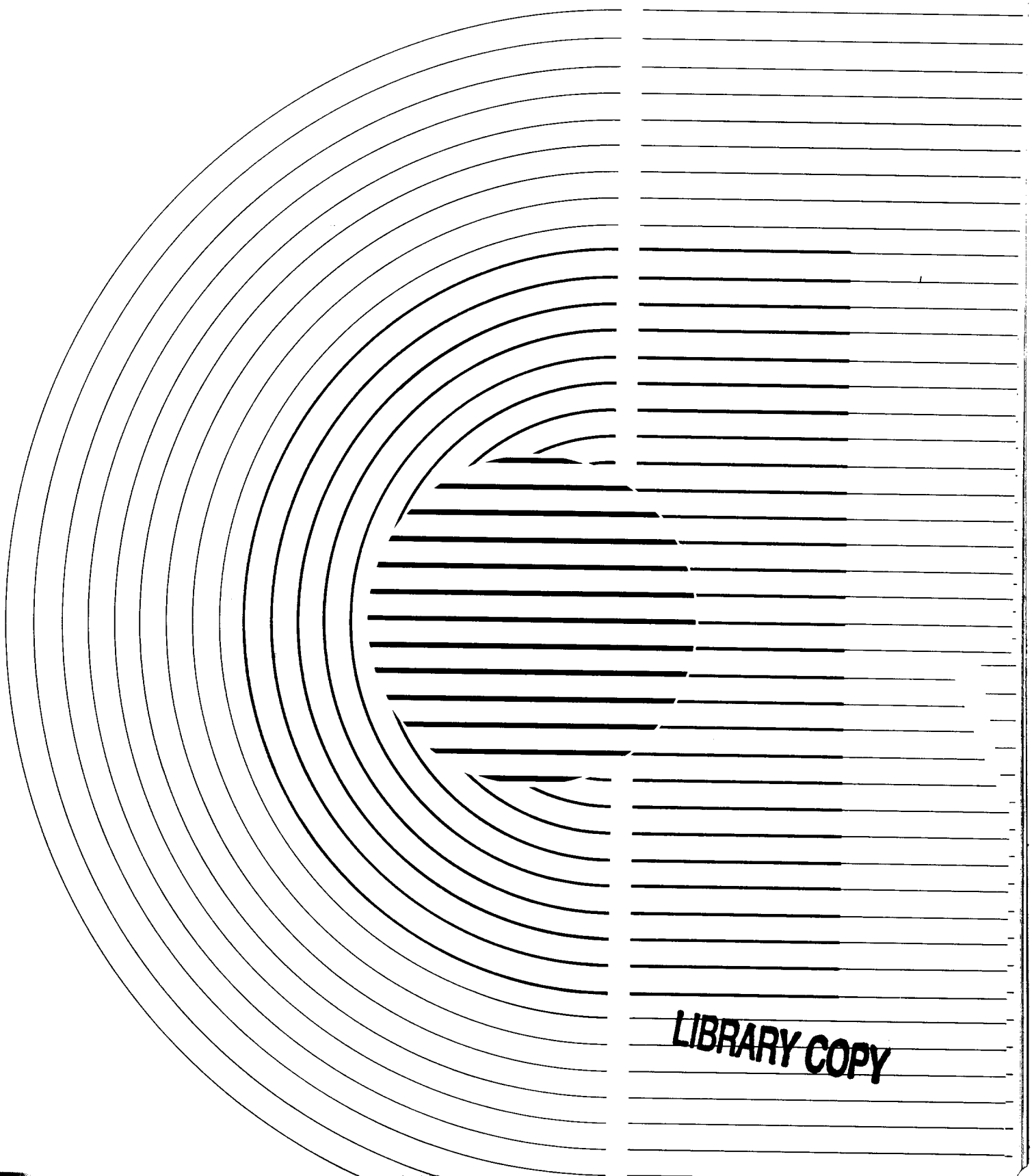
