

Fitting Instructions for the elCo High Density Module

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Thank you for purchasing the elCo high density module. Once it is fitted you will hardly notice it is there, except for your Atari's new ability to read and write high density disks.

Your new HD module allows you to use disk drives that detect the HD hole in HD disks as well as those drives that must be told to run in high density mode. The module automatically adapts the step rate. If you use this module in conjunction with EOS, the Enhanced Operating System for your Atari ST, you don't even need the included driver software as these routines are already build into EOS.

Please do not hesitate to contact your dealer or the Atari Workshop if you need help to install the module. If you need a fitting service, ask your supplier to do it for you. If you don't have a dealer or a service centre near you, don't hesitate to contact us.

Should any problems arise using the HD module, please give us full descriptions of the fault so that we can help. Please make notes before you telephone.

A warning before you start

Guarantee

If you install the HD module yourself, you will void any guarantee or warranty that exists for your Atari computer.

The elCo HD module carries a 90 day guarantee, parts only and labour, if our fitting service is used. The guarantee excludes all despatch costs.

The companies, Brandt Fernandes (Europe) Ltd and elCo do not assume any liability for any consequential damage caused by the installation of the module. The above mentioned companies also do not assume any liability for any damage caused during or as a result of installing the module or by using parts not supplied with the kit.

Care should be taken if you are fitting the module yourself, since your work can not be guaranteed by us, and a mistake can seriously damage your computer and/or the module. If you are not experienced with soldering irons and electronic components we strongly advise you to get a professional technician to install it for you.

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The module doubles the speed at which the floppy disc controller

(FDC) is run, from 8 Mhz to 16 Mhz. Some FDCs are not designed for use with a 16 Mhz clock and can be damaged by the increased heat generation. FDCs with the serial number WD1772 02-02 xxx are the only controllers known to work in the high-density mode. FDCs marked WD1772 00-02 xxx are not suitable. We can supply selected FDCs which have been tested at the higher speed. Usually, however you shouldn't have problems while running the FDC at the higher frequency.

How does it work?

Once you have installed the module and the software has been run from the AUTO folder during start up, you will be able to read, write and format high density disks as well as your old double density disks. The driver expands some routines of the BIOS so that they accept the new parameters necessary. The hardware ensures that the speed of the FDC is doubled when needed. The software doubles the step rate so that no timeout occurs. No further software or hardware is necessary.

This method of using hardware and software offers continued compatibility with software changes Atari may introduce for the new Mega STe and TT computers now sold with high density drives.

Finely tuned logic in the software driver assures that the disk drives recognize the type of disk inserted. This same logic provides a highly dependable error recognition scheme.

High Density Floppy Drives and Suppliers Support

Floppy disk drives are a commodity. They are sold by lots of companies mostly without ANY technical support. The Atari Workshop supplies ONLY quality drives WITH technical support.

Whilst we are confident that the elCo High Density Module will work with most floppy disk drives available we are not able to give technical support on products sold by other companies.

Please DO NOT call for support on floppy disk drives which have not been supplied by the Atari Workshop.

Tips for users of TEAC drives

In our opinion disk drives manufactured TEAC are of very high quality.

TEAC FD-235HF-3217-U (3.5"-drive)

This disk drive may be used as drive 0 (A:) or drive 1 (B:). Jumper the appropriate bridge (D0 or D1).

If you want to use the drive in auto-sensing mode you must set the jumpers OP and HHO. If you want the OS to tell the drive how to work set only the jumper HHI instead.

TEAC FD-55GFR (5.25"-drive)

This drive may be used as drive 0 through 3; set the appropriate jumper.

The OS must tell the drive in which mode to work, otherwise you have to use a switch like "in the old days". Out of the jumpers LG, I, IS, RY and DC, only set I.

If you also want to write and read 360K disks (40 tracks, 9 sectors) you must solder in a switch. It has to be connected to the soldering dots S2 and S3. If you use 360K disks you must double the step rate manually.

De-installing the HD module

If for any reason you have to take out the HD module at any time, make sure you put the Shugart Bus connections back to the original state.

You don't have to re-install your old floppy drives, but you must re-jumper the 3.5"-drives so that they always work in DD mode or work in the auto-sensing mode. Remember that even if the drive is auto-sensing, you are not able to use HD disks without a HD module.

