Cortland
Hardware Designer's Handbook

Preliminary Notes
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Changes Since Previous Draft

These preliminary notes are as previous as they get. They are based on information extracted from the following ERS's.

- Mega II ERS Rev. 2.2 (6-25-85)
- FPI (Fast Processor Interface) ERS (9-5-85)
- Cortland I/O Timing (11-4-85)
- Slot Maker ERS and Specification (5-1-85)
- Front Desk Bus Specification Rev. B. (9-16-85)
- KEYGLU (Keyboard GLU) ERS 1.0 (6-25-85)
- Connector Diagrams (1-25-85)
- Cortland Block Diagram (8-8-85)
- Cortland Banks $E0/$E1 Memory Map 00:50 (12-16-85)
- 65816 Documentation Notebook
- VGC (Video Generator Chip) ERS Rev 2.1 (11-19-85)
- Sound GLU ERS Rev. A (11-21-85)
- Front Desk Bus ERS 02:50 (10-24-85)
- Mouse ERS 00:10 (7-15-85)
- Control Panel ERS 00:20 (12-9-85)
- Serial Port ERS 00:10 (11-5-85)
- Disk Support ERS 00:10 (11-6-85)

Contents

Foreword

About These Notes

These preliminary notes for the *Hardware Designer's Handbook* are a collection of notes and fragmentary scribblings and are not guaranteed to be either complete or correct. Their only redeeming feature is their availability now, so far in advance of the product they describe.

Chapters 3, 4, and 6 have yet to be written. The chapter titles and headings are included as an indication of the topics to be covered.

After the developer seeding, the information in these notes will be incorporated into the *Cortland Hardware Designer's Handbook*. That book will be the peripheral designer's reference manual for the Cortland technical manual suite. It will describe those parts of the Cortland that peripheral designers need to know about, including the Front Desk Bus, the expansion slots, and the soft switches. It will also provide compatibility guidelines and other helpful hints.

About the Cortland

The Cortland is a combination of old and new technology: at the same time that it enhances the Apple II line with its faster processing, larger memory, and a vastly improved color display, it maintains compatibility with existing Apple II software and peripherals.

The Cortland includes features of both the Apple IIc and the Apple IIe. Like the Apple IIc, the Cortland has built-in I/O ports so that users can attach standard I/O devices without the need for additional cards. Like the Apple IIe, the Cortland also has seven expansion slots for adding peripheral cards and custom hardware.

The Cortland also resembles the Macintosh, with built-in hardware and software to support the mouse and the desktop interface. The Cortland's program tools make it easy for applications to have menus, windows, and multiple-font text in high-resolution color.

Table 1-2. Serial Port Signal Conventions

Pin	AppleTalk	General Purpose	DTE	DCE
1	-	Data Terminal Ready	from	to
2	Handshake	Data Set Ready	to	from
3	Transmit Data Minus	Transmit Data Minus	from	to
4	-	Signal Ground	-	-
5	Receive Data Minus	Receive Data Minus	to	from
6	Transmit Data Plus	Transmit Data Plus	-	-
7	-	GP input	to	from
8	Receive Data Plus	Receive Data Plus	to	from
shell	Physical Ground	Physical Ground	-	-

Disk Port

The disk I/O connector is a nineteen-pin miniature D-type connector. The disk port can handle up to four drives, two $3^1/_2$" drives and two $5^1/_4$" drives. The drives are connected in daisy-chain fashion with the $3^1/_2$" drives first and $5^1/_4$" drives (if any) last.

