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From: Stephen Buggie

001- How do I add a write-protect On-Off switch to my Disk II drive?

Adding an Auto/Manual Write-Protect Switch

Often, as when doing copying, it is useful to be able to guarantee that a diskette is Write-Protected whether or not the side is notched. Other times, it is convenient to defeat Write Protection-- for example, when you wish to write to a diskette side which is not notched. And, naturally, you also want a setting which permits Normal, notch-controlled, Write-Protect.

Based upon a circuit suggested by David Wilson (Australia), the A/MWP enhancement offers full user control of Write Protect. The switch's three

positions are

Protect OFF: Writing is allowed regardless of notching.

Protect ON: Writing is prohibited regardless of notching.

Normal: a diskette side must be notched to permit writing.

A/MWP Step-by-Step

Unplug the drive from the disk controller and remove the case.

Drill a mounting hole. This can be at a convenient spot in the back or in the plastic front panel. On the front, a good spot is at the lower left, above and to the left of the "in use" LED. Another open spot is at the upper right in the space just above the diskette slot; but, we're saving this place for Part 2's enhancement. (You can't use the lower right, of course, because this would mess up the "Apple" logo!)

Cut three wires (Brown, Black, and White) long enough to run from the mounting point to the Large Connector plugged onto the back, middle of the Disk][circuit board.

Solder the leads to a Single-Pole Triple-Throw mini toggle Switch: Brown to center, White to one end, Black to other end. Twist the leads or encase them in tubing.

Mount the Switch. Normally, the Switch handle will point in the White lead direction for "Protect OFF" and in the Black lead direction for "Normal". Center is "Protect ON". Route the leads to the area next to the Large Connector. (Make sure no wires will get in the way of an inserted diskette.)

Locate the Brown and Black leads coming from the Notch Detect micro-switch. The leads are the Brown (bottom) and Black (top) pair near the right end of the Large Connector (as viewed from the front of the drive).

Cut the Notch Detect micro-switch leads about 1" away from the Large Connector.

Connect the Black Notch Detect, Black Large Connector, and Black Switch leads (i.e. strip ends, solder, and cover in heat-shrink tubing or tape).

Connect the Brown Notch Detect lead to the White Switch lead.

Connect the Brown Large Connector lead to the Brown Switch lead.

Viola! Now you're ready to replace the cover, plug in the drive, and try out your A/MWP enhanced Disk][.

Boot a diskette which is not write-protected and load a program, say the HELLO program (or STARTUP on a ProDOS diskette). Set the A/MWP to center and try SAVE HELLO. You should get a "WRITE PROTECTED" error.

Place a write-protect tab on the diskette. Set A/MWP to the Left or UP position and try SAVE HELLO again. If the save works, then Left or UP is the "Protect OFF" position and Right or Down is "Normal". If you get a "WRITE PROTECTED" error then it's the other way around.

Now is a good time to mark "Normal" and, if you like, the other positions. You can use dots punched from self-stick labels.

From: Ed Eastman

Most of the time what you want to be able to do with a Write Protect modification is turn On Write Enable when a disk is not notched. That is what this mod for does. Details relate to the **5.25" UniDisk** but the method will also work with other Apple II 5.25" drives.

The way the write protect sensor works on newer drives is that an LED on one side shines on a phototransistor (the sensor) on the other side. When there is a notch in the diskette you insert, light passes through the gap and the sensor 'closes' to complete the Write Enable circuit.

What we will do is give the Write Enable circuit an alternate enable option using an On/Off switch. A mini toggle switch is okay; but, I like to use a small normally-open momentary contact pushbutton switch from Radio Shack. It's compact, looks nice, and pressing the button for the few seconds usually required for a file, etc. write is no problem.

I normally mount the switch in the upper left part of the face plate, opposite the light to balance the look. Drill a hole a little smaller than required and use scissors or a larger drill to taper the hold to just where you can screw in the switch.

Before soldering on leads and mounting the switch, decide where you want to make the connections. You can locate the output leads from the sensor and splice one switch lead to each; or, you can find the place on the circuit board where the sensor leads go and connect there.

On a UniDisk you will see a large connector labeled "CN1" near the front. Pins 9 and 11 of CN1 are the write protect sensor connections. More convenient connection points are the circuit board edge side of R12 and the wire at J29.

Solder on leads long enough to reach the connection points and screw in the switch. On a UniDisk, connect one switch lead to the R12 point near the edge and one to the wire at J29.

Now when you need to override write protect on an unnotched disk, you simply press the button while writing. Go ahead and plug in the drive and give it a try.

Note: For more details, pics, and info about a three-position switch option, see my page at <http://www.appleinc.org/UnidiskMod/UnidiskWPMMod.htm>.

From: Stephen Buggie

002- How do I add an external speed adjustment to my Disk][?

Reference: FAQs Resource file [R006SPDKNOB.GIF](#)

Adding a Speed Control Knob to your Disk][Drive

This article tells how to move speed adjustment from the Disk]['s dark interior to a handy front-panel location and how to "tune" the drive for optimal performance.

One drive-test software vendor states that Disk][is good for about 500 hours of normal use between speed adjustments-- not exactly a strong argument for placing the control on the front panel! On the other hand many of today's Disk][owners are interested in applications which go beyond "normal use".

Some utilities (e.g. DiversiCopy II) report rotational speed during ongoing applications; so, relocating the speed adjuster to the front panel is especially helpful. Similarly, users who want to back up their old, copy-protected wares know that ready access to speed control is essential.

Finally, there is no question that, whatever your applications, periodic speed trimming will be required. When it is, you'll be very glad _your_ Disk][has a front panel Speed Knob!

Adding Speed Knob

To install Speed Knob you will need a good quality, linear taper 5k Ohm potentiometer, some wires, and a knob with a pointer mark or some other way to show position (e.g. a ring of numbers). Most of the work, really, consists of opening the drive and drilling a hole. There is no need to disconnect the drive from the controller card.

