ACS IDE to CF Adapter

Module

User's Manual

Monday, July 03, 2006

On The Cutting Edge of Technological Evolution

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Introduction

Thank you for purchasing the ACS IDE to CF Adapter Module. This device provides low-cost interfacing of Compact Flash Association CF Cards with IDE / ATA equipped computers.

Features:

The ACS IDE to CF Adapter Module provides the following hardware resources:

- CF Standard Type 1/Type 2 Card 50 pin Connector
- Four different models:
  - Original IDE Standard 40 pin 0.1" Male Ribbon Connector (non-SFF)
  - IDE Standard 40 pin 0.1" Male Ribbon Connector (non-SFF)
  - IDE 40 pin 0.1" Female Connector (non-SFF, Type 1 only)
  - SFF IDE Standard 44 pin 0.079" Male Ribbon Connector (SFF)
- Drive Select Jumpers
- CF Card Power Control
- Card Powered Indicator
- Card Accessed Indicator
- DMA support with DMA capable CF cards

Installation

The ACS IDE to CF Adapter module may be mounted with screws through the appropriate mounting holes. Note that the plated mounting hole marked 'MT1' is connected to the Ground on the module. Please refer to the board outlines at the end of this manual for mounting dimensions. The newer models are designed for ease of installation with redesigned form factors, mounting holes and additional jumpers. An optional 3.5" drive mounting plate is available for the IDE Standard model.

The module connects to the host PC in the same way that a hard drive is connected - using an IDE cable on both SFF and non-SFF male connector models, and powered via a disk drive power cable on non-SFF models. There is also a new model that is designed to plug directly into the IDE connector on the motherboard.

Be careful to observe the pin numbers and connector orientations that are marked on the board legend. Pin number 1 is also denoted by the use of a square PCB pad.

The use of a standard 40-conductor IDE cable is mandatory for proper operation with most motherboards. *

(***** The 80-conductor cable was first defined with the original Ultra DMA modes 0, 1 and 2. The cable is considered "optional" for those modes. However, for any Ultra DMA modes above mode 2, the 80-conductor cable is *mandatory*. Since the cable is mandatory for high speed modes, the system has to have some way of knowing it is installed. This is done by having the /PDIAG:/CBLID signal, carried on pin #34 of the interface, grounded in the connector that attaches to the motherboard. Since the older 40-conductor cable would not have this pin grounded, by looking for the grounding on this pin at startup the host can determine if the 80-conductor cable is installed. This may result in incorrect operation of the ACS IDE to CF Adaptor and the use of 80 conductor cables is not recommended.)

IDE Connector

The IDE connector supports PC compatible signals that allow the ACS IDE to CF Adapter Module to be connected to widely available PC compatible motherboards. The IDE connector pin-out follows:

Pin #	SFF Pin #	Name	Notes
1	1	RESET-	
2	2	GND	
3	3	D7	
4	4	D8	
5	5	D6	
6	6	D9	
7	7	D5	
8	8	D10	
9	9	D4	
10	10	D11	
11	11	D3	
12	12	D12	
13	13	D2	
14	14	D13	
15	15	D1	
16	16	D14	
17	17	D0	
18	18	D15	
19	19	GND	
20	20	KEY	
21	21	DMARQ-	TIED to CF pin 43 *
22	22	GND	
23	23	IOWR-	
24	24	GND	
25	25	IORD-	
26	26	GND	
27	27	IORDY	
28	28	CSEL-	MAY BE FORCED LOW VIA JB1
29	29	DMACK-	TIED to CF pin 44 *
30	30	GND	
31	31	IRQ	
32	32	IOCS16-	
33	33	A1	
34	34	PDIAG	Grounded in 80-conductor cables at the mobo end
35	35	A0	
36	36	A2	
37	37	CE1-	LIGHTS RED LED WHEN ACTIVE WITH IORD- or IOWR-
38	38	CE2-	LIGHTS RED LED WHEN ACTIVE WITH IORD- or IOWR-
39	39	DASP	
40	40	GND	
N/A	41	+5v Logic	
N/A	42	+5v Motor	
N/A	43	GND	
N/A	44	0=ATA	