Figure 1-3. Disk Drive Connector Pinouts

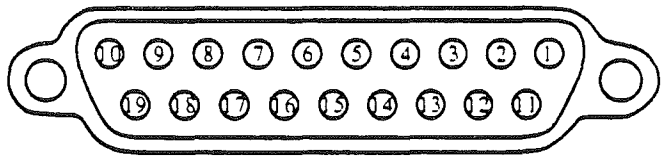


Table 1-3. Disk Drive Connector Signals

Pin	Name	Description
1, 2, 3	GND	Ground
4	EN3.5	Enable $3\frac{1}{2}$" disk drive
5	-12V	-12V supply
6	+5V	+5V supply
7, 8	+12V	+12V supply
9	EXTINT'	external interrupt
10	WRPROT	write-protect input
11	Phi 0	motor phase 0 output
12	Phi 1	motor phase 1 output
13	Phi 2	motor phase 2 output
14	Phi 3	motor phase 3 output
15	WRREQ'	write-request
16	HDSEL	head select output
17	DR1'	drive 1 select
18	RDDATA	read data input
19	WRDATA	write data output

Video Connectors

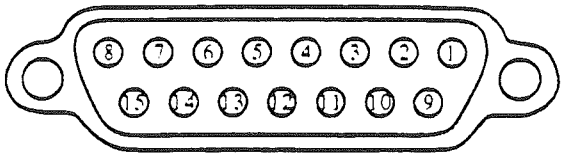
The Cortland video signal is available in two forms: a composite signal appropriate for a composite color or monochrome monitor, and a set of RGB signals appropriate for an RGB color monitor. The composite signal can also be used with a video RF modulator and a television set.

The composite video signal appears at the tip connector of the RCA phono jack; the shield is ground. The composite video signal is compatible with the standard EIA video levels: white level is approximately 2.0 volts, black level approximately 0.75 volts, and sync level is 0.0 volts. Impedance is 75 ohms.

The RGB signals are available through a fifteen-pin miniature D-type connector, as shown in Figure 1-4. Table 1-4 lists the signals.

Warning: The RGB video signals from the Cortland are not the same as those from the Apple IIc or those from the Apple III. Do not attempt to connect the Cortland RGB monitor to either an Apple IIc or an Apple III.

Figure 1-4. RGB Video Connector Pinouts



Each of the red, green, and blue video signals (pins 2, 5, and 9, respectively) includes the composite sync signal, which is also available separately on pin 3. The composite video signal on pin 12 is the same signal available on the separate composite-video connector. Likewise, the sound signal on pin 11 is the same as the signal available on the separate sound connector. The nominal sound level is 1V peak-to-peak.

Table 1-4. RGB Video Connector Signals

Pin	Signal
1	Ground
2	Red video and sync
3	Composite sync
4	(n.c.)
5	Green video and sync
6	Ground
7	–5V supply
8	+12V supply
9	Blue video and sync
10	(n.c.)
11	Sound
12	Composite video
13	Ground
14	(n.c.)
15	(n.c.)

Game I/O Connector

The game I/O connector is the same as the game I/O connectors on the Apple IIe and the Apple IIc. It is a nine-pin miniature D-type connector for attaching a set of hand controllers or game paddles, a joystick, a graphics tablet, or a similar I/O device designed for use with Apple II computers.

Figure 1-5. Game I/O Connector Pinouts

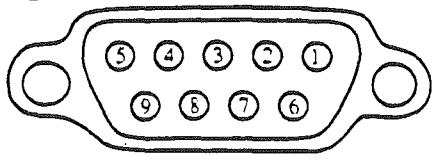


Table 1-5. Game I/O Connector Signals

Pin	Name	Description
1	PB0	Button 0 input
2	+5V	+5V supply
3	GND	Ground
4	PDL2	Paddle 2 input
5	PDL0	Paddle 0 input
6	PB2	Button 2 input
7	PB0	Button 0 input
8	PDL1	Paddle 1 input
9	PDL3	Paddle 3 input

Audio Connector

The audio (sound) connector is a 9mm minature stereo phone jack with the channels connected together (mono). It provides the audio signal connected to the internal speaker in the Cortland. The sound is produced by the same kind of one-bit circuit found in other models of the Apple II. If the user installs the optional Sound Enhancement Kit, the sound produced by the Enhancement Kit will also be available at the audio connector. For more information, please refer to the manual that accompanies the Sound Enhancement Kit.

Chapter 2

Front Desk Bus

The Front Desk BUS (FDB) is a new I/O port and protocol designed to accommodate keyboards, pointing devices, and similar kinds of human-interface input devices. The Front Desk Bus is controlled by an independent microprocessor that connects to the system through a custom IC, the KeyGLU chip.

Functions of the Front Desk Bus (FDB)

The Front Desk Bus (FDB) has three functions in the Cortland:

- Support the detached keyboard for different countries.
- Support the FDB mouse.
- Support additional input devices, such as keypads and graphics tablets.

Keyboards

Communications between the detached keyboard and the Cortland are handled by the Front Desk Bus microprocessor, which is also called the Single-chip Microprocessor Keyboard Interface (SKI). The SKI provides several useful features for the keyboard, including a type-ahead buffer and the ability to switch keyboard layouts. Using the Control Panel in the Cortland firmware, the user can select any keyboard layout from the list of keyboards in Table 2-1.

Table 2-1. Cortland Keyboard Layouts

U.K. (United Kingdom)
Dvorak
U.S. (United States)
French
German
Italian
Spanish
Swedish
Canadian (Western French)

FDB Mouse

The Cortland mouse communicates with the system through the Front Desk Bus (FDB). The FDB has a microprocessor that keeps track of the mouse and provides position and status information to the system. This use of a peripheral processor is a departure from mouse support on the Apple IIc, which uses the main processor. The Cortland mouse interface is more like the AppleMouse card on the Apple II plus and the Apple IIe in that it has a true passive mode that enables it to operate without interrupting the main processor. Even when operating in interrupt mode, the Cortland mouse can interrupt the main processor only when there is a vertical blanking signal (VBL), which happens only 60 times a second.

Connecting to the Bus

The Front Desk Bus is a communications link between the Cortland and one or more peripheral input devices. Peripherals connected to the bus are called devices.

The Cortland is the host and the undisputed master of the bus. It controls the flow of information by issuing commands, which only it can issue. The command for sending data from a device to the host is the Talk command. The command for sending data to a device from the host is the Listen command.

FDB Connector

All devices communicate with the host by means of three-conductor cables terminated with four-pin miniature DIN plugs, with pinouts as shown in Figure 2-1 and Table 2-1. The capacitance of the cable must not exceed 100pF per meter, and the length of the cable must not exceed five meters.

Figure 2-1. Front Desk Bus Connector

Table 2-1. Front Desk Bus Connector Signals

Pin	Signal
1	Data
2	(n.c., reserved)
3	+5V supply
4	Ground

.FDB Signals

Chapter 3

Expansion Slots

I/O Expansion Slots

Slot Address Validity

Using Slots or Ports

Memory Expansion Slot

Chapter 4

System Timing

1MHz Operation

2.8MHz Operation

DMA Operation

Chapter 5

Soft Switches and Status Registers

Apple II ROM is available in banks $E0-$E1 or in other banks when IOLC shadowing is enabled. Soft switches are like ROM: they operate in bank $E0 or in any bank where shadowing is enabled and when the I/O inhibit flag in the shadow register is zero (inhibit off).

Soft Switches

*** (The list of soft switches and their addresses will appear here.) ***

Status Registers

Status registers are like soft switches, except that a read instruction returns valid information. Status registers are like ROM: they operate in bank $E0 or in any bank where shadowing is enabled and when the I/O inhibit flag in the shadow register is zero (inhibit off).

The status registers are

- State Register (FPI and Mega II) ($C068)
- Shadow Register (FPI) ($C035)
- CYA (Configuration) Register (FPI) ($C036)
- DMA Bank Register (FPI) ($C037)
- Slot ROM Register (FPI) ($C02D)
- Language Select Register (Mega II) ($C02B)
- Video Select Register (Mega II) ($C029)
- Horizontal Count Register (Mega II) ($C02F)
- Vertical Count Register (Mega II) ($C02E)

Table 5-1. Video Select Register (Location $C029)

Bit	Function
0	Enable bank latch (used by system)
1-4	(reserved)
5	Inhibit color in standard Apple II displays
6	Enable linear mapping for Super Hi-Res graphics
7	Enable Super Hi-Res graphics display

Chapter 6

Real-Time Clock

The Clock Chip