1. Remove the 4 bottom bolts and slip off the case. Unscrew the 4 bottom bolts holding the drive to the case bottom, and unplug the main ribbon cable. The drive can now be moved to your work area.
2. Drill a hole properly sized and centered for mounting your 5k Ohm pot in the upper right front panel.
3. Place the drive on its face and unscrew the 2 bolts which hold the small daughter board to the drive. (Be ready to catch loose spacers, washers, etc..)
4. Turn the small board over to the bottom side. Locate and cut the traces going to the mini-pot speed adjuster as shown in pic R006SPDKNOB.GIF.

5. Cut three wires, White, Gray, Black, long enough to reach from the board to the front panel. Connect these to your 5k Ohm pot and to the small circuit board as shown in pic R006SPDKNOB.GIF. (In case you cannot view the pic, what you're doing is substituting the new pot for the mini-pot.)

6. Re-mount the daughter board. Mount the 5k Ohm pot. Install knob.

7. Bring the drive back to the computer. Slide it onto the case bottom plate, reconnect main ribbon cable, replace bottom bolts, slide on and re-fasten case top.

You can use Copy II Plus, XPS, APEX, or one of several other utilities to set speed (see next question). A good starting adjustment will be near the center of Speed Knob's range. Once speed is adjusted, you can loosen and re-set the knob so that its position indicates a "correct" speed setting.

003- How can I adjust my 5.25" drive for the best performance?

The typical 5.25" drive will run for months with no need for maintenance save an occasional dusting or session with a head-cleaner disk. When adjustment is required, it will usually be to fine-tune Speed or, less often, to set track centering.

If a 5.25" drive has difficulty reading diskettes, including those it created, and head-cleaning does not help, then, the odds are it's time to adjust speed. If your drive is a Disk II and does not have the external 'Speed Knob' mod, look for a small hole on the lower right side near the back-- some owners add this hole to allow easy access to the Speed Adjustment mini-pot screw. If there is no hole, you will need to remove the case. (Remove bolts on bottom and slide out the drive through the front.)

On the 5.25" Apple 'Platinum Drive', the Speed Adjustment is accessed through a small hole on the bottom of the drive near the front on the right side. Non-Apple 5.25" drives may place the Speed Adjustment almost anywhere. Look for a small hole through which you can see a screw head. If you don't find one, remove the case and look for a mini-pot labeled "Speed" or something similar.

The most popular speed adjustment software utility is, probably, dear old Copy II Plus. From the menu, just select "Verify", then "Drive Speed". Put a diskette into the drive you want to adjust and, turning the Speed Knob (or min-pot shaft) use Copy II's numeric speed display to zero-in on the 'magic' 200ms. number. (Standard Disk II rotation speed is 300 rpm, which comes out to be 0.2 seconds per revolution.)

Other speed adjustment utilities show an rpm number or a hires pointer. Whatever, all speed check routines need to read AND write; so, you will usually need a "scratch diskette" which you do not mind having over-written.

Track-center realignment is needed when a Disk II writes and reads its own

disks fine, but does not 'communicate' with many other Apple II 5.25" drives. It generates disk errors when reading disks written by other drives and other drives have the same problem with its diskettes.

CALL A.P.P.L.E's APTEST, now in the public domain, tests track-center alignment. With this software, the user checks the alignment of the drive with disks regarded as well aligned --- such as Apple diskware supplied with the computer or some unprotected, original, commercial software diskette. (In a pinch, a diskette formatted by any drive that has no problem reading most other diskettes should be okay.)

Basically, a track-centering test tries to step your head between two tracks of the 'standard' diskette and read the tracks on either side. If the number of successful reads from each track is about equal, the head is "centered" and your drive is well-aligned with the standard diskette.

The test may indicate serious misalignment. ("Aha! That explains why my IIs and II+ have problems reading each other's diskettes!") Centering adjustment is done by slightly repositioning the stepper motor (mounted on the underside of the drive). This requires loosening the two bolts holding the stepper-motor, rotating it clockwise or counter-clockwise, and retightening.

The adjustment/test process may require several repetitions. Each time, the program will report "differential fractions". The smaller these numbers, the closer you are to near perfect alignment with tracks on the diskette.

From: Rubywand

Suppose you have just one drive and it is so far out of adjustment that it will not boot a speed adjustment utility diskette? In this case, you can remove the drive cover, turn over the drive, and (probably) find that the drive has a strobe pattern on the main pulley or flywheel.

Set a fluorescent light near the drive (or do the adjustment in a room with fluorescent lighting). Get the drive spinning via power-on booting or a PR#6 and adjust the speed for a stable pattern.

Note: If you live in a place which supplies 50Hz power and the drive is intended for use in the U.S. or other country with 60Hz power, you may have to experiment with + deviations in speed from a stable pattern.

From: Rubywand

004- How do I clean my disk drive R/W head(s)?

The easiest way to clean a drive's R/W head(s) is with a Cleaner Diskette. This is a diskette with a paper disk such as the 5.25" and 3.5" Cleaner Diskettes available in Radio Shack's Disk Drive Head Cleaner Kits. These kits usually include "Cleaning Fluid" (isopropyl alcohol), too.

The 5.25" Cleaner Diskette has panels you pop out to expose the cleaning surface. Apple II 5.25" drives have a single head which contacts the disk from the bottom and a pressure pad which presses against the top side. So, pop out the panel on the bottom side of the Cleaner Diskette and leave the top panel in place. When cleaning, insert the diskette with the bottom side facing down. This lets the paper disk rub against the head and avoids wear on the pressure pad.

The 3.5" diskette has a small plastic panel you can snap out for cleaning two-head drives. Since the standard 3.5" 800k Apple II drive has two heads, snap out the panel so that both the top and bottom heads get wiped.