***** = Connections for proposed DMA operation.

CF Connector

The CF Adapter Card connector provides CF compatible signals. The CF connector pin-out follows:

Pin #	Name	Notes
1	GND	
2	D3	
3	D4	
4	D5	
5	D6	
6	D7	
7	CE1-	LIGHTS RED LED WHEN ACTIVE
8	A10	GROUNDED
9	OE-	GROUNDED
10	A9	GROUNDED
11	A8	GROUNDED
12	A7	GROUNDED
13	VCC	+5VDC
14	A6	GROUNDED
15	A5	GROUNDED
16	A4	GROUNDED
17	A3	GROUNDED
18	A2	
19	A1	
20	A0	
21	D0	
22	D1	
23	D2	
24	IOIS16-	
25	CD2-	LIGHTS GREEN LED WHEN ASSERTED WITH CD1
26	CD1-	LIGHTS GREEN LED WHEN ASSERTED WITH CD2
27	D11	
28	D12	
29	D13	
30	D14	
31	D15	
32	CE2-	
33	VS1-	NO CONNECTION
34	IORD-	
35	IOWR-	
36	WE-	TIED TO +5V
37	IREQ-	
38	VCC	+5VDC ONLY
39	CSEL-	MAY BE FORCED LOW VIA JB1
40	VS2-	NO CONNECTION
41	RESET-	
42	IORDY	
43	INPACK-	TIED to IDE DMARQ-
44	REG-	TIED to IDE DMACK-
45	DASP	
46	PDIAG	
47	D8	
48	D9	
49	D10	
50	GND	

Power Connector

All ACS IDE to CFA Adapters only require +5vdc. They are designed to use industry standard power cabling.

The **ACS-CF-IDEtoCFA 40 PIN FEMALE Rt. Angle** model plugs directly into the Host PC motherboard and requires a floppy drive style power connector.

The **ACS-CF-IDEtoCFA 40 PIN IDE MALE** is designed to be mounted in a drive bay and has a standard 5 ¼" power connector as part of the IDE connector.

The **ACS-CF-IDEtoCFA 44 PIN SFF IDE MALE** is designed to connect to a 2.5" hard drive IDE chain and obtains its power via the extended signals on extra four pins of the IDE interface.

Drive Select Jumpers

Jumper JB1 allows the original ACS IDE<->CF Adapter (revision #2) module to be connected standalone or as the Master in a Master/Slave IDE string. When installed, JB1 forces the IDE CSEL- line active low indicating that there are no other devices on the IDE channel. This is the proper setting when the IDE to CF Adapter is the only device on the IDE channel.

The **ACS-CF-IDEtoCFA 40 PIN FEMALE Rt. Angle** model has no drive configuration jumpers as it is designed to plug directly into the Host PC's motherboard and be the only device on the IDE chain.

The **ACS-CF-IDEtoCFA 40 PIN IDE MALE** is designed to be mounted in a drive bay and has Master (MS), Slave (SL) and Cable-Select (CS) jumpers as part of the IDE connector.

The **ACS-CF-IDEtoCFA 44 PIN SFF IDE MALE** is designed to connect to a 2.5" hard drive IDE interface and has a jumper block for selecting Master (MS), Slave (SL) and Cable-Select (CS) operation. The ATA jumper grounds the same named signal on the extended IDE connector, and may or may not be required for correct operation with your Host PC.

Indicators

All ACS IDE to CF Adapter Modules have two LED indicators to provide operating feedback to the user. The Green LED is illuminated whenever the CF card is fully inserted and subsequently has power applied. The Red LED briefly illuminates whenever the CF card is being accessed by the host PC.

Operation

All ACS IDE to CF Adapter modules have circuitry to detect proper CF card insertion and apply power only when the card is fully installed. This is indicated by the illumination of the Green LED. However, the circuitry in the Host PC is not designed for removable IDE device operation while power is applied.

To avoid damage to the Host PC and/or CF Card, it is <u>strongly recommended</u> that CF cards are only installed or removed when the power to the system is OFF.

The BIOS in most host PCs are able to recognize the CF cards using the 'Auto' detection feature. Some early BIOS do not support this capability and may require the manual entry of the Cylinders, Heads and Sectors values as for a 'User' defined hard drive. These values are available from the CF card manufacturer or may be obtained via the BIOS IDE detection screen on another host PC.

