLIB is used to copy files from one directory or device to another, using the library for selecting files. Files can be copied between discs and/or diskettes as well as between the current User File Directory (=directory UFD:) and the master file directory (=the device name).

Start by:

```
BYE
COPYLIB Dir1:Fileselect,Dir2:
```

or use the options COPYLIB,V or give only
COPYLIB and the program asks for parameters.

COPYLIB will copy files from 'Dir1:' to 'Dir2:'. Directory names like HDO:, MF1:, UFD: etc. are used.

The files in the library of 'Dir1:' is displayed one after the other. The operator selects for each file if the file shall be copied or not.

If the 'Fileselect' character string is given, COPYLIB ignores files which do not correspond to the select criteria. See the description of the LIB.BAC program for the select criteria.

The display after start-up is a prompt like in the following example, indicating the different possible commands to give for each file:

```
COPYLIB UFD:.BAC,HDO:
```

```
** COPY FILES **
Ver 6.00 1982-05-17
Copyright 1982 Dataindustrier AB
AVAILABLE COMMANDS:
A   = COPY ALL REST OF LIBRARY
X   = EXIT, DO NO COPYING
I   = IGNORE THIS FILE AND REST OF LIBRARY
Y   = YES, COPY THIS FILE
Y=NEWFILE.EXT = COPY, GIVING FILE A NEW NAME
```

```
COPY NYFILE .BAC    ?Y    <List of files,
COPY YOURFILE.BAC   ?Y    corresponding
COPY TEST    .BAC    ?I    to the select criteria>
```

If only RETURN is given as answer, the file will not be copied. Note that the SYSDIR.SYS file is not listed, as this file must not be copied.

During the copying phase, each filename is displayed and the number of sectors in the file.

When the verify option is specified, the COPYLIB will compare the old and new files after copying, and display error if the files are not equal.

When files are to be copied, using a double track drive, FROM a single track mini-diskette TO a double track mini-diskette, a special feature of the COPYLIB program can be used. The program will automatically use single track commands if the diskette structure is not double track. The device parameters will temporarily be set and reset during the copying phase. The switches for single/double track on the 4106 interface should be set according to the diskette format.

NOTE! DO NOT copy TO a Single Track minifloppy with a double track drive!!

If COPYLIB is started without parameters, the program asks the operator for the parameters according to the following example:

```
Original Drive unit ?  
Drive unit for copy ?  
Verification ?  
File to copy ?           <give Fileselect>  
Available command :  
      <etc. according to display shown above>
```

13. COPY.ABS

Copy one file between devices or within the same device.

Start by:

BYE

COPY Device:Filename.ext,Newdevice:

or

COPY Device:Filename.ext,Newdevice:Newfile.ext

If COPY is started without parameters in the command line, the program asks the operator for the parameters according to the following example:

Original Drive unit ? :

Drive unit of copy ? :

File to copy ? :

New file name ? :

14. DELETE.ABS

DELETE.ABS is used to delete files on a device, using the library for selection. The file selection is done exactly as in the COPYLIB program.

Answer RETURN for files which shall not be copied.

See COPYLIB.ABS for more information.

Start by:

BYE	or BYE
DELETE	DELETE Drive: File

Display

```
** Deletion of files **
  Ver 6.00 1982-05-19
  Copyright 1982 Dataindustri AB
Drive unit? ....
Delete file? ....
Available commands:
A - Delete all files left
X - Exit, No deletion
I - Ignore this file and rest of library
Y - Delete this file

Delete MYFILE .BAC ?....
.
.
.
.
```

15. REPROT.ABS

The user may change the software protection status of a file, using the REPROT program.

One of the options 'W', 'D' or 'X' is given.

Option:	Function:
W	File is write protected. The file is also delete protected.
D	File is delete-protected. Writing is however permitted.
X	Protection is removed from the file.

Start by:

BYE
REPROT

Display:

Filename :
Options (X,W,D) : <select one>

Winchesterinterface

4107

För ABC 800/DTC

(Z80CPU, Z80DMA)

Buffert Ram varierande storlekar
(2k Ram 6 sektorer)

(Med 8k Ram
30 sektorer buffer)

256 byte/sektor

61184 sektorer

Cluster-storlek : 32 sektorer

Bitmap i en sektor = $8 \times 239 = 1912$ clusters/disk

$$1912 \times 32 = 61184 \text{ sektorer}$$

En logisk diskenhet innehåller max 65535 sektorer
(mer kan inte pekas ut av ABC 800)

För större diskenheter delar man in den logiska driven
i 2 eller fler fysiska enheter. Till detta behövs ett
extra EPROM på 4107 interfacet

Standardadress för 4107 skall vara $36_{dec} = 44_{oktalt} = 414Q$

Cluster storlek: är antal sektorer per bit i bitmappen på d

Bitmappen har alltid 1912 bitar $(256 - 17) \times 8 = 1912$

Clusterstorleken är alltid 1, 2, 4, 8, 16 eller 32 sektorer/bit

den minsta clusterstorleken ^{man kan ha} beror på det totala
antalet sektorer på disken.