

DigiImage

Image Processing for Fluid Dynamics

Installation Guide

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DL Research Partners

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Preface

Installation of *Dig/mage* may be divided into six relatively simple phases:

1. Installing Microsoft language utilities (optional)
1. Installing the frame grabber board
1. Setting up the environment variables and RAM disk
1. Installing the *Dig/mage* software
1. Configuring *Dig/mage*
1. Setting up the Panasonic AG-7330 or AG-7350 Super VHS video tape recorder.

We shall deal with these six phases in order.

This guide assumes that Microsoft Fortran has previously been installed on the computer. The installation procedure utilises the `LINK.EXE` command supplied with the Fortran (and other Microsoft languages) to build the executables required for a given choice of hardware. The `LINK.EXE` should be accessible on the MS-DOS `PATH` - refer to the MS-DOS manual and Fortran manual for details. If you do not currently have a copy of Microsoft Fortran, please contact DL Research Partners, informing us of your exact hardware/video combination, and we will supply you with the executable files already built.

1 Microsoft Language Utilities

The *Dig/mage* software is designed to act both as a stand-alone “shrink wrapped” system and as a development platform for more specialised or customised image processing. To achieve these ends, the installation disks contain both complete executables for the system and an extensive set of Fortran linkable object files and libraries. Complete documentation is provided for both these aspects of *Dig/mage*. Refer to the System Overview and Development System documentation for details.

With versions of *Dig/mage* prior to version 1.5 the system was supplied as object files which were then linked together during installation. The rationale for this was to enable the full range of supported video recorders to be used and reduce the number and size of the installation disks. The draw back was that it was essential that the user had already installed the `LINK.EXE` utility supplied with Microsoft Fortran, MASM and other high-level languages. Typically the user would have Microsoft Fortran version 5.0 or 5.1 installed which they would subsequently use in any software development.

The situation has changed to allow the main *Dig/mage* executables to use the more advanced dynamic overlay facilities available with later versions of `LINK.EXE`. As many users may not have a copy of this later `LINK.EXE`, *Dig/mage* is pre-linked and supplied as executable code in addition to the object and library files. For user-developed code, support is provided for both the old Static Overlays and the newer Dynamic Overlays with the installation procedure automatically detecting whether the installed `LINK.EXE` supports Dynamic Overlays. A secondary benefit of this change is that the system may now be installed even if there is no `LINK.EXE` present. There are thus three possible states of the system prior to installation of *Dig/mage*. These are summarised below. In each case the installation procedure is the same and is detailed in the remainder of this guide.

1.1 NO LINK.EXE INSTALLED

If there is no `LINK.EXE` installed on the computer, or it can not be located on the MS-DOS `PATH` then the system will be loaded from the installation disks, using the supplied executables. The object and library files will also be installed, but will be of little value in the absence of MicroSoft Fortran and `LINK.EXE`. The system will be set up as though an older style `LINK.EXE` were being used.

The supplied executable files provide support for the Panasonic AG-7350 SVHS VTR only. If you are using the earlier AG-7330 or the JVC BRS-822 machines, then please contact DL Research Partners for appropriate executable files.

1.2 LINK.EXE SUPPORTING STATIC OVERLAYS

The `LINK.EXE` utility supplied with MicroSoft Fortran versions 5.0 and 5.1 and MASM versions 5.0 and 6.0 support only the older style Static Overlays. If *Dig/mage* detects one of these older `LINK.EXE` utilities then the installation procedure will set up the system for use with this form of `LINK.EXE`. The executables, however, will be copied from the installation disks so that the newer Dynamic Overlay technology is used in the core modules.

The supplied executable files provide support for the Panasonic AG-7350 SVHS VTR only. If you are using the earlier AG-7330 or the JVC BRS-822 machines, then please contact

DL Research Partners for appropriate executable files. In the mean time the installation procedure will link the system using the older style Static Overlays.

1.3 LINK.EXE SUPPORTING DYNAMIC OVERLAYS

The `LINK.EXE` utility supplied with the more recent MicroSoft high level languages such as C version 7.0, Visual C++ version 1.5 and MASM version 6.1 supports Dynamic Overlays. This newer technology offers significant speed improvements over the Static Overlays provided with the earlier languages and allows **Dig/mage** to run in less memory than previously possible. You may determine whether or not you have one of these newer copies of `LINK.EXE` by typing

```
LINK /?
```

If the response from `LINK.EXE` includes the `/DYNAMIC` switch in the list then it provides support for Dynamic Overlays. This is the method **Dig/mage** uses to determine the type of `LINK.EXE` installed. Note that if there is more than one copy of `LINK.EXE` installed then **Dig/mage** will use the first one located. Thus it is important to ensure that this is the one you wish to use.