Once correctly identified to the Host PC BIOS, the CF cards behave exactly like a PC hard drive. They may be FDISKed, FORMATted and made bootable just like their larger, rotating counterparts.

<u>REMEMBER!!! The CF card has a limited number of write cycles!!! Performing an OS Plug and Play setup or configuring a swap or page file on the CF card will rapidly exhaust its usable life.</u>

Trouble Shooting

The ACS IDE to CF Adapter module has circuitry to detect proper CF card insertion and apply power only when the card is fully installed. This is indicated by illumination of the Green LED. The Red LED indicates CF card access. If the BIOS hangs on power up, try the following:

1. Turn power off to the computer in which the CF adapter is being installed
2. Install the CF adapter on the Primary IDE cable/chain
3. Make sure the Master jumper is installed on the CF adapter
4. Insert your CF card into the CF adapter
5. Power up the computer
6. Set the CMOS to auto type the Primary Master IDE device
7. Save the CMOS settings and reboot
8. See if the BIOS correctly reads the Cylinder, Heads, Sectors from the CF card.
9. If it can't read the Cylinders, Heads, Sectors, make sure the following happened during power up:
    a. The Green LED turned on when power was applied to the computer
    b. The Red LED turned on or flashed when the bios was trying to determine is size

    If step "a" doesn't happen, check for power to the CF adapter via the disk drive connector on non-SFF adapters.

    If step "a" & "b" happened, but the BIOS still cannot determine the Cylinders, Heads, and Sectors, try a different CF card

    If step "a" & "b" happened, and the BIOS determined the Cylinders, Heads, and Sectors, but the computer will not boot, check the following:

    1. Make sure the CF Card if setup as a hard disk, not a floppy. Some manufactures ship the cards formatted as floppies. Use fdisk to display and or create a partition on the CF card, then format the partition. If you have a choice, format the partition using FAT, or FAT16. Some motherboards will not boot FAT32.
    2. Make sure the partition is active
    3. Try using a different brand of CF card. Some BIOS's need a delay after resetting the hard drive to identify it. CF cards with SST controllers have a built in delay, to sometimes better mimic a mechanical hard drive.
    4. Some older BIOS's just will not boot from a CF card, due to its speed. Check the motherboard manufacture for a newer BIOS.
    5. Make sure you're using a 40 conductor ribbon cable and not an 80 conductor cable.

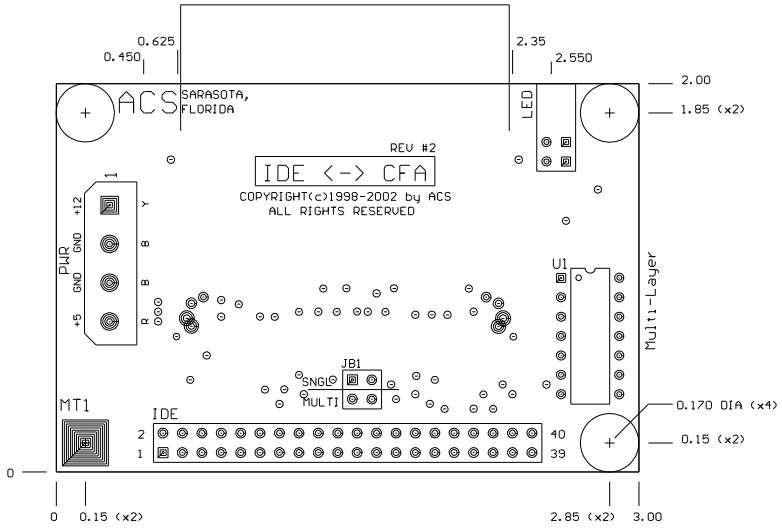
It is possible to have a defective ACS IDE to CF Adapter, but more likely to have a bad CF card(s), or incompatible BIOS. If the Green LED flickers when the Red access LED turns on, then the ACS IDE to CF Adapter CF Card power switching section is bad, and the adapter needs to be returned for repair.