To clean your drive head(s), you squirt a few drops of Cleaning Fluid onto the Cleaner Diskette disk, insert it into the drive, and get the disk spinning. Allow about 20 seconds for a 5.25" and a couple 10-second spins, with drops between spins, for a 3.5" drive. (Booting the Cleaner Diskette is one way to get it spinning. If DOS or ProDOS is installed, doing a CATALOG is another way. For example: CATALOG,S6,D2 would get your 5.25" Drive 2 spinning. Doing a RESET will stop the spinning.)

If you think it has been several months since the drive was last cleaned, repeat the procedure-- i.e remove the Cleaner Diskette, add more fluid, etc.. As a rule, do not let the disk spin more than 15-20 seconds for any cleaning cycle. This is especially a concern with 3.5" drives where the heads are mounted on springs and much more subject to snagging and being pulled out of alignment.

From: Steve Jensen

005- I picked up an apple IIe and a duodisk drive at a thrift store. Could someone describe the connecting cable?

I just checked the pinout on a Duodisk cable. The numbers for the pins are inside the plug by the pins, but I'll draw them for you.

DB 19 looking at the end of the cable:

1	2	3	4	5	6	7	8	9	10
o	o	o	o	o	o	o	o	o	o
	o	o	o	o	o	o	o	o	o
11	12	13	14	15	16	17	18	19	

DB 25 looking at the end of the cable: (x = no pin)

1	2	3	4	5	6	7	8	9	10	11	12	13
x	o	o	o	o	o	o	o	o	o	o	o	x
	o	o	o	o	o	o	o	o	x	o	o	x
14	15	16	17	18	19	20	21	22	23	24	25	

Cable

DB 19 DB 25

1	2
2	4
3	9 & 21
4	10 & 14
5	23
6	7
7	19
8	20
9	8
10	12
11	15
12	16
13	17
14	18
15	5
16	24
17	11
18	3
19	6

From: Steve Jensen and Jonathan Adams

006- What DuoDisk mods are necessary?

The following is excerpted from an info file from my old bbs ...

There are TWO modifications that should be made to Duodisk drives:

The First one was recommended by Apple several ago to solve occasional problems with trashing diskettes. The solution is to remove 2 capacitors.

The Second modification is only required to solve a problem with daisy-chaining on the GS Smartport, though the modified Duodisk will still work fine on older Apple II's. It requires removing a resistor.

DUODISK MODIFICATION #1- REMOVAL OF TWO CAPACITORS

This mod should be done on ALL Duodisks, no matter whether they're used on //e's, IIGS's, etc. The problem was that diskettes would sometimes be damaged when doing an Open-Apple-CTL-Reset or when using disks with certain kinds of copy protection. The mod was in an Apple dealer service bulletin several years ago for "analog board PN 676-[]101 or 676-[]102."

The Analog board is the one inside Drive 1 in the Duodisk. You may have to unplug the cable near the back right of the board to see the board's model number. Anyway, if you have the -101 or -102 board, just snip out Capacitors C29 and C30 at board locations A1 and B1, respectively.

DUODISK MODIFICATION #2- REMOVAL OF A RESISTOR

This mod should be done for Duodisks used with a GS; otherwise, it is optional. The problem is that the Duodisk draws just a little too much current when connected to the GS Smartport. This can render other drives on the chain inoperable. Problems are MOST likely to occur when the Duodisk is daisy-chained from a UniDisk 3.5 Drive. (ROM 3 GS users should check Q&A 007.)

Remove the top cover and turn the drive so that the identifying number will be at the bottom left of the analog board. The number might read 676-[]101, 676-[]102 or 676-[]107.

If the I.D.# for the analog board is 676-[]101 or 676-[]102, use a pair of nippers and cut out resistor R8 (located at position A2).

If the I.D.# for the analog board is 676-[]107, use a pair of nippers and cut out resistor R39 (located at position C3).

From: Dave Althoff

There are two capacitors which must be clipped from the board on the DuoDisk regardless of what machine you intend to use them on. Failure to do this can lead to very nasty failures. For instance, some copy-protection schemes can cause the drive to start writing unexpectedly-- say, during a re-boot-- thus trashing the disk without regard to the write-protect switch.

From: Chet Gerhardt

I have done the capacitor removal mod with all DuoDisks I have sold and my own DuoDisks. It is amazing that after all of this time most still have not had the mod done.

From: Steve Buggie

007- Will a Duodisk function correctly on my ROM 3 GS?

I have three Duodisks. The one connected to my flagship ROM 3 Iigs has had the resistor and capacitors clipped out as recommended in a memo from Mitch Spector. It works perfectly!

From: Rubywand

A Duodisk may not be entirely functional connected to the usual ROM 3 "Disk" connector (i.e. the SmartPort). Users report that the system may not start up unless a write-protected disk is inserted in the Duodisk. Apple, in Tech Library notes #5010 and #5434, mentions these reports and says that there is some code in the ROM 3 ROM that does not handle the interface to a Duodisk properly. Apple's workaround is to connect the Duodisk to a drive interface card instead of to the Smartport.

From: John L. Graham

008- How do I fix a false Write Protect?

I recently ran into this problem with a Disk II. It insisted the disk was write protected. I checked the write protect switch, but it was okay. I pulled all the chips out of the analog board inside the drive, cleaned the contacts with a clean pencil eraser (one was really dirty, almost looked burnt) and re-installed them. Voila! The problem went away.

From: Rubywand

**009- My 800K, 3.5 Disk Drive is no longer working on my IIGS.
When a disk is inserted the drive tries to read it and then
locks up the entire system forcing me to do a 3 finger reboot.
Any suggestions on where to start troubleshooting?**

If you have a SCSI interface card plugged into your GS, you may have run into a bug which seems to affect setting up of the diskette port. (See the next

question and answer.)