The object library files will be configured automatically for use with the newer Dynamic Overlays.

As with the other two options, the installation procedure will installed the distributed executables for the Panasonic AG-7350 SVHS VTR. If the installation procedure detects one of the other supported videos, then it will automatically link the correct control routines using Dynamic Overlays. There is thus no need to request updated executables.

1.4 CHANGING TO A DIFFERENT LINK.EXE

If you change to a different version of `LINK.EXE`, then simply run `DIGILINK.BAT` from the **Dig/mage** directory after installing the new utility. The system will then reconfigure itself so that future `DigiMake` operations use the newer Dynamic Overlays. To forcibly relink the core modules, type

```
DIGILINK FORCE
```

in the **Dig/mage** directory.

2 Board Installation

The various issues related to the installation and configuration of the DT-2861 or DT-2862 frame grabber card are discussed in this section. In addition to this installation guide, you may also need the Data Translation documentation for the frame grabber and details of the hardware/software configuration of your computer.

2.1 JUMPERS

Two of the jumpers (links) on the frame grabber board are required only if a colour video signal is to be digitised. Their purpose is to invoke the filters necessary to remove the colour from the video signal so that only the luminance is digitised. In section 6.3 we recommend connecting only the luminance signal of the Super VHS output from the video recorder. This ensures only a monochrome signal reaches the frame grabber. As a result jumpers W17 (chrominance filter) and W20 (3MHz band width) should be removed. Refer to frame grabber manual for further details.

2.2 BOARD ALREADY INSTALLED

If you already have a Data Translation DT-2861 or DT-2862 board installed, then there is no need to reinstall this board. You will, however, need to know what the I/O port and memory map address for which the board is configured -refer to the board's own manual for details. If you are not intending on using any Data Translation software, remove or comment out the reference to the Data Translation software driver in your `C:\CONFIG.SYS` file (removing the driver both increases the available memory and prevents the onboard frame buffers from being cleared if the computer is rebooted).

2.3 INSTALLING THE FRAME GRABBER BOARD

If the DT-2861 or DT-2862 arithmetic frame grabber board is not already installed, refer to the installation documentation supplied with the board. Make a careful note of any change in the default factory settings for the I/O port or memory map addresses. There is no need to install the Data Translation device driver.

The frame grabber card is mapped into the computer's memory space through a 512KByte window which must be located somewhere in the first 16MBytes of address space. With older computers this limited the amount of RAM to 8 or 12 MBytes as the frame grabber card will not function if RAM occupies the same address space as the frame grabber. However, with the newer "Plug and Play" machines, the BIOS often allows a "hole" to be created somewhere in the first 16MBytes of the address space, thus allowing the frame grabber to be used even if 16MBytes or more of memory are actually installed. The base address of the card may need to be changed from the factory default of 0xA00000 (*i.e.* starting at the 10MByte mark) to make efficient use of this mechanism (on some machines this hole must be located at the top of the first 16MBytes thus suggesting a base address of 0xF00000 or 0xF800000).

Regardless of how much memory is installed it is essential to ensure that the part of the memory map occupied by the frame grabber must not be cached as both the frame grabber and main processor may access the memory. With the BIOSes in some older machines this may require some adjustment using the computer's setup utility. Plug and Play BIOSes tend to look after this requirement automatically.

2.4 INTERRUPTS

Perhaps the most difficult task when installing the frame grabber card is resolving interrupt channel conflicts between the frame grabber card and other cards and devices in the computer. The design of the PC prevents more than one device simultaneously having control over any single interrupt channel. While it would have been easy for the designers to have avoided this limitation, they chose instead to supply PC/AT style PCs with 15 separate channels. In the past this has not been too much of a problem, but as the number of peripherals and cards have increased, 15 is starting to be a problem.