Since Compact Flash cards are consumer price driven, Compact Flash card manufactures use any CF controller they can buy the cheapest. Just because you're buy brand "X" compact flash card, doesn't mean you're getting the same CF controller every time. It can change from production lot to lot.

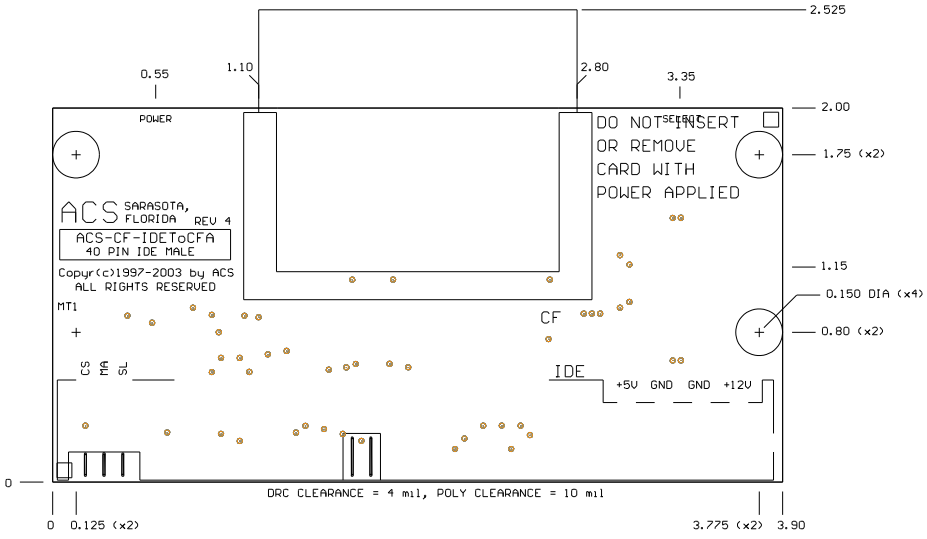
Because of these unknowns with the compact flash cards, we test each ACS IDE to CF Adapter twice, once after the manufacturing process, and again before it ships.

IDE to CF Module Layouts

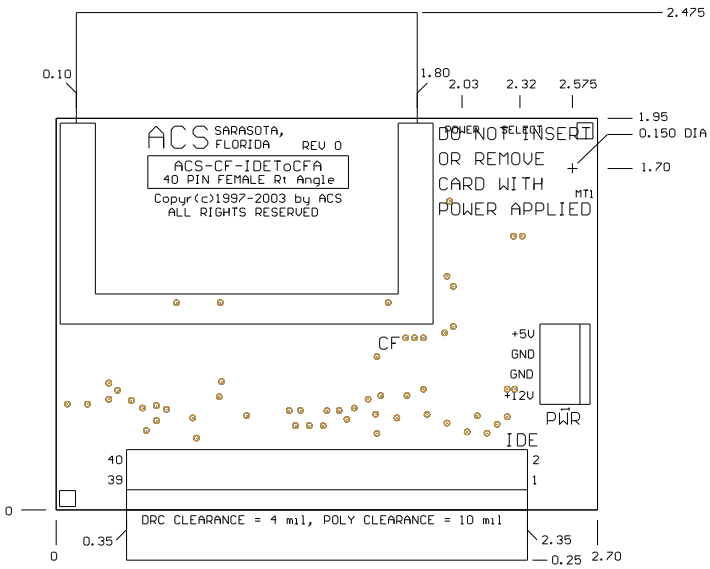
Original ACS IDE <-> CFA (Rev #2)