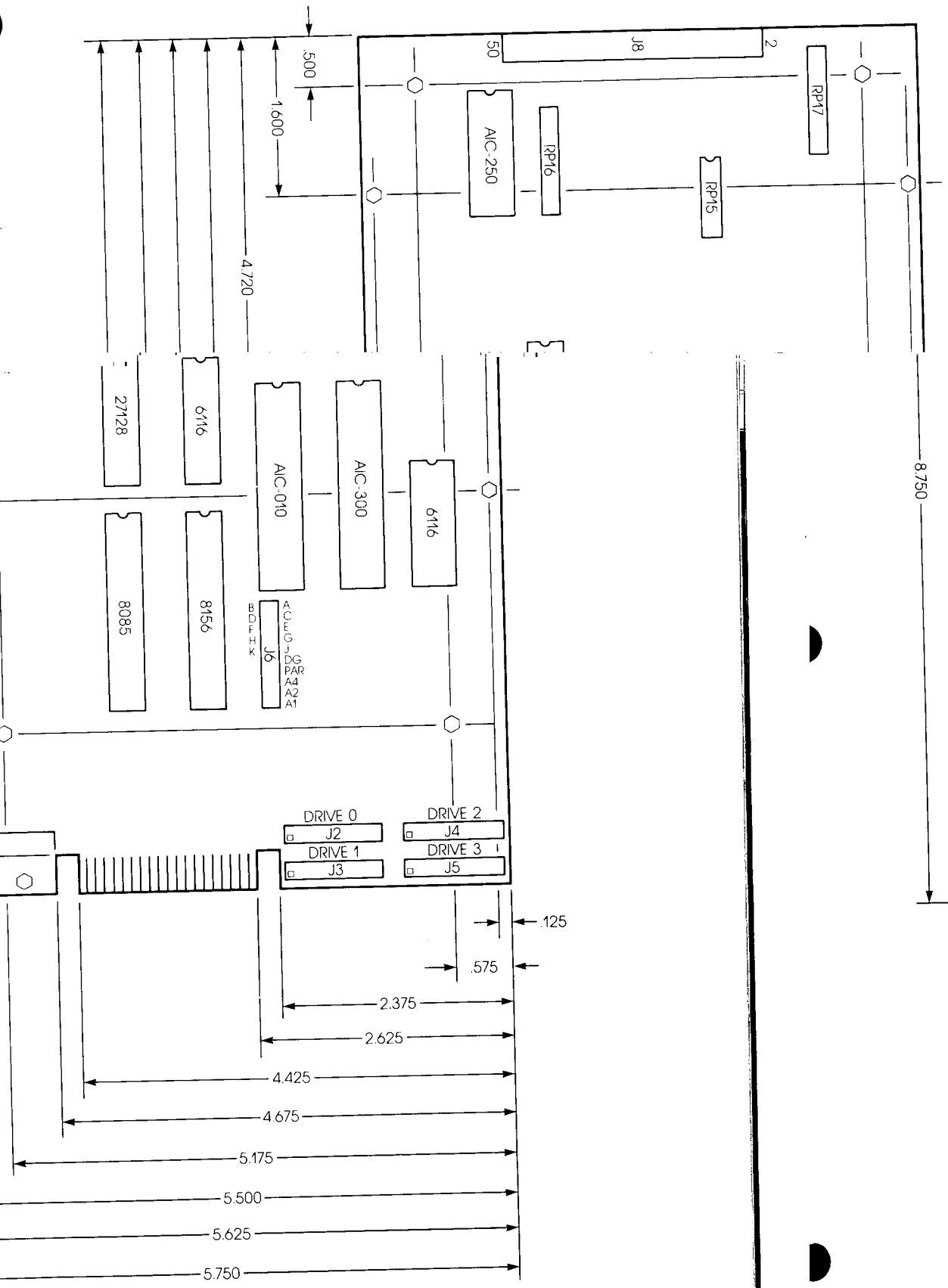
adaptec, inc.

ACB-5500
User's Manual



1.4 BOARD LAYOUT

The component layout of the ACB-5500 is shown in Figure 1-1.



ACB-5500 BOARD LAYOUT

FIGURE 1-1.

3.Ø INSTALLATION

The ACB-55ØØ is a self-contained circuit board. All logical and electronic functions required for its normal operation are contained on the circuit board. The ACB-55ØØ is simple to install, operate, and maintain.

3.1 UNPACKING

The ACB-55ØØ is shipped in a protective carton with shock-absorbing material and static-protecting material completely surrounding the card. The carton should be examined for external damage as it is opened. The cards were physically inspected when packed. Any mechanical damage to the cards should be reported to the carrier and to Adaptec as soon as possible.

CAUTION

All circuit boards containing VLSI circuitry have some sensitivity to electrostatic discharge. The ACB-55ØØ is no exception. Proper handling precautions, including personnel grounding and work surface grounding, should be taken to prevent circuit stress which can cause premature circuit failure.

3.2 PREPARATION OF INSTALLATION AREA

The ACB-55ØØ is generally designed into the host system or the peripheral disk system. Proper attention should be given to the location of the ACB-55ØØ so that the necessary ventilation, installation clearances, and cabling paths are provided.

The power output is low enough so that convective ventilation will be sufficient if the air and surrounding surfaces are at a temperature of 55 degrees Centigrade or less. If this requirement cannot be met by the system enclosure in its worst case environment, then the system enclosure must provide for appropriate ventilation and cooling.

Care should be taken to support the card mechanically. Any appropriate combination of the eight mounting holes provided can be used, depending upon the forces to which the system will be subjected. No conductive material should come in contact with the ACB-5500.

Installation clearances, both for the ACB-5500 and the selected power and signal cabling configuration, should be sufficient to optimize system cost, manufacturability, and maintainability.

The ACB-5500 emits a small amount of radio-frequency signals. Extremely sensitive components, such as high bandwidth analog sensors, should be properly shielded from the ACB-5500. Normal case construction is sufficient to shield the ACB-5500 as required by the FCC. If FCC compliance is required, and the SCSI cable leaves the box in which the ACB-5500 is installed, the high-frequency signals generated by normal SCSI operation may require connector and cable shielding.

The ACB-5500 and all other partially shielded electronic devices are sensitive to high-power, high-frequency electrical or magnetic sources. The ACB-5500 should be protected from such sources while it is operating. In particular, unshielded switching power supplies should be physically isolated from all electronic boards and their interconnecting cables. External noise sources, such as welding machines and radio transmitters, should be similarly isolated from electronic systems. Cable and connector shielding may be required in some environments.

An appropriate power source must be provided. Care should be taken to prevent ground loops and other power disturbances.

Proper programming support must be provided to generate the required command sequences. Additional program support must be provided to manage the SCSI protocols. Any system supporting Adaptec's ACB-4000, nondisconnecting ST506/412 disk controller, will also support the ACB-5500. Use of the advanced performance-oriented functions will require a more powerful SCSI host adapter that supports disconnect/reconnect, command linking, and arbitration. Use of the advanced command functions requires expanded software support. Adaptec's host adapters will provide the required SCSI protocol services, but must receive the commands to be executed from appropriate system software.

3.3 INSTALLATION

The following steps are required for installation of the ACB-5500 into a system properly designed to accept it. These steps are separate from any other testing and installation procedures required by other portions of the system, but can often be done in conjunction with those other installation steps.

1) Inspect the ACB-5500 for obvious physical damage before installing.

2) Install the proper jumpers (see Section 3.4) to enable the desired ACB-5500 functions and to define the address of the ACB-5500 on the SCSI Bus.

3) Install the ACB-5500 with appropriate mounting hardware.

4) Make the required cable connections to the ACB-5500. The cable connections are:

   J7 - Power cable
   J8 - SCSI cable
   J2, J3, J4, J5 - ST506 data cable (radial connections as required)
   J1 - ST506 control cable.

5) Install ST506 drives according to the manufacturer's directions. The drives must have appropriate drive select address and bus terminators set. The last ST506 drive on the control cable daisy chain must be terminated.

6) Power on the system and perform any power-on test procedures required by the system.

7) Format the attached drives. (See Section 3.7.)

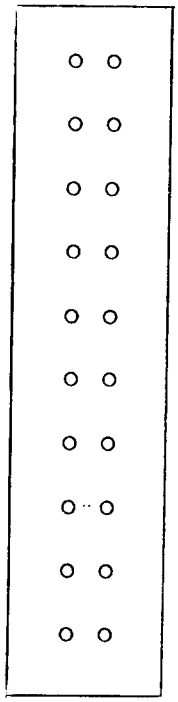
   Note: In a production environment, the drives may be optionally formatted by a dedicated ACB-5500 manufacturing work station before installation. Since all parameters are stored on the drive by the formatting procedure, further formatting or parameter specification is not required after installation. The ACB-5500 will autoconfigure to the drive parameters at power-on time.