Try cleaning the heads using a Head Cleaner Diskette, such as a paper diskette + cleaning solution kit from Radio Shack. (See [Q&A 004](#).)

In a few rare cases, a drive may actually have globs of dust inside which end up interfering with its operation. You can shine a flashlight into the slot to check for a heavy dust buildup. The safest way to clean out dust is to open the case and the drive and remove the dust. However, you can try inserting a small cheap plastic artist's paintbrush (slightly dampened) into the slot and, with a flashlight, lightly sweeping around to pick up dust. ("Lightly" means you do not push or snag on anything, especially the R/W heads.) Blow into the slot and do another sweep with your brush.

If cleaning does not seem to help, try wiggling the drive cable while attempting to CAT a known-good, unprotected diskette in the drive. If wiggling helps, you are likely to have a bad cable or a GS plug with a loose connection to the motherboard.

Try formatting a diskette. A drive which can format and R/W diskettes it has recently formatted but cannot read most other diskettes probably has heads which have become misaligned.

Set your boot Slot to Slot 5 and try power-up booting a couple bootable ProDOS diskettes known to be in good condition. If you can boot a variety of diskettes, including commercial game, etc. diskettes, the odds are pretty good that your drive is okay.

A 3.5" drive that, after cleaning, cannot boot known-good diskettes is likely to have screwed-up heads. However, it's a good idea to try unplugging and re-plugging the drive (with the computer OFF) and, then, try another boot.

If you have a 5.25" drive attached, boot ProDOS from the 5.25" drive and try some CAT's of non-protected known good 3.5" diskettes in the 3.5" drive. As earlier, do the cable wiggling test while attempting the CAT's.

A very good test is to try out the drive on a friend's IIgs or IIc+. If it continues to bomb, it is likely to have R/W heads which have become badly misaligned, heads which are badly worn, or heads which have been partially dislodged from the mountings. (The 3.5" drive's heads are held in place by springy metal sheets. Unlike the mounting for the 5.25" Disk][head, these are fairly delicate. If anyone has tried cleaning the heads by sticking in an alcohol swab and 'swishing around', there is a good chance the head mountings are messed up.)

Shops which replace heads are fairly rare. I had this done a few years ago and the drive still works fine. However the charge is around \$80. It is cheaper and easier to get a good 2nd-hand drive at a swap-meet. You can, also, look for a bargain Mac drive and do a "transplant" as described by Steve Buggie in the Winter 1996 issue of **II Alive**.

Steve Buggie is a good source of information on drive repairs. Check out some of his recent posts to this newsgroup.

010- Sometimes the 3.5" drives on my GS do not function correctly.

This started after adding a SCSI interface card. Is there a fix?

This problem seems to crop up from time to time, especially when a SCSI interface is present and when no device is connected and recognized on the SCSI chain. (For example, you may have only a Zip Drive connected to your SCSI interface; but, it is not powered ON or no Zip disk is inserted.)

Evidently, something (e.g. a register or softswitch) involved in the usual GS power-up routine relating to on-line devices gets messed up. Arranging to have some active, on-line device on the SCSI chain (or removing the SCSI card) seems to help reduce frequency of the problem.

A nearly certain fix is inserting a 3.5" diskette into Drive 1 before or just after power-up. This usually forces recognition of 3.5" diskette drives and enables correct functioning.

011- Both of my Disk]['s come on when booting! How can I fix this?

Basically, it sounds like Drive 2 does not know when to stay OFF. There are three fairly high-probability places where a glitch may cause this to happen:

1. The 74LS132 on the Disk][Controller card may have a blown gate or some pins may be making poor or no contact. Try unplugging and re-socketing the IC. This usually takes care of bad contact problems. (Or, you can replace the 74LS132 IC with another 74LS132 or 74132. A 74LS00 or 7400 may work, too.) Also unplug and re-socket the 9334 and 556.
2. The ULN2003 IC on the Drive 2 main circuit board may have a bad gate or may have developed some poor pin-to-socket contacts. Remove the drive cover. Unplug and re-socket the ULN2003 IC. (Replacing a blown ULN2003 should not be too difficult. Both Mouser and Newark carry the IC.)
3. Drive 2's cable may have developed a short between pins 14 and 16. Mark the position of the cable at the Controller card and at the Drive 2 circuit board and unplug the cable at each end. Use an Ohm meter to check for shorts between adjacent pins. If you find a short between 14 and any other pin you can try repairing the cable or cutting out line 14 and running a new lead; or you can get a replacement cable.

012- In connecting a second Disk II drive to my Disk II card I misaligned the connectors. The result upon turning it on was a static-like clicking noise. Now I can't load anything from disk. Is the Disk II card dead? Are the IIe and Drives all right?

Try removing the drive which was connected incorrectly. If your system boots from the remaining drive (connected in the Drive One position), this is a fairly good indication that the Disk II card and IIe are okay and that the removed drive is messed up.

If it looks like a drive is bad, remove the cover and inspect the drive's main circuit board for blown components. If nothing obvious shows up, a decent fix try is to replace the 74LS125 IC on the drive's main circuit board. (Also, see Q&A 013.)

From: Ryan Underwood

I accidentally offset a row of pins on the //e disk controller card when plugging one of the drives in. Snap, crackle... you get the picture. I opened up my freshly fried Disk II, and in the center of the board there is a 74LS125 that is blown. Replaced it (it was socketed) with the same chip from another Disk II, and voila! it works again.

I would assume that misaligning the drive connector on the controller is what blew the 74LS125 in several Apple II drives before they got to me. Note that while the genuine Apple Disk II simply lights the LED and doesn't move the head at all when this IC was blown, a Mitac drive actually ate disks. So any number of dead Apple II drives with different symptoms could have a blown 74LS125.

From Rubywand

013- Last night a sound like a shotgun going off came from my 5.25" Disk II drive. Now it doesn't work. How can I fix it?