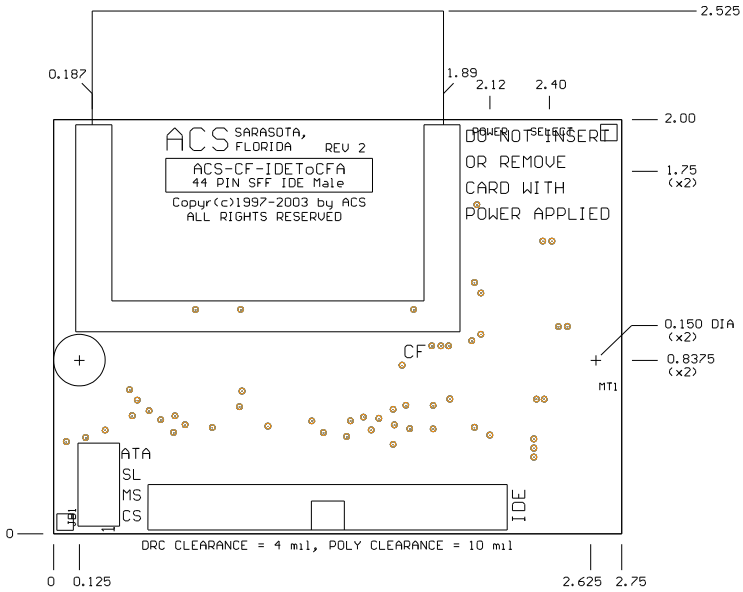
ACS-CF-IDEtoCFA 40 PIN IDE MALE



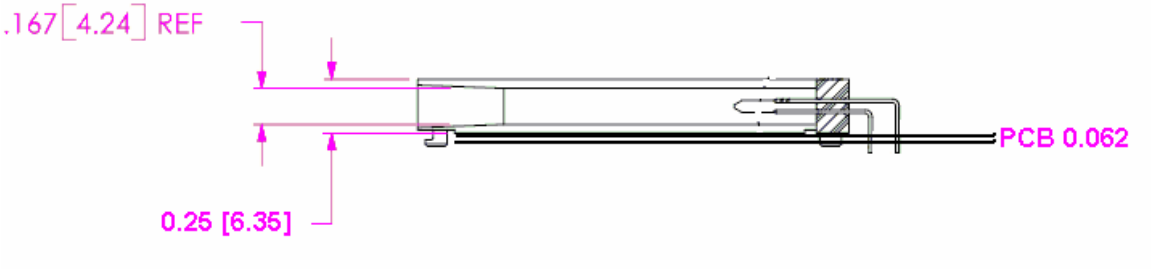
ACS-CF-IDEtoCFA 40 PIN FEMALE Rt. Angle



ACS-CF-IDEtoCFA 44 PIN SFF IDE Male



CF Card Connector Mechanical



Frequently Asked Questions

Are the IDEToCFA adaptors UL listed ?

The ACS-CF-IDEToCFA adaptors are themselves not UL Rated. The printed circuit board material that is used is rated UL94V-0. The other components may or may not be UL listed.

Can the adaptor be used as a Slave IDE device ?

The ACS-CF-IDEToCFA and ACS-CF-IDEToCFA-SFF have jumpers that allow them to be configured as an IDE Master, IDE Slave or determined by Cable Selection.

The ACS-CF-IDEToCFA-FRA does not have these jumpers as it designed to plug directly into the motherboard's IDE connector, either primary or secondary, and since it fully occupies the cable slot, it will always appear as the Master device on that IDE 'chain'.

Can the CF card be write protected ?

Using the ACS-CF-IDEToCFA, the CF cards are operated in 'True-IDE' mode. This mode does not support write protection. This is identical to a hard drive that also doesn't have write protection. While there is a 'write' signal on the interface, this signal is required in normal read operation to talk to the IDE controller registers in the device, and cannot be disabled.

Windows XPe provides a Enhanced Write Filter (EWF) component that can map writes to a RAM disk to protect the contents of a CF card used as a hard drive.

Can you use the adaptor to connect a harddrive to a CF only device ?

While it may be possible, the adaptor is not designed with this in mind. The 'Gender' of the IDE and CF connectors would be incorrect for starters.

Do you have an adaptor that supports 3.3v ?

This adaptor obtains it's power from the disk drive style Molex power connector on the back edge of the board. Only the 5v input is used, not the 12v.

If you were to apply 3.3v instead of 5v to the appropriate connector pins, then the adaptor might work for you. The IDE standard does not specify 3.3v operation, and our adaptors are designed to be compatible. Note that the IDE interface that you connect the adaptor to must also be 3.3v compatible - we're not aware of any that are, and most might produce or expect signals that are 5v - which may or may not damage your CF card compatible device. The adaptor is merely a connector map - the IDE controller and its functionality is entirely contained within the CF card.

Devices designed to be compatible with the CF card standard are required to be operable at 5v.