Admin Teac (02) 6842566

Teac Service Technical (02) 6386566

*Electronic Service (02) 5972385
authorised centre
service
Teac.*

My drive : FD-235HF-3291-U

*My new drive 4 : FD-235HF-240-U - It works -
has same
jumpers as 3217*

Watch out for static charges. These are most harmful to the electronic components you are about to work on. Discharge yourself by touching a radiator or a tap. Do not work in a carpeted area.

Unplug all cables from your Atari computer, especially the mains power cable.

Turn over your ST. Now unscrew all screws which are shorter than 3 cm. At least one of the screws could be hidden underneath a seal by Atari. Punch right through it or tear it off. From this moment on your warranty and guarantee will be null and void.

If your ST is fitted with an internal drive, it will be fastened with three long screws. Don't unscrew these yet. Just tighten them back up if you accidentally did.

Turn over your computer again and take off the lid.

- **Mega ST: BEWARE!** The battery compartment is connected with a very short cable. Carefully lift the lid and unplug this plug before taking off the lid. Squeeze the socket and push it into the shielding.
- If you have a ST with an integrated keyboard (260/520/1040) you must unplug the keyboard. Lift it up a bit and pull the plug on the right side from its socket. Don't worry, you can't plug it in the wrong way. Now unscrew the screws which hold the shielding in the front part of the computer.

Straighten all metal tabs which hold together the upper and the lower half of the shielding.

- **ST(F)/Mega ST:** Before you can take off the shielding you have to loosen the disk drive. In an ST(F(M))(e) you must also take out the power supply. To do so, first remove the screws which hold a metal cover above the power supply. Once you have taken this off, you can pull the plug that connects the power supply to the motherboard and unscrew the two screws that hold the power supply in place. Now take out the power supply unit.

Unscrew the screws which hold the disk drive in place. When you turn over your computer keep hold of the disk drive so it doesn't fall out. To make later work easier on your ST you can cut out the metal strips of the shielding which run underneath the disk drive and behind the power supply unit. In later sessions there

will be no need to unscrew everything just to take off the shielding. Now take out the power supply unit and disk drive from your Mega ST.

The motherboard should now be in front of you. We will have to go yet one step further since we have to solder some wires to the solderside of the motherboard. Unscrew the six hexagonal screws at the back (Mega ST only) which fasten the DMA, Printer and Modem port sockets to the ST. You should then be able to lift the motherboard out of the lower part of the shielding. Put everything but the motherboard aside.

Some advice for owners of very old STs without internal disk drive. Normally you will only be able to connect one cable to the floppy connector. If you need more, you will have to do some work of your own to connect the appropriate cables to the disk drives. Make sure the cables you use to connect the HD signal to the external drive(s) are not too long.

Installing the elCo HD module

Your HD module has two sockets. One has 3 pins, the other has 10. If you are using drive(s) without auto-sensing on Pin 2 or if you jumper them to work this way, you have to connect all wires from the three way socket to ground. Use the ground connection next to the socket. This is the recommended and best mode of operation, unless you use the high density drives with a PC Emulator. In this case the HD signalling used is the violet wire of the 10 way connector. This wire must be connected to pin 2 of the Shugart Bus (computer side).

If you want the disk drive to automatically detect density, you must connect the appropriate wire from the three way connector to pin 2 of each of the high density drive's Shugart Bus. At the same time you must not have any contact between pin 2 of the drive's Shugart Bus and the motherboard. The wires of the three pin plug are assigned as follows:

3 Way Connector:

Brown Pin 2 drive 0(A)

Red Pin 2 drive 1(B)

Orange Ground

10 Way Connector:

Brown	Pin 1 sound chip, YM2149F	(Ground)
Red	Pin 20 sound chip, YM2149F	(DS 0)
Orange	Pin 19 sound chip, YM2149F	(DS 1)
Yellow	Pin 13 sound chip, YM2149F	(I/O B0)
Green	Pin 18 FDC, WD1772	(Clock) (New clock signal; cut pin 18 as close to the motherboard as possible with a small pair of cutters. This pin must not make contact with the motherboard)
B1	Pin 12 sound chip, YM2149F	(I/O B1)
Violet	Pin 2 Shugart bus	(HD signal) (HD signal for HD drives without high density signalling)
White	Pin 12 Shugart bus	(Drive Select 1)
Grey	Pin 14 Shugart bus	(Unused, Do not Connect)
Black	Pin 40 sound chip, YM2149F	(+5V)

- ST's without internal disk drives. These STs don't have a Shugart bus cable. Therefore you have to make a modification. Since you can only connect a single connection to external drives you can either only use one HD drive or use the mode of operation for non auto-sensing drives. The signal sent to external drive(s) can be carried on pin 7 of the floppy connector. Thus you will either connect the brown cable from the 3 pin plug or the violet cable from the 10 pin plug.