The noise was probably an electrolytic capacitor exploding. Sometimes, these develop internal shorts, heat up, and blow (kind of like a sealed can of beans on a campfire).

The fix is to remove the drive cover and replace the blown capacitor. (Look for a small can-like component with goo and/or shredded foil coming from it.) Circuit board markings should help identify the component. Here are some suggested replacement values:

C2 (on +12V line): 220uF-500uF at 20V-50V

C4 (on +5V line): 470uF-500uF at 10V-25V

C5 (on -12V line): 10uF-50uF at 20V-50V

If there is some difficulty identifying the blown capacitor, replace it with a 500uF unit rated at 20V-50V.

Before removing the bad capacitor, note which lead is connected to the outside 'can' part and mark the circuit board where this lead is connected. This is the Negative side of the capacitor. When installing the new capacitor make sure its negative lead goes to the marked point on the circuit board.

From: Wayne Stewart

014- Recently I picked up two 3.5" drives at a swap meet-- a Uni-disk and a Laser 128 drive. I've tried cleaning the heads; but, neither works with my IIc. What's the problem?

The 3.5 UniDisk won't work on the earlier IIc unless the IIc has had a ROM upgrade. The Laser 3.5 is actually a Macintosh drive with the addition of an eject button. It isn't compatible with any Apple II unless it has a special controller card, which of course a IIc doesn't.

From: Stephen Buggie

015- Can I replace a bombed Apple II 3.5" drive mechanism with one from a Mac?

Yes. 3.5" drive mechanisms are cheaply and abundantly available from the Macintosh world. Although Apple II users have increased their interest in 3.5" drives, these drives have declined in their utility for Mac users who have shifted to hard drives, CD-ROM, and flopticals. Few Mac owners have use for the external 3.5" drive any more; if they have not yet discarded their external 3.5" drive, it is now in storage.

MAC AND APPLE II 3.5" DRIVES: SIMILARITIES/DIFFERENCES

The basic Sony 3.5" mechanism is shared by Mac and Apple II. It stores 800K of data on a two-sided disk. Unlike the IBM version with its constant rotational speed, Mac/Apple II drives maintain constant head velocity by varying the rotational speed as the head assembly approaches towards or moves away from the disk hub. Mac and Apple II drives differ in their track sectoring arrangements, so disks cannot be read directly without special translational software. The opportunity for compatible disk sharing was lost during development, because rival teams working on Mac/Apple II drives went

their separate ways (Steve Weyhrich, APPLE II HISTORY, Pt. 9, 1992).

The platinum 3.5" drive supplied with the IIgs is directly compatible with the Mac, although the Mac ignores its front panel manual eject button; Mac disk ejection is handled strictly by the desktop trash icon command. An older version of the external Mac 3.5" drive lacks the manual eject button and, in its casing, is plug-incompatible with Apple II. Thanks to advice provided by Ken Watanabe, I learned that the inner mechanism is identical among all versions of 800K Mac and Apple II drives, including the internal drive mechanism in the Mac CPU. This is good news for Apple II users who wish to transplant the abundantly available Mac mechanism into their platinum 3.5" drive casing.

WHAT ABOUT THE APPLE UNIDISK 3.5" DRIVE?

The classic white UniDisk drive was released in 1985 as a 3.5" platform for the IIe and IIc. This release date was 18 months prior to the introduction of the IIgs. Disks written by the UniDisk 3.5 and Platinum 3.5 drives are fully interchangeable; the two models differed because the earlier UniDisk 3.5 used an intelligent microprocessor-controlled analog board to slow the data transfer rate to match the IIe/IIc parameters. This slowdown was not needed for the popular platinum 3.5 drive used by the IIgs.

Can the Mac mechanism be transplanted to the UniDisk 3.5 casing? Probably yes, but this has not yet been verified. I am reluctant to hack with the working UniDisk 3.5's attached to my IIC's. I now seek a mechanically jammed UniDisk 3.5 drive to verify whether its life can be resurrected with a Mac transplant.

FINDING A USED MAC 3.5" DRIVE MECHANISM

The internal DSDD 800k drive mechanism can be salvaged from any mid-vintage Mac except for early models (Mac 128, Fat Mac 512) --- those two models used a quaint single-sided 400k drive. Suitable models include the Mac Plus, Mac SE, Mac II, or other Macs that have the standard DSDD 800K mechanism --- newer Macs have incompatible high density drives. Get a genuine Mac Sony drive mechanism, not a clone; the suitability of non-Sony clones is uncertain.

Salvaged internal drives must be removed from the Mac internal mounting bracket --- take out the four side-mounted bolts, and slide the mechanism forward. The early version of the external Mac mechanism is mounted in a plastic casing that resembles the Apple II platinum drive except that the manual eject button is absent.

Remove the mechanism from the casing, but save its round external cable and db-19 plug --- that cable/plug can be used later to adapt flat-ribbon Apple II drives for use with the IIgs or IIIC! The Mac external drive's plastic casing can be saved for use as a coin bank, or discarded.

You should anticipate that the older Mac drive has had plenty of use; most Mac users have fewer drives attached to their computer than is common for

the Apple II.

The 3.5" drives are sturdier than hard drives, but to protect the drive's head assembly from damage during rough shipment, the seller should be asked to ship the unit with a disk inserted.

DISASSEMBLY OF THE APPLE 3.5" PLATINUM DRIVE

Use a well-light work area that gives you plenty of elbow room, with containers to hold bolts and other small parts. All dimensions (left/right/top/bottom/front/rear) refer to the unit's own dimensions, NOT to your own egocentric viewpoint as the observer. Standard precautions against static or other electrical damage must be followed: Discharge static frequently by touching grounded metal, wear a grounded wrist strap, hand all power OFF when attaching/removing drives, put insulating tape over the db-19 drive plug when not in use.