8) Perform appropriate system test and verification procedures. Errors related to drive operation, ACB-5500 operation, SCSI operation, and certain installation errors will be indicated through the normal SCSI error presentation mechanism.

3.4 CONFIGURING THE ACB-5500

The ACB-5500 has a number of options that must be selected by the installation of hardware jumpers located at position J6 on the controller. The function of each jumper pair is shown in Table 3-1. The jumper header is designed to accommodate jumpers with optimum reliability, the jumper pairs may be wire-wrapped together.

TABLE 3-1. CONFIGURATION JUMPERS



A	o o	B	- SCSI Reset Option
C	o o	D	- Reserved
E	o o	F	- Hard-Sectored Lun0
G	o o	H	- Hard-Sectored Lun1
J	o o	K	- Reserved
	o o	Diag	- Diagnostic Mode
	o o	Par	- Parity Enable
	o o	A4	- SCSI Address 2^2
	o o	A2	- SCSI Address 2^1
	o o	A1	- SCSI Address 2^0

3.4.1 SCSI RESET OPTION

The installation of the A-B jumper will cause the ACB-5500 to initiate a "Hard" reset in response to an SCSI bus reset. Without this jumper installed, a "Soft" reset will result. The effect of both a "Hard" and "Soft" reset are detailed in Section 4.1.3.2.

3.4.2 HARD-SECTORED/REMOVABLE DRIVES

The installation of the E-F or G-H jumpers will indicate to the ACB-5500 that a hard-sectored drive is attached as logical Unit 0 or 1, respectively. The presence of a jumper will cause the ACB-5500 to use the sector pulse input from the drive. The jumpers must only be installed if a hard-sectored drive is attached. Hard-sectored drives must either be logical unit 0 or 1.

3.4.3 DIAGNOSTIC MODE

The installation of the DIAG jumper will cause the ACB-5500 to continuously repeat a diagnostic self test. Appendix A details this self test.

3.4.4 PARITY ENABLE

The installation of the PAR jumper will cause the ACB-5500 to check for bus out (data into the ACB-5500) parity errors. This jumper should only be installed if all SCSI devices communicating with the ACB-5500 generate SCSI data parity. The ACB-5500 will always generate parity on bus in data.

3.4.5 SCSI BUS ADDRESS

The installation of jumpers A4, A2, and A1 set the SCSI bus address for the ACB-5500. SCSI devices can have an address of 0 to 7 but no two devices can have the same address.

3.5 POWERING-ON THE ACB-5500

Once the ACB-5500 is properly configured, the controller may be powered on. When power is supplied to the system, the controller will enter a power-up mode and wait for a maximum of 18 seconds for the drive to become ready. During the 18-second power-on

uence, the controller performs a self test and begins checking
drives 0,1, 2, and 3 to become ready. If the host sends a
mand requiring access to a drive before it has become ready
d before 18 seconds have elapsed), the controller will accept
command and continue to check for a ready status. Once the
ve comes ready, the controller will then execute the command;
e does not come ready, a DRIVE
t. The controller will then
xt command requiring access to

ntroller will recalibrate the
ts at track 0, the controller
to confirm that the drive can
was valid. With the drive's
ontroller then seeks back to
t can be seen) appears to make

read from track 0, parameter
ng formatting. If the drive is
ted by other than an Adaptec
mation is not present. The
at" to warn the user that the
equence is stopped and the
The drive must be formatted
disk data.

d, the controller will seek the
ad the largest block address
n and largest block addresses

for
com
(and
the
driv
if 18 seconds elapse, and the driv
NOT READY (04_H) error will resul
check for a ready status on the ne
that drive.

Once a drive comes ready, the cor
head to track 0. If the drive star
will step the head off of track 0
seek and that the track 0 signal
ability to seek confirmed, the c
track 0. The drive actuator (if i
a short 'blip.'

The controller then attempts to
information which is written durir
unformatted, or had been format
controller, the parameter infor
controller then sets "blown form
drive is unusable, the reset s
controller is ready for a command.
to allow a READ or WRITE access to

If the drive is correctly formatted
drive to the last cylinder and re
present. The parameter informatio
are saved by the ACB-5500.

Once the last block address has been read, the controller will seek the drive back to track Ø, stopping several times in 'zones' to read the defect count within each zone. This defect count is also saved in the controller to allow it to better predict the location of a block on the disk for accurate seeking.