Does your adaptor support CF card model xxx from manufacturer zzz ?

The adaptor is merely a connector map. The IDE controller functionality is entirely contained within the CF card.

To date, we've only found that Lexar CF cards are not compatible with the adaptor. This is because Lexar has decided to provide undocumented dual functionality on some of the IDE signals to support their USB cable connection. This is not a supported feature of the CF card standard, and it causes Lexar cards to not operate properly in these adaptors. Lexar has chosen not to respond to our requests for documentation of these incompatibilities, so we cannot make our adaptor compliant with their non-standard CF cards.

We have had no problems with Sandisk CF cards - they originated the CF card standard. We recommend Sandisk cards. Kingston CF cards also work. SimpleTech cards also work.

All the adaptors except the –FRA model support Type II CF cards. This is solely a mechanical issue due to the CF card connector that we use.

How to use with an older BIOS requiring Cylinders/Heads/Sectors ?

You can get a datasheet from the manufacture of the CF card, which should give the specifications of the logical drive format. An alternative would be to install the adapter with a CF card in a newer computer, and autotype/autoconfig the drive, write down the C/H/S, and enter this into the drive type 47 of the older computer.

I can fdisk and format the CF card under DOS, but Linux / Solaris fails to mount the device?

Linux and Solaris appear to have problems when mounting a device that is labeled as 'removeable'. User's have informed us that correcting the removabililty of the media fixed their problem. **The current Sandisk product -388 parts support the proposed DMA operation, ship out as removable and will have a utility to change the bit available for no charge after signing a Source Code License Agreement.**

Is there an industrial grade Compact FLASH card ?

The SanDisk Industrial card offerings have been end-of-lifed and replaced by a standard OEM or Ultra II CF -388 offering. These cards have technology that will allow them to meet almost every customer's requirements.

What are the dimensions of the ACS-CF-IDEToCFA-xxx ?

The dimensions of the various adaptors are diagrammed in the IDE to CF Layouts section of this manual.

What is the mating power connector for ACS-CF-IDEToCFA-FRA ?

These are availble from Digikey (www.digikey.com)
Catalog page:
http://dkc3.digikey.com/PDF/T052/0098.pdf
Power Connector (0.100" 4 Pos)
Housing:
WM2002-ND or WM2013-ND
Contact:
WM2200-ND or WM1114CT-ND

Where can I find out about the CF card limited write cycles ?

Compact Flash cards use Flash Memory. Flash Memory has a limited number of Erase/Write cycles ~300,000. The controller in the Compact Flash card does wear leveling by spreading out the writes amongst various 'sectors' in the card to prevent premature wearout of a sector.

Here's a link to the originator of the CF card that discusses how they 'wear level' the flash memory to optimize card life: **http://www.sandisk.com/pdf/oem/WPaperWearLevelv1.0.pdf**
Digital cameras write to Compact Flash cards to store their photos. However, if you were to place a pagefile or swapfile on the Compact Flash card, the intense write activity would very quickly exhaust the life of the card.

Which Compact FLASH cards support DMA?

The current **Sandisk** -parts xxx-388 support multi-word DMA and have a utility available from Sandisk available under Software License Agreement to toggle the ATA Identify 'Removable Media' bit.

Why am I getting spurious or non-operation?

Due to standards compliance issues of both the motherboard (specifically some of the VIA 533Mhz models) and CF card controller manufacturers, the use of 80-conductor IDE cables may result in spurious or non-operation of the ACS-CF-IDEToCFA adapters. If you experiance any problems, ACS recommends that only standard 40-conductor IDE cables of a minimum length be used with this product.

Why can I only create a single partition on the CF card with your adaptor ?

This is entirely determined by the controller on the CF card. The controller returns a bit in the ATA Identify Device command that labels the media as being 'removeable' or not. Windows XP and Windows XPe (embedded) do not allow multiple partitions to be created on removeable media. Contact your CF card vendor about obtaining CF cards that are marked as non-removeable. Sandisk has a utility available under Software License Agreement that allows the 'removeable' media bit of their card controllers to be changed. Please contact: Sandisk Steve Larrivee or Dave Beasley Phone: (408) 542-0500

Why does Windows XP show some CF cards as 'Removeable' and others as 'Hard Drives' ?

This is entirely determined by the controller on the CF card. The controller returns a bit in the ATA Identify Device command that labels the media as being 'removeable' or not. Windows XP and Windows XPe (embedded) do not allow multiple partitions to be created on removeable media. Contact your CF card vendor about obtaining CF cards that are marked as non-removeable. Sandisk has a utility available under Software License Agreement that allows the 'removeable' media bit of their card controllers to be changed. Please contact: Sandisk Steve Larrivee or Dave Beasley Phone: (408) 542-0500

Will the "-FRA" version fit into an IDE connector on a motherboard ?

Yes. Look at the picture and drawing of the Female Right Angle "-FRA" version carefully, and notice where the power connector is located. This is the only constraint. Make sure it will clear nearby components. Care also needs to be taken, when inserting the adapter into the IDE connector on the motherboard, that pin #1 on the adaptor mates with pin #1 on the motherboard's IDE connector !

Appendix

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Engineering Bulletin

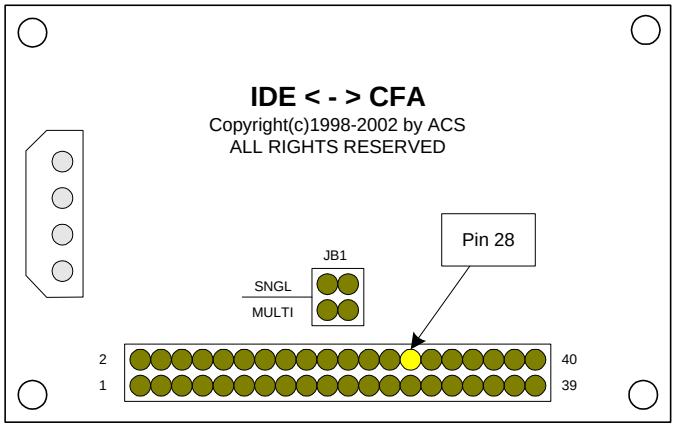
DATE: 1/3/06

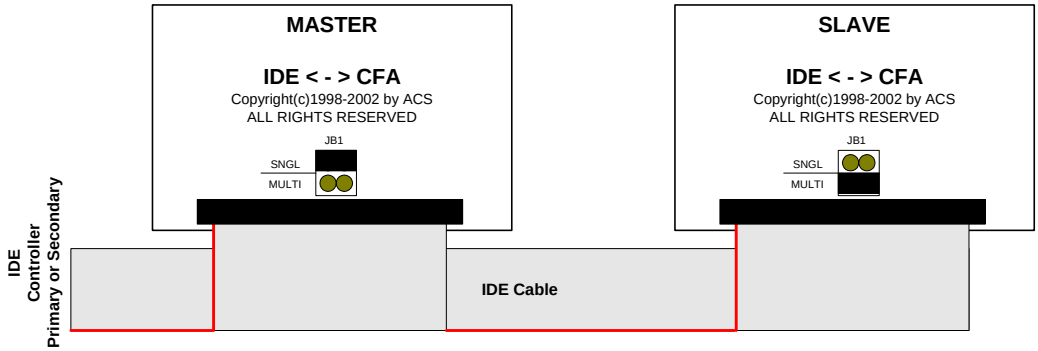
PRODUCT: ACS IDE to CFA Adaptor **Revision #2 Only**

TITLE: Master / Slave Operation

Normally, the ACS IDE to CFA Adaptor revision #2 must be the only device on an IDE Primary or Secondary chain. By making a small modification, two ACS IDE to CFA revision #2 Adaptors, master and slave, may be used on an IDE Primary or Secondary chain.

IDE connector Pin 28 on the ACS IDE to CFA revision #2 adaptor is the CSEL- signal. By **removing or cutting this pin** on both adaptors, then jumpering one ACS IDE to CFA adaptor as Master (jumper installed on SNGL) and jumpering the other IDE to CFA adaptor as Slave (jumper installed on MULTI) two ACS IDE to CFA adaptors can coexist as master/slave on the same IDE chain.





One caveat - the select LEDs on both adaptors will light whenever either drive on the chain is selected.