Move slowly and patiently when removing or inserting the mechanism from its housing ---- metal parts must not be forced or bent. These tools are needed: (a) medium and small Phillips-head screwdrivers, (b) a small pliers, and (c) a fine-tipped felt marker. This procedure was outlined in an essay by Lorne Walton (Apples BC, 1992), but many further details have been added here to facilitate disassembly and drive replacement.

The first step is to remove the worn/defective mechanism from its Apple II platinum casing. Flip the casing on its back and rest it on soft cloth. Remove the four shiny bolts from the bottom of the casing. With the unit inverted, slowly lift the bottom half-shell of the plastic casing upward and push the external cable's attached grommet towards the upper casing. The unit's bottom casing should come off cleanly.

Use the felt marker to label the unit's own main dimensions, writing on the metal internal shroud: front-bottom, rear-bottom, left side, right side. Examine the metal innards as they lie upside down in the upper casing. Note that a red and black wire pair are tucked on the inner edge of each side --- These two wires go to the eject switch (right front) and to the red in-use LED lamp (left front).

At the unit's rear, observe that the wire pairs terminate in RED and BLACK plugs. Use the felt-tipped marker to write "R" and "B" on nearby metal surfaces to identify the positions of these two plugs. These letters will help during reassembly when reinstating the two plugs onto their proper pins. Next, use the small pliers to grasp each plug, slowly and carefully pulling it backwards to remove it from its mounting pins.

With the black and red plugs each removed, slide the top plastic cover in a rear-to-front direction, past the metal-enshrouded mechanism. The wire-pairs from the eject-button and also from the in-use LED lamp should remain tucked into their plastic side-braces.

You now hold the mechanism, enshrouded in its grey metal shielding, with the external db-19 cable protruding from the rear. Remove the two medium Phillips mounting bolts (with flat washers) from each side. Remove the single medium Phillips bolt/washer that is centered on the upper-rear metal shroud. Then lift off the upper-rear should and look inside.

Note that the round external cable terminates in a familiar IDE-20 flat-ribbon connector that plugs into the inner mechanism. Unplug that inner connector --- the small pliers can be used to rock and pull the connector towards the rear. With the IDE-20 ribbon connector unplugged, the inner mechanism can be slid forward and out.

As you hold the inner mechanism in your hand, observe that a shiny thin metal shroud covers its top and sides. Use the felt-tipped pen to label this shroud's dimension: TOP-FRONT and TOP-REAR. This thin shroud should be removed by rocking it and spreading its thin side-tabs. At this point, you have the bare mechanism in your hand, with heads visible from its top perspective, and with pancake motor visible underneath.

You are now ready to begin reassembly, but pause to appreciate what is before you. Hold the old mechanism and its Mac replacement side-by-side --- they should appear identical. The date of manufacture is coded on a sticker on the pancake motor (e.g., 8809 = September 1989). Apply rubbing alcohol with a cotton swab to clean the surfaces of both read/write heads.

REASSEMBLY

Remount the innermost top-and-sides metal shroud, taking care that its "fingers" have clicked into place on the mechanism's sides. When properly fitted, both bolt-holes on each side will be visible through the shroud's thin metal. If the shroud does not fit, or if the bolt-holes are not seen, check with your dimensional labels to verify that the front and rear have not been reversed.

With the top/side inner shroud correctly in place, then reverse the disassembly steps: Slide the mechanism through the front of the metal shroud. Reattach the IDE-20 internal ribbon connector, align the two bolt holes on each side of the outer shroud with the mechanism and reinstall the four medium Phillips bolts and their washers. Then reattach the rear-upper shroud with its centered bolt and washer. Reassembly of the outer metal shroud is now finished!

The final reassembly task is to refit the enshrouded mechanism into the plastic outer casing. Lay the inverted UPPER plastic half-shell on the bench, with its front facing away from you.

Observe the small red or black wires tucked along the sides of the upper plastic half-shell. With the metal enshrouded drive mechanism upside down, it should be slid into the plastic top-shell, from its rear to its front. Check that the red-black wires remain tucked along the inner edge between the plastic casing and the metal shroud. Insert the black and red plugs into their respective connectors. Note the "R" and "B" markings you wrote on the metal

shroud; those markings will guide the plugs' insertion into their proper connectors.

The oblong-shaped grommet attached to the round external cable should be fitted first to the bottom plastic half-shell casing, which is then mated to the top casing. Reattach the four small shiny Phillips bolts through the bottom plastic half-shell, and you're done!

From: David Empson

016- I have one 5.25" drive connected to my GS, but the System 6.0.1 Finder display shows two 5.25" icons!? How can I fix this?

You need to change the AppleDisk5.25 driver file's auxiliary filetype from \$010E to \$0101. You can use File Manager (an NDA utility) to make the change.

For a standard GS/OS device driver, the lower six bits specify the number of devices supported by the driver (see the file type note on GS/OS drivers: FTN.BB.XXXX), so the maximum number of devices that can be supported by a single driver is 63. You should NEVER increase this higher than the original value, because the driver probably doesn't have space in its device tables to support more drivers than it originally claimed to.

The AppleDisk5.25 driver supports a maximum of 14 devices - two 5.25" drives for each available slot. (In theory, it should be able to support 16: all seven real slots, plus the built-in disk port, but Apple never completed the implementation of dynamic slot switching for drivers, probably for compatibility reasons.)

Don't change any of the higher order bits. The high order byte specifies the type of driver (\$01 = GS/OS device driver), and the top two bits of the low order byte specify the type of GS/OS driver (00 = standard).

NOTE: All of the above applies ONLY to GS/OS standard device drivers, not to GS/OS supervisory drivers, printer drivers, or anything else. See the filetype note for further information.

There is one bit in the auxiliary type which is the same for all types of drivers: bit 15 set (\$8000) indicates the driver is inactive (this is what Finder toggles when you click on the "Inactive" check box).