The DT2861 and DT2862 cards are capable of generating interrupts to request immediate action from the computer under some circumstances. As *Dig/mage* did not utilise this feature prior to version 1.4, there was no need to activate the interrupt channel, and so no conflicts occurred. However, from version 1.4 the interrupt channel is used in some facilities. In the future the number of facilities using the interrupt are likely to increase, so it is desirable to resolve any conflicts during installation of the card. **If it is not possible to resolve the interrupt conflicts, disable the frame grabber interrupts on the card and configure *Dig/mage* accordingly. Most of the features of *Dig/mage* will still function correctly.**

The frame grabber card may be configured to one of four different interrupt channels: IRQ3, IRQ5, IRQ10 or IRQ15. This configuration is achieved using jumpers W10 to W13 (consult the Data Translation documentation for details). It is normally desirable to utilise IRQ15 (factory default) or IRQ10. If neither of these can be made available, then you can use IRQ5. Do **not** use IRQ3 as this will interfere with the COM2: serial port required for controlling the video recorder. The normal uses of these interrupt channels are given below:

If you are running Windows 95, Windows 98 or a machine with a "Plug and Play" bios, it will be necessary to inform Windows 95/98 that the interrupt is reserved for a specific ISA card. This can be done either at the BIOS level, or using the System group in Control Panel under Windows 95/98.

Channel	Normal Use	Comments
IRQ15	Reserved	Reserved by IBM, but often used for third party peripherals. In machines with two IDE disk controllers, it may be used for the second controller.
IRQ10	User	Normally available
IRQ5	LPT2	Second parallel printer port. If only one port fitted, then it should be available.
IRQ3	COM2: (and COM4:)	Do not use as it will prevent proper control of the video recorder.

Note that it is essential that the interrupt channel selected is reflected accurately in [Addresses for frame grabber] in the configuration utility (see section 5)

2.5 VIDEO CONNECTIONS TO FRAME GRABBER

The method of connecting the video source and display monitor to the frame grabber card is through a connector on the back of the card. Data Translation supply an interface cable as an optional extra. For newer frame grabber cards, the cable is attached via a 15 way D plug. This cable is suitable, but unduly expensive. If you wish to make your own cable, the connections

are as follows (looking into the D plug on the card the top left pin is number 8 and the top right number 15):

Pin	Signal	Pin	Signal
1	Vertical Drive signal	9	Vert. & Horiz. Drive ground
2	Horizontal Drive signal	10	Composite Blank ground
3	Composite Blank signal	11	Composite Sync ground
4	Composite Sync signal	12	Blue ground
5	Blue signal	13	Green ground
6	Green signal	14	Red ground
7	Red signal	15	Video Input ground
8	Video Input signal		

For older model frame grabber cards, the Data Translation cable consists of the 16-way connector to fit the frame grabber card, an eight-way shielded ribbon cable (in which each of the conductors is separately shielded) and eight BNC sockets. We recommend against using this cable for the following reasons:

1. The BNC sockets are very difficult to undo and must be held in a pair of pliers to prevent damage to the cable.
1. The conductors in the shielded ribbon cable are very thin and prone to breakage after prolonged use.
1. The shielded ribbon cable is very stiff and places undue strain on the connector to the card.
1. The cost of the cable is unreasonably high.

We suggest instead that you make your own cable to connect the card to BNC sockets attached to a rigid box. The connector for the frame grabber card is manufactured by AMP connectors (part number 26733-5); alternatively a 16-way IDC may be used. While the AMP connector is designed for the shielded ribbon cable, conventional miniature coaxial cable may be used instead to connect only those signals required - typically only four or five of the eight signals are needed (refer to the manual for the frame grabber card for details). This signal side of the connector corresponds to the component side of the frame grabber card. The shield for the coaxial cable is connected to the other side of the connector.

If you are installing the optional video multiplexer (DT-2859) then we recommend the same method of connecting the video signals. The AMP connector in this case is part number 26733-7.

2.6 DIAGNOSTICS

After installing the frame grabber card in the PC/AT, please run the diagnostic utility `DT2861.EXE` supplied with the frame grabber card by Data Translation. Note that this utility does not require installation of the Data Translation device drivers. The frame grabber must pass the *Acceptance Test* in this utility prior to installing *Dig/mage*. If the card does not pass this test, please check the address jumpers are correctly set up and consult the frame grabber manual. Note that if the base memory address of the frame grabber has been changed from the default `A00000` (this will typically be done to allow for more than 12MBytes of installed memory), then when you specify the new address in the diagnostics utility, specify only the first four hexadecimal digits (*e.g* for `F80000`, specify `F800`). If problems persist, please contact Data Translation or DL Research Partners.