In all cases you will have to interrupt the connection to the motherboard. If you look at the back of the socket (the internal side of the computer) you will see several metal straps which lead to the motherboard. The connector for pin 7 can be found to the very right and is largely covered by the monitor socket. This connector needs to be cut and isolated from ground, the most practical method is to use a small flat blade screwdriver underneath this metal strap and break the strap by turning the screwdriver.

When you install the new drive make sure that it is compatible with

the modes discussed above (the pin must not be connected to ground, but to pin 2 of the drive's Shugart bus).

- ST's with internal drives: The wires which are connected to the Shugart bus should be soldered to the motherboard from underneath. If you are going to connect an external drive as well, you must also make the modification discussed in the last two paragraphs. If you are going to use an auto-sensing drive inside your ST connect the appropriate cable from the three pin connector. Otherwise use the violet cable from the 10 pin connector. If you have already used the violet cable solder a wire connecting pin 2 of the Shugart bus to pin 7 of the modified disk drive cable socket.

Installing the high density drives

You can easily exchange the internal 3.5" drive for a HD type. The power supply connectors are standard. Make sure, however, that pin 1 from the 34 way ribbon cable is connected to pin 1 of the socket on the drive. Usually the cable connecting pin 1 and pin 1 is marked. On some drives it may be necessary to cut off the polarisation notch with a sharp knife. Twist the ribbon cable 180 degrees and plug in.

We don't know of any drive that directly fits into the Atari case. You will have to make some modifications to the case. Our advice is to cut out as little as necessary from the case. Just take out enough to place the drive inside the case until it is easy to use the eject button.

Testing

Now put the motherboard back into the lower part of the shielding. Don't forget the insulating paper and check you didn't forget any bits of solder or wire, and that you did not inadvertently create short circuits. Replace the shielding, install the power supply into its place as (if appropriate) well as the (new) disk drive. Connect the (new) disk drive. If you have a 260/520/1040 ST you have to connect the keyboard and put the keyboard into its place. Make sure that the keyboard does not touch the power supply. If you have a Mega ST connect the keyboard as usual. Insert the monitor and the power cable.

WARNING! Make sure that the computer is turned off. Insert the mains plug into an earthed mains outlet and turn on the monitor.

Now is the exciting moment. Turn on your computer, but look out! The cooling fins on the power supply carry high voltages. Touching them may be fatal. So, keep your hands off!

If your computer shows the desktop after a few seconds everything is ready for the test. If you don't see the usual desktop, it smells like burned plastic or you see smoke, immediately take the power cable out of the wall socket and check your modifications. Thoroughly double check your work for short circuits, bad solder joints etc. If you can't find anything wrong you can always phone us for help. Our number is on the first page.

As the driver has already been installed you should now try to format some disks. First try a regular DD disk and then a HD disk. If you don't have any problems, the chances are everything is OK and you can proceed to reassemble your computer. If you have problems check your work again. If you can't find any obvious mistakes feel free to contact us.

Reassemble

Firstly turn off the power and disconnect the mains plug from the power point. When reassembling your computer do everything in the reverse order. If you have carried out our 'slight modifications' to the shielding, the reassembling should be done a lot quicker. Work in this order:

1. Fit the motherboard to the lower part of the shielding.
2. Insert the motherboard into the lower part of the case.
3. Fix the 6 hexagonal screws to the back if you have a Mega ST.
4. Insert and screw down the power supply. Don't forget to connect the power supply to the motherboard.
5. Screw the internal drive into place. Connect the power connector and plug in the 34 way ribbon cable. Watch out for the correct orientation (1 on 1).
6. Replace the upper part of the shielding. On a Mega ST don't forget to put the battery socket back in place before fastening the shielding. Fasten the shielding.
7. Reconnect the keyboard.
8. Put the case top back in place and fasten it.

Using high density drives

If your operating system is EOS you don't need the driver software. This O/S automatically detects HD drives and uses them appropriately.

The driver for the module is called HDP.PRG. This program must be placed into the AUTO folder of your boot drive together with the file HIGHDENS.INF. It installs a "cookie jar" if none is present yet and sets the FDC cookie. Also it provides the necessary extensions to the BIOS routines to make the use of HD diskettes possible.

The file HIGHDENS.INF, which is placed in the AUTO folder of your boot drive, contains some codes which describe how the drives connected to the ST are used. This file can be modified using any text editor which saves ASCII text.

Unlike many of its competitors the elCo HD module is capable of changing the track to track step rates on the fly. To use this feature you must have EOS installed. You can also change the step rate at any time using the HIGHDENS.ACC accessory. But, you don't need the accessory for the regular use of the module.

The accessory allows the following modifications:

1. You can give a drive an optional name which is not used yet.
2. You can set the step rate separately for each drive.
3. You can define the type of each drive separately (DD or HD).

The accessory includes a universal formatting program. Finally you can turn on or off the keyboard click and the system error bell. The symbols in front of a drive's name show the drive's type assigned to it in HIGHDENS.INF (3.5" or 5.25").

Problems and solutions

Some Atari floppy disk drives can give problems when writing to disks. If this is the case, you have two options:

1. Replace with a better quality drive.
2. Increase the signal strength from your floppy disk controller (FDC). Next to the IC labelled WD 1772 you find a TTL IC labelled 7406. Solder a second 7406 IC on top of the first. Make sure there is some space between the two chips so the generated heat can get out.

Installation

We want to emphasise again, do not attempt the installation, unless you have had previous soldering experience. We recommend that you read the fitting instructions thoroughly before you start. If you are in any doubt, give us a call and we will put you in touch with a service centre near you.

Another word of caution. Remember that power supplies can hold deadly voltages for quite some time after they have been turned off. Never touch the cooling plates or capacitors.

These are the steps you have to follow:

1. Install the driver software
2. Disassemble your computer
3. Install the elCo module
4. Test your computer
5. Reassemble your computer

Installing the driver software

Note: EOS, the Enhanced Operating System does not need the driver nor the accessory as all its functions are already integrated.

If you don't have EOS, copy the program HDP.PRG as well as the file HIGHDENS.INF into the AUTO folder of your boot drive. Copy the accessory HIGHDENS.ACC with its resource file HIGHDENS.RSC to the root directory of the (boot) drive.

Disassembling your computer

Before you start check that you have the following tools. You need:

- Small pair of flat nosed pliers
- Philips type screwdriver
- Flat blade screwdriver
- Pair of wire cutting pliers
- Pair of tweezers
- Multimeter (to check voltage and resistance)
- Soldering iron
- some solder and TIME. Don't rush it!

An IC extractor and a small side cutter would be useful.

Use a fine tipped soldering iron (16 to 25 watt max.) for use on electronic equipment. A cheap iron will not do.

Appendix

Counting pins on ICs

Integrated circuit pins are counted anti-clockwise. Usually pin 1 is marked somehow. Put the IC in front of you with the mark (dot or dent) on the left side. Pin 1 is the pin in the lower left corner. The pins are numbered by counting from the lower left corner pin 1 anti-clockwise, the last pin being opposite pin 1.

Shugart Bus and Floppy Connector

The Shugart Bus is the 34 way connection from the mainboard to an internal disk drive. All odd pins of the Shugart Bus are grounded for shielding purposes.

Not all even pins are used by the ST. Some pins are only used by the HD module. These are marked with an asterisk in the following list.

Shugart Floppy		Signal
*2	7	HD
8	4	IDX, index pulse
10	5	DS0, drive select 0
*12	6	DS1, drive select 1
*14		
16	8	MON, motor on
18	9	DIR, direction
20	10	STP, step impulse
22	11	WDT, write data
24	12	WGT, write gate
26	13	TR0, track zero
28	14	WPT, write protect
30	1	RDT, read data
32	2	SSL, side select

References

EOS manual

Scheibenkleister II, MAXON, 1989, ISBN 3-927065-00-5

TEAC FD-235 HF Micro Floppy Disk Drive Specification (11.90)

TEAC FD 55 GFR Mini Flexible Disk Drive Specification (7.90)

Notes