From: Neil Parker

017- How does one distinguish between a 13 and 16-sector Disk][controller card?

For a while at least, new 16-sector Disk II cards shipped with a little white circular sticker depicting a red Apple with the number "16" in the middle.

But the sticker is hardly a reliable test. A better test is to look look at the part numbers of the P5 PROM (the lower left chip on the card) and the P6 PROM (left column, second from the top).

13-sector. **16-sector**

P5 **341-0009-xx.** **.341-0027-xx**

P6 **341-0010-xx.** **.341-0028-xx**

The 16-sector PROMs may also be labelled "P5A" and "P6A".

A program can test the card type by looking at its slot ROM space. The signature bytes are as follows:

\$Cn01: 20
\$Cn03: 00
\$Cn05: 03
\$Cn07: 3C
\$CnFF: **FF** if 13-sector; **00** if 16-sector

For example,

```
1  REM Scan the slots for Disk II interfaces
2  REM By Neil Parker
10  FOR S = 1 TO 7
20  A = 49152 + 256 * S
30  IF PEEK (A + 1) < > 32 OR PEEK (A + 3) < > 0 OR
    PEEK (A + 5) < > 3 OR PEEK (A + 7) < > 60 THEN 100
40  PRINT "Disk II (";
50  T = PEEK (A + 255)
60  IF T = 0 THEN PRINT "16-sector";: GOTO 90
70  IF T = 255 THEN PRINT "13-sector";: GOTO 90
80  PRINT "other";
90  PRINT ") in slot "S
100 NEXT
```

From: Dan DeMaggio

018- Can a Disk II Drive be used on a IIc or GS smartport?

Yes. Call Jameco Electronics. Get the S20-pin header- to -DB19-pin connector module. It is intended for adapting II/II+ drives for IIc. (Part# 10022; Product name: AAM APPLE IIC ADAPTER; price: \$3.95)

From: Rubywand

019- I would like to add a Read/Write indicator to my Disk][drive. How can I do this with a bi-color LED?

The circuit described below works well. It shows Red for Drive Enabled + Write and Green for Drive Enabled + not Write. That is, a Read is assumed if the drive is ON and no Write is occurring. The advantage of this approach is that you always have a lighted LED 'drive ON' indicator and, so, there is no need to drill a new hole in your drive panel. The new LED can use the hole occupied by the old "in Use" indicator LED.

Parts

IC- 74121 or 74LS121 1-Shot multi-vibrator
Qgreen- 2N2222A gen purpose NPN transistor
Qred- 2N2222A gen purpose NPN transistor
Rcath- 120 Ohm 5% 1/4 watt resistor
Rgreen- 3.3k 5% 1/8 watt resistor
Rred- 3.3k 5% 1/8 watt resistor
Rp- 20k 5% 1/8 watt resistor
Cp- 10uF/10v 10% "dipped tantalum" capacitor
LED- 2.2V 20ma 3-lead (common cathode) Green/Red bi-color LED

Building the Circuit

IC- locate pin-1 and mark it on bottom side with white-out.
'Dead-bug' mount the IC using epoxy in the open area near top-middle of board with pin-1 end pointing to the right.

connect Rcath to solder pad at - (minus) end of C2
connect #20 wire from IC pin-7 to solder pat at - end of C2

connect Rp from IC pin-11 to IC pin-14
connect Cp + to IC pin-10 and Cp - to IC pin-11

connect #20 wire from IC pin-14 to solder pat at + end of C4

connect a wire from IC pin-3 to end of R16 closest to 74LS125

connect Rgreen to IC pin-1 (74121 "/Q" output)
connect Rred to IC pin-6 (74121 "Q" output)

solder transistor Qred Collector to Q1 power transistor Collector (solder pad area at left front of circuit board just to left of the power transistor). Position toward left edge of pad.

solder transistor Qgreen Collector to Q1 power transistor Collector solder pad to the right of Qred.

LED- connect a 3-wire 11" cable to the LED (black to center, red to to lead with right-angle bend, green to lead with slant bend).

Old "in Use" LED- pop off the retainer ring and push through the LED. Leave the LED mount in the hole. Cut off the LED, spread cable ends and tab over with cellophane tape. (Put old LED and ring into parts box.

Spread apart retainer 'leaves' of LED mount (at back side of panel) to permit easier insertion of new 3-lead LED.

Run LED + cable over back of board and along bottom toward the hole in the front panel. Push through hole. (If hole is too small, use a Dremel tool and steel 'bulb bit' to slightly enlarge front part of hole.)

connect LED cable black to free end of Rcath
connect LED cable green to Emitter of Qgreen (right transistor)
connect LED cable red to Emitter of Qred.

position old LED cable beneath new LED cable.

connect a wire from the free end of Rgreen (on IC pin-1) to the Base lead of transistor Qgreen.

connect a wire from the free end of Rred (on IC pin-6) to the Base lead of transistor Qred.

Add epoxy to the back of the LED and holder to secure the LED.

How it Works

When /Enable goes low to select the Drive, the power transistor (Q1) switches ON and supplies +12V at its Collector. If there is no Write, 74121 output /Q is high, Qgreen conducts, and the LED shows Green. That is: the Green LED will light during boots and for any READs.

If the Drive is selected (/Enabled is low) and there is a Write operation and Write Protect is not ON, then, the /Write Request signal at 74LS125 pin 8 will go low. This triggers the 74121 One-Shot (at pin 3) producing an approx. 160ms pulse at 74121 output Q. For the duration of the pulse, /Q is low and Q is high. Qred conducts, and the LED shows RED to indicate WRITE.

From: Dan DeMaggio

020- What's the scoop on the 3.5" High Density drive?

In order to do High Density on the Apple II, you will need both the High Density 3.5" drive and the Apple 3.5" HD controller. If you don't have both, you will only be able to do regular density. Of course, you will also need High Density diskettes.