2.7 MONITORS

The ideal monitor to connect to the frame grabber card is a long persistence RGB monitor designed to work with a standard interlaced video signal. Such monitors are often used in the broadcasting industry, but are frequently very expensive. A reasonably priced alternative until recently were monitors designed to work with home computers such as the Atari ST and Commodore Anigma. These CGA standard monitors have largely been replaced by much higher resolution PC monitors which, unfortunately, are seldom able to cope with the relatively low refresh rates and interlaced signals of standard video.

The alternative is to use a television set as the monitor. Many modern television sets have the ability to accept a video frequency RGB signal, even though this is seldom of use in the domestic market. One common standard for connecting such a television, at least in Europe, is a SCART connector. Figure 1 shows the connections that may be required. The connector is viewed looking into the socket.

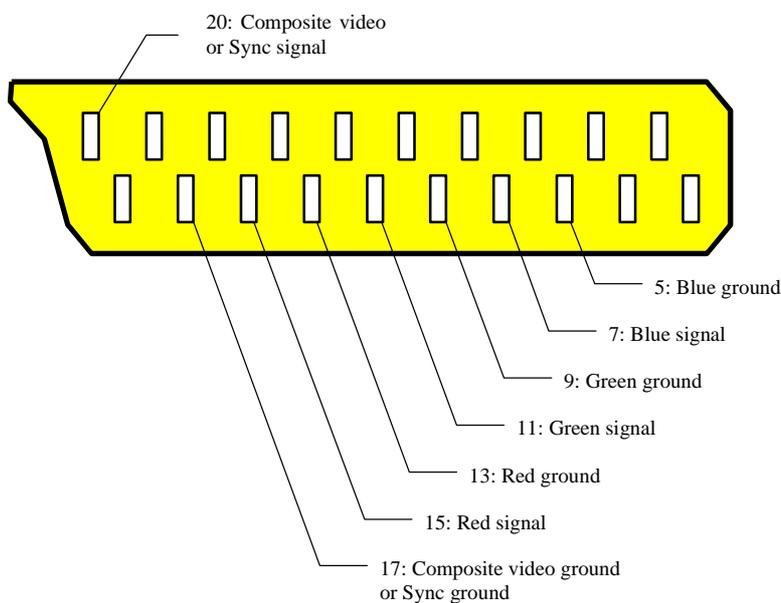


Figure 1: SCART connector pinouts. For composite video (VTR output) use pins 20 and 17. For RGB video (framegrabber output) use Red (15 & 13), Green (11 & 9) and Blue (7 & 5) pins for colour components and pins 20 and 17 for composite sync. Connector viewed looking into socket.

3 Operating System Setup

This section details the setting up of the MS-DOS, Windows 3.1 or Windows 95/98 environment so that **Dig/mage** is able to access the resources it requires. It is strongly recommended that Windows 95/98 is used on all newer machines. Future releases of **Dig/mage** may not operate correctly in the older environments.

3.1 Dig/mage DIRECTORY

Create a base directory on your hard drive to contain the **Dig/mage** files (e.g. C:\DIGIMAGE). The installation procedure will create a number of subdirectories within this directory in which the various parts of the **Dig/mage** system will be located. Included among these is a subdirectory BIN. The complete path specification for this directory (i.e. C:\DIGIMAGE\BIN) **must** be added to PATH within your C:\AUTOEXEC.BAT so that MS-DOS is able to find the **Dig/mage** executable files.

In addition, **Dig/mage** requires an environment variable DIGIMAGE to point to the base directory you have created (i.e. C:\DIGIMAGE). This should be specified in your C:\AUTOEXEC.BAT by adding a line of the form

```
SET DIGIMAGE=C:\DigImage
```

Dig/mage uses this variable to find the various components of the system.

3.2 RAM DISK

With versions of **Dig/mage** prior to 1.5 it was recommended that a RAM disk was utilised for temporary files. However, due to changes in the way **Dig/mage** uses overlays and improvements in disk caching software, the use of a RAM disk is no longer recommended. It is very strongly recommended that you do not use a RAM disk if you are operating under Windows 95/98.

If you still wish to use a RAM disk (perhaps for other purposes) and wish **Dig/mage** to be aware of it and make use of it, then ensure that you have a line of the form

```
SET RAMDISK=D:
```

in your AUTOEXEC.BAT. We would advise, however, that any such RAM disk is at least 1MByte in size and that you do not use one when running under Windows unless you have at least 16MBytes of RAM installed. Refer to sample AUTOEXEC.BAT for further details.