Once a drive is formatted, the host can determine the drive size (READ CAPACITY, 25_H, command) and self-configure without any driver software modification. This device independence provides a major advantage for host systems using true SCSI controllers over the SASI-like units that send parameters at a reset and with commands.

3.6 COMMUNICATING WITH THE ACB-5500

The SCSI bus is a simple bus to interface. However, a quick reading of the SCSI spec may leave you lost due to its extreme attention to detail. Also, some SASI-like controllers exist on the market which allow some deviation from the ANSI/SCSI protocol. The important point to remember in designing a drive routine is that once the controller is started by the host, THE CONTROLLER CONTROLS THE SCSI BUS. The controller drives the data direction line (I/O), the phase lines (C/D and MSG), and initiates data transfers (REQ). The host driver should make no assumptions about the bus phases or byte counts. In addition, the controller can (and will) change phases betwe while going through intermediate phases. Thus, t (C/D and MSG) are only valid when the controller as not write your driver or allow your hardware to when REQ is not active or it may be 'fooled' by between REQ. Also, other controllers only support commands, thus some users have set up counters in to send a six-byte command. Since the ACB-55 supports six- and 10-byte commands, the hardware/s not count out the command bytes but rather should bytes as long as the controller requests them controller; it 'knows' how many bytes it needs.

The sequence of operations for a single comman simplest of SCSI applications would be:

1) Select the controller onto the bus (wake it select remains asserted until the controller re

2) Send the ACB-5500 the appropriate command b changes phases (do not count bytes). If too m bytes are REQuested, check for valid comman proper SCSI REQ/ACK timing.

3) If required, send/receive data until phase-c count bytes; controller will determine data di

4) Receive (REQ/ACK cycle) one status byte evaluation (see Section 4.5).

5) Receive (REQ/ACK cycle) one message byte (see Section 4.2).

6) Check status byte. If Busy bit set, resend command; if Check bit set, send REQUEST SENSE ($Ø3_H$) command to get error.

2.7 FORMATTING WITH THE ACB-5500

Note: Two additional bytes would be added for a hard-sectored or removable drive (see Section 6.14).

After the MODE SELECT has been transferred to the controller and good completion status has been sent to the host, the drive may be formatted.

Step 2: FORMAT UNIT

Interleave of 1:1
Fill data fields with $E5_H$
One defect at head 2, cylinder 11, 256 bytes from index

ectors per cylinder

MAT UNIT command

ription

ode (04_H for FORMAT UNIT command)
and indicate fill character and defect
riptor appended
acter to be filled in data fields
byte of interleave (must be 00)
byte of interleave
rved

AT UNIT Data Block

at entire unit
cate two spare sectors per cylinder
byte of length of defect list
byte of length of defect list
byte of cylinder number of defect
le byte of cylinder number of defect
byte of cylinder number of defect
number of defect
byte of defect bytes from index
le byte of defect bytes from index
le byte of defect bytes from index
byte of defect bytes from index

e can be used for formatting single cylinders.
tains details on changes required to the FORMAT
cylinder level formatting.

ws you to select the desired interleave factor
NIT command. The interleave can range from zero
of blocks-per-track, minus one. The number
umber of physical blocks between consecutive
nbers, thus an interleave of one means that the
ecutive. (Interleave of zero is the same as an
).

wo spare

FOR

Hex	Desc
04	Op c
1E	Lun0
	desc
E5	Char
00	High
01	Low
00	Rese

FORM

00	Form
02	Allo
00	High
08	Low
00	High
00	Midd
0B	Low
02	Head
00	High
00	Midd
01	Midd
00	Low

The same procedur
Section 6.4.2 cont
UNIT command for

The ACB-5500 allo
with the FORMAT U
to the number
represents the n
logical block num
sectors are conse
interleave of one

The use of an interleave factor one allows a maximum transfer rate, but will only be effective with a host adapter and system capable of very high transfer rates. On the other hand, the use of interleaving can maximize the storage capacity of your drive and allows you to time the operation to your operating system.

Table 3-2 shows the number of formatted sectors-per-track for different block sizes and interleaves when using soft-sectored drives.

TABLE 3-2. INTERLEAVED SECTORS/TRACK

SECTOR SIZE	INTERLEAVE	SECTORS/TRACK
256	1	32
256	>1	33
512	1	17
512	>1	18
1Ø24	1	9
1Ø24	>1	9