Once you have collected the above items, you are in for a pleasant surprise. ProDos 8 programs not only recognize it, but most programs format and recognize HD disks just fine. You can even boot off of a HD disk, allowing plenty of room for System Desk Accessories and such.

There are a few drawbacks: You cannot boot copy-protected software or some FTA demos. You can't daisy-chain a 5.25" on an HD card. Also, it takes up a Slot, even on the GS.

From: Benjamin Summers

021- What is a "UniDisk"?

The UniDisk 5.25 was Apple's replacement for the venerable Disk][. It featured an updated design, tan color plastic case, a DB-19 cable, and daisy-chain port on the back to which other drives could be connected. The case color was later changed to platinum and the drive was rechristened to the "Apple 5.25 Drive".

The UniDisk 3.5 was Apple's first 3.5" drive for the Apple II line. Like the UniDisk 5.25, it had the DB-19 cable and daisy chain port on back. UniDisk 3.5 was dropped in favor of the Apple Disk 3.5, a different design, at the time of the launch of the IIGs.

From: Mitchell Spector

One important difference you forgot to mention: The UniDisk 3.5 was an "intelligent" drive, whereas the Apple 3.5 was a "dumb" drive. There was a specialized circuit board inside the UniDisk 3.5 drive which had its own processor, memory, IWM controller and firmware. This was needed for the //c, in order for the drive to process data before sending it on to the machine (which was too slow to do the job by itself). You can easily spot a UniDisk 3.5 as it matched the snow-white color of the //c and had its access LED and eject button above the disk insert slot (the Apple 3.5 has them in-line).

From: Rubywand

022- What is a "RAM disk"; and, how do I create one on my IIs?

A RAM disk is a block of memory which your computer uses like a disk.

To create a RAM disk on your IIs ...

o- Boot a ProDOS-8 or DOS 3.3 diskette; or, start your computer with no boot and press CONTROL-Reset to get to the Applesoft prompt.

o- Press OpenApple-Control-ESC (all three keys at once) to get to the Desk Accessories menu and select "Control Panel".

o- In the Control Panel menu, select "RAM Disk".

o- Set "Minimum RAM Disk Size" and "Maximum RAM Disk Size" to the same value = size of the RAM disk you want. If you have enough RAM left over to start your operating system and run your favorite application, a good RAM disk size is 800k.

o- Press Return to set the value. Exit the Control Panel. Exit the Desk Accessories menu. Turn OFF the computer.

When you next power up your computer, your RAM disk will be ready to use.

From: David Empson

023- Which 3.5" drive/interface combinations work on a IIe?

For the UniDisk 3.5 (model number A2M2053), you need either Apple's "SuperDrive" card or the "Liron" card. The UniDisk 3.5 is quite rare. It is a clean white color instead of greyish "platinum". It also has the eject button just above the line of the disk insertion slot, with a separate manual ejection hole.

The "Liron" card's official name is "Apple 3.5 Floppy Disk Drive Interface Card". It has the word "Liron" on the back (which is the nickname of the IWM disk controller chip, if I remember right).

For the Apple 3.5 Drive (model A9M0106 as used on the IIs), you need either Apple's "SuperDrive" card or the third party "Universal Disk Controller" card. The drive is platinum in color and has the eject button in line with the disk insertion slot and the ejection hole is in the middle of the button.

The "SuperDrive" card's official name is "Apple II 3.5 Disk Controller Card". The card has an LED on top, and has its own processor, RAM and ROM.

For the Apple SuperDrive, you need the "SuperDrive" card. Model ID is inconsistent. Check for something like "Family number G7287".

The SuperDrive looks exactly the same as the Apple 3.5 Drive. It supports 1.44 MB high density and 720 KB double density disks as well as the 400 KB and 800 KB formats. You can use a SuperDrive with the Universal Disk Controller card, but you won't be able to use its extra capabilities, and it will behave like an Apple 3.5 Drive.

From: O Aaland and Michael Pender

024- How can I boot from my /RAM5 RAM disk? All the files are there but it just beeps at me and says 'check startup device'!?

When GS/OS boots, the RAM disk is formatted; but, the boot blocks for ProDOS are not written. That is why you can not boot from it if you just copy files or install a system on it.

For the RAM disk to be bootable, you need to do a whole-disk copy of a same-size bootable diskette to the RAM disk. Or, you can initialize* the RAM disk before you copy files to it or do an install.

*Note: To initialize the RAM disk, click on the RAM disk icon to select it. Then, click on "Disk" on the menu bar and select "Initialize". Follow the prompts to init the disk.

Finally, in the IIGS Control Panel, go to Slots and set Startup Slot to "RAM Disk".

From: Ryan Underwood

025- My 5.25" drive ruins every disk I insert. How can I fix it?

Probably, the drive's Write signal is ON when it shouldn't be. This happens with some 5.25" drives when a 74LS125 IC on the drive's circuit board is blown. (I accidentally offset a row of pins on the //e disk controller card when plugging in a drive and blew the IC.)

I removed the drive cover and replaced the 74LS125-- it was socketed-- voila! it worked again. (For possible disk-trashing fix for DuoDisk drives, see Q&A 006.)

From: Beverly Cadieux

026- I have a 3.5" UniDisk drive on my GS that has performed flawlessly for years. Recently, when I try to save a file to a diskette, I get a 'Disk Full' message; but it isn't full. This happens with other diskettes, too. What's going on?

There is a known problem when attempting to save an Appleworks file to a 3.5" UniDisk drive when the disk in the drive is write-protected. It ruins the disk for future use, and you can't save to it any more. If you try to save to that disk again later, the situation you describe will happen.

From: Mark R. Percival

Perhaps the cable has come loose at the back of your IIgs or there is some buildup of corrosion on the pins. I had a similar problem with an Apple 5.25" drive once that ended up being that. Try unplugging your drive and making sure the contacts are clean and then plug it back in.

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