3.3 VIDEO TYPE

The environment variable VIDEO is used to communicate the type of video recorder to be used by **Dig/mage**. VIDEO should be set in C:\AUTOEXEC.BAT to one of the following:

AG7330	For Panasonic AG-7330 VTRs
AG7350	For Panasonic AG-7350 VTRs
BRS822	For JVC BRS-822 VTRs
NOVIDE	No modified RS232 controlled video

3.4 TEMPORARY FILES

At times during its operation, **Dig/mage** needs to create a number of temporary files. Generally these files will be deleted when they are no longer required. By default **Dig/mage** will utilise the directory %DIGIMAGE%\TMP (*i.e.* C:\DIGIMAGE\TMP) to contain these files. However, if the environment variable TMP has been declared in your C:\AUTOEXEC.BAT, then the directory pointed to by this variable will be used instead. If you wish this to point to a RAM disk (see comments in section 3.2) then you should ensure at least 1MByte of RAM is available.

3.5 EXAMPLE: MS-DOS and Windows 3.1X

A typical CONFIG.SYS and AUTOEXEC.BAT is listed below. Copies of these files may be found in the DigImage\Document directory as CONFIG.DOC and AUTOEXEC.DOC. It will be necessary to make minor adjustments to these files for most installations. We recommend, however, that you follow the same basic configuration. Refer to the next subsection if you are installing **Dig/mage** under Windows 95/98.

Typically you will copy these files into your root directory and then make the minor adjustments necessary to match your computer hardware. Once you have done this you would run MEMMAKER to optimise the use of the Upper Memory Blocks (UMBs) and so make more basic DOS memory available. During the MEMMAKER session, select the boot option which uses the most number of extended memory buffers and the minimum hardware configuration you will be using.

Once MEMMAKER has finished, you should have close to 600K of DOS memory available. If there is less than around 540K **Dig/mage** may not be able to run. If there is too little memory, use MSD (Microsoft Diagnostic) to examine the memory map. Try including those blocks marked "possible available" (indicated by a period in the memory map) in the EMM386 list in CONFIG.SYS. You may need to iterate a few times to determine which blocks are really available and which cause conflicts with other hardware. Once you have changed the I=. . . switches for EMM386 then run MEMMAKER again to re-optimize the use of the UMBs.

You will notice that MEMMAKER moves the HIMEM.SYS and EMM386.EXE statements to the top of CONFIG.SYS. Once you are satisfied with the memory arrangement, you will need to move them back to where they were originally and re-activate the HIMEM.SYS statements MEMMAKER has disabled (in the other boot options).

CONFIG.SYS for MS-DOS and Windows 3.1x:

```
rem *****
rem ** Config.Sys for MS-DOS and Windows 3.1x                **
rem ** *****                                              **
rem **                                                         **
rem ** This file contains a sample Config.SYS file for DigImage **
rem ** when running under MS-DOS and/or Windows 3.1x. For operation **
rem ** under Windows 95, please refer to Document\Config95.TXT.  **
rem *****

rem =====
rem = Configuration menu                                     =
rem =   DigImage21      Set up for 21 EM buffers and no CD Rom. May be =
rem =                   used for Windows if 16+MByte RAM installed.   =
rem =   DigImage8      Set up for 8 EM buffers and no CD Rom. May be =
rem =                   used for Windows if 8+MByte RAM installed.    =
rem =   Windows        Set up for DPMS EM buffers under Windows.     =
rem =                   No CD.                                         =
```

```

rem =   WindowsCD           Set up for CD operation. Only DPMS EM buffers. =
rem =====
[Menu]
MenuColor=15,1
MenuDefault=DigImage21
MenuItem=DigImage21 DigImage with 21 EM buffers (no CD)
MenuItem=DigImage8  DigImage with  8 EM buffers (no CD)
MenuItem=Windows    Windows (DPMS buffers, no CD)
MenuItem=WindowsCD  Windows (DPMS buffers, CD)

rem =====
rem = Memory for EM buffers =
rem = Under most circumstances, installations of DigImage will wish =
rem = to make use of some of the computer's own memory for image =
rem = buffers in addition to those available on the frame grabber =
rem = card. There are two fundamental ways in which this memory may =
rem = be made available to DigImage. Under the first, some of the =
rem = computer's RAM is reserved for the sole use of DigImage, while =
rem = under the second, DigImage requests memory when it starts and =
rem = frees it when it exits. Both options have their advantages. At =
rem = present, however, the second option is available only when =
rem = running under Windows (3.x or 95). =
rem = =
rem = Reserving memory at boot time - /INT15= =
rem = Memory may be reserved at boot time for use by DigImage in =
rem = both DOS and Windows. This memory is obtained by the addition =
rem = of the /INT15= switch to the HIMEM.SYS statement in =
rem = CONFIG.SYS. Unless there is another application which also =
rem = makes use of memory reserved in this way (this is fairly =
rem = unlikely), then the contents of the extended memory buffers =
rem = will be preserved from one invocation of DigImage to the next =
rem = until the computer is turned off or rebooted. =
rem = =
rem = The main drawback of this method of allocating memory is that =
rem = this memory is not available for other applications even =
rem = when DigImage is not running. =
rem = =
rem = Allocating memory at runtime =
rem = Under this scenario DigImage requests memory for the =
rem = additional image buffers each time DigImage (or one of its =
rem = components) is started. This memory is provided by the =
rem = operating system, and returned to the operating system when =
rem = you leave DigImage. Thus the memory is available for use by =
rem = other applications when DigImage is not running. =
rem = =
rem = To use this form of memory allocation, do NOT include the =
rem = /INT15= switch and make the appropriate selection in =
rem = CONFIGUR.EXE. Note that at present this form of memory =
rem = allocation is available only when DigImage is running =
rem = under a DPMS server such as Windows (3.x or 95). =
rem = =
rem = A consequence of the memory being reused is that the =
rem = contents of the image buffers will be lost if another =
rem = application uses some or all of the memory. Normally this =
rem = will not be a problem, but it may sometimes be inconvenient. =
rem = =
rem = From version 2.0 DigImage provides the capacity to save all =
rem = the images to hard disk when you leave DigImage and restore =
rem = them when you start again in that directory. While this =
rem = may be a convenient feature, it requires up to 8MBytes of =
rem = memory either in a single central file common to all =
rem = directories in which DigImage is started, or a local file in =
rem = each directory where you use this feature from. Refer to =
rem = [X Procedure on quitting] under CONFIGUR.EXE for further =
rem = details. =
rem = =

```

```

rem = Number of buffers available =
rem = Under DOS, the number of buffers available is determined by =
rem = the smaller of the number dictated by the available memory =
rem = reserved by /INT15= and the maximum number set in CONFIGUR. =
rem = =
rem = Under Windows 3.x or Window 95, the number of buffers is =
rem = always taken from the setting in CONFIGUR. If you are using =
rem = memory allocated with /INT15= you MUST ensure the number of =
rem = buffers specified does not exceed the amount of memory you =
rem = have reserved. (If you are using memory allocated dynamically =
rem = at run time, then you should restrict the CONFIGUR setting to =
rem = be a reasonable value.) =
rem = =
rem =====

```

```

[DigImage21]
rem DigImage with 21 EM buffers
set BootOption=DigImage21
DEVICE=C:\DOS\HIMEM.SYS /int15=5440

```

```

[DigImage8]
rem DigImage with 8 EM buffers
set BootOption=DigImage8
DEVICE=C:\DOS\HIMEM.SYS /int15=2112

```

```

[Windows]
rem DPBI buffers available under Windows 3.x
set BootOption=Windows
DEVICE=C:\DOS\HIMEM.SYS

```

```

[WindowsCD]
rem DPBI buffers available under Windows 3.x
rem CD Rom installed
set BootOption=WindowsCD
DEVICE=C:\DOS\HIMEM.SYS

```

```

[Common]
rem =====
rem = EMM386.EXE =
rem = Install memory management to free up memory in the first 640K. =
rem = At times DigImage can be very greedy on memory, so you should =
rem = ensure as much upper memory (UMB) is available as possible. =
rem = One way of determining which blocks of memory between 640K and =
rem = 1MByte may be available is to run MSD (Microsoft Diagnostic) =
rem = and try including everything that it says is available or =
rem = is possibly available. If you specify something with the I= =
rem = switch when it is not available, then your machine will =
rem = probably not boot up correctly. In this case, bypass =
rem = CONFIG.SYS and remove the offending switch. =
rem = =
rem = If you have an ethernet card then it is likely that MSD will =
rem = report the ethernet card's RAM window as available when in =
rem = fact it requires the X= exclusion switch for EMM386. =
rem = =
rem = In some cases you might be able to rely on MEMMAKER and EMM386 =
rem = to determine which blocks of memory are available. However, =
rem = our experience suggests that there is often much more memory =
rem = available than reported by either of these. =
rem = =
rem = If things remain tight, then it may be possible to shift some =
rem = of the hardware addresses around (e.g. an ethernet card RAM =
rem = window) in order to make a smaller number of larger memory =
rem = blocks available. MEMMAKER should then be able to fill these =
rem = more efficiently. =
rem = =
rem = After all the switches are set up for EMM386 and Config.SYS =

```

```

rem = and AutoExec.BAT have been taylorred to suit your environment, =
rem = run MEMMAKER in CUSTOM mode. Specify no expanded memory and =
rem = no optimisation for Windows. All other controls should be =
rem = "yes". As MEMMAKER prompts for which programs to put in =
rem = extended memory, think about how the computer will be used. =
rem = Only allow those drivers which will always be required to =
rem = be included in the optimisation. In these examples you would =
rem = not include the CDROM drivers as they are only used in the =
rem = non-DigImage option. =
rem = =
rem = Note that after you have run MEMMAKER it will probably be =
rem = necessary to reorganise this file back to its original form =
rem = (retaining the DEVICEHIGH location switches) as MEMMAKER moves =
rem = the HIMEM.SYS and EMM386.SYS lines to the top of the file, =
rem = ignoring the possibility of there being more than one boot =
rem = configuration of these. =
rem = =
rem = If you are running a WFW (Windows for Workgroups 3.11) network =
rem = from DOS (i.e. you use the Windows\NET START command, then =
rem = DO NOT include this in the optimisation. It will automatically =
rem = load into the UMBS if there is space available. If you specify =
rem = it in the optimisation then you will actually end up with less =
rem = space! =
rem = =
rem = You will see in the example one that I have not tried moving =
rem = BIOSes or the Ethernet RAM window to defragment the UMBS. The =
rem = first of the I= switches (I=B000-B7FF) says to use the VGA =
rem = monochrome memory area. As most displays ar colour these days, =
rem = this is pretty safe for DOS, but may cause a problem with some =
rem = Windows display drivers. All the other I= switches were set =
rem = from the information returned by MSD and represent areas of =
rem = memory available but which EMM386 and MEMMAKER could not find =
rem = by themselves. =
rem = =
rem = There are two X= exlude switches. One (CC00-CFFF) is for the =
rem = Ethernet card (a SMC Elite Ultra), and the other for one of =
rem = the BIOSes (I can't remember if its the ATI video card or the =
rem = Adaptec SCSI controller, not that it matters. =
rem = =====
DEVICE=C:\DOS\EMM386.EXE NOEMS HIGHSCAN I=B000-B7FF I=D400-D7FF I=E800-EBFF
X=CC00-CFFF X=D300-D3FF
rem = =====
rem = Locate and set up DOS =
rem = =====
DOS=HIGH,UMB

BREAK=ON
SHELL=C:\DOS\COMMAND.COM C:\DOS\ /E:768 /p

Buffers=10,0
Files=60
DOS=UMB
LastDrive=Z
FCBS=16,0
Stacks=0,0

rem *****
rem ** Set up devices **
rem *****

rem =====
rem = SCSI controller =
rem = Typically IDE drives do not require a driver. Some SCSI drive =
rem = controllers require a driver to control the C: drive (e.g. =

```

```
rem = BusLogic, UltraStor) while others only need them for things =
rem = like Magneto-Optical drives and CD Roms (e.g. Adaptec). =
rem = =
rem = The computer on which this example was produced (a Gateway =
rem = P5-90) has an Adaptec PCI SCSI controller for the hard disk =
rem = and an IDE controller for the CDRom. The SCSI controller also =
rem = controls a Magneto-Optical drive, thus requiring an additional =
rem = driver to provide the standard interface layer (ASPI). For =
rem = some controllers this driver must be loaded before EMM386 but =
rem = for most loading after allows the driver to be loaded in =
rem = extended memory. =
rem =====
DEVICEHIGH=C:\SYS\ADAPTEC\ASPI8DOS.SYS /D
```

```
rem =====
rem = RamDisk =
rem = For DigImage version 1.x the use of a RAM Disk was recommended =
rem = as this improved the performance of the particle tracking. =
rem = However, due to improvements in the more recent versions of =
rem = SmartDrv, the introduction of Dynamic Overlays to DigImage =
rem = (which allow DigImage to run faster if more memory is =
rem = available in the first 640K), and the general need to recover =
rem = more of the first 640K to allow operation under Windows, we =
rem = recommend a RAM Disk is no longer used. If a RamDisk is still =
rem = available, DigImage will use it provided the environment =
rem = variable %RamDisk% points to it. =
rem = =
rem = The order in which this and the Magneto-Optical drives are =
rem = specified in Config.SYS determines the letter assigned to the =
rem = drive. =
rem =====
rem DEVICEHIGH=C:\DOS\RamDrive.sys 1216 128 8 /E
```

```
rem =====
rem = Disk drive =
rem = Here we load any other drivers required for controlling disk =
rem = drives etc. In this case there is a M-O drive on the SCSI =
rem = controller (giving the Adaptec driver) and a CDRom on the =
rem = IDE controller (an NEC device). The CDRom driver is loaded =
rem = only if the machine is booted for WindowsCD. =
rem =====
DEVICEHIGH=C:\SYS\ADAPTEC\ASPIDISK.SYS /D
```

```
[WindowsCD]
DEVICE=C:\SYS\CDROM\MTMCDAI.SYS /D:MTMIDE01
```

[Common]

```
rem =====
rem = Display card =
rem = DigImage utilises standard ANSI control sequences for =
rem = controlling screen format and colour at a Fortran level. =
rem = If there was a replacement driver supplied with your VGA card =
rem = then use this in preference to the standard DOS one as it is =
rem = bound to be better and require less RAM. Here we are using an =
rem = Orchid driver (although the display card is ATI). =
rem =====
rem DeviceHigh=C:\DOS\Ansi.SYS
DEVICEHIGH=C:\SYS\VGA\EANSI.SYS
```

```
rem =====
rem = Country specific information (UK) =
rem =====
COUNTRY=44,,C:\DOS\COUNTRY.SYS
```

```

rem =====
rem = Other drivers
rem =   IFSHLP.SYS           32 bit disk access for Windows 3.x. Needed if
rem =                       you are running a WFW network from DOS, so may
rem =                       as well include it in all boot options.
rem =
rem =   POWER.EXE           Power management. May cause problems on some
rem =                       machines. Not essential, so include only if
rem =                       you have memory to spare!
rem =
rem =                       This is NOT needed for Windows 95.
rem =
rem =====
DEVICEHIGH=C:\SYS\WINDOWS\IFSHLP.SYS
rem DEVICEHIGH=C:\DOS\POWER.EXE

```

AUTOEXEC.BAT for MS-DOS and Windows 3.1x:

```

@ECHO Off
rem *****
rem ** AutoExec.Sys for MS-DOS and Windows 3.1x
rem ** *****
rem **
rem ** This file contains a sample AutoExec.BAT file for DigImage
rem ** when running under MS-DOS and/or Windows 3.1x. For operation
rem ** under Windows 95, please refer to Document\AutoEx95.TXT.
rem ** *****

rem *****
rem ** Basic MS-DOS set up
rem *****
VERIFY OFF
PROMPT $P$G
VER

rem *****
rem ** Environment Variables
rem *****

rem =====
rem = MS-DOS settings
rem =====
set DIRCMD=/o

rem =====
rem = DigImage pointers
rem = -----
rem = DigImage
rem = This should point to the directory in which DigImage is
rem = installed.
rem = Video
rem = This should indicate the type of video recorder being
rem = controlled by DigImage. The supported options are:
rem = AG7330 Older Panasonic SVHS
rem = AG7350 Newer Panasonic SVHS
rem = BRS822 Expensive JVC SVHS
rem = RamDisk
rem = For DigImage version 1.x the use of a RAM Disk was recommended
rem = as this improved the performance of the particle tracking.
rem = However, due to improvements in the more recent versions of
rem = SmartDrv, the introduction of Dynamic Overlays to DigImage
rem = (which allow DigImage to run faster if more memory is
rem = available in the first 640K), and the general need to recover
rem = more of the first 640K to allow operation under Windows, we
rem = recommend a RAM Disk is no longer used. If a RamDisk is still

```

```

rem =   available, DigImage will use it provided the environment   =
rem =   variable %RamDisk% points to it.                           =
rem = =====

set DigImage=C:\Img\DigImage
set Video=AG7350
rem set RamDisk=D:

rem =====
rem = Disk Driver pointers                                         =
rem = -----
rem =   On our systems these variables are used by standard batch   =
rem =   files on a number of different machines with different     =
rem =   configurations and drive assignments. They provide a standard =
rem =   way of accessing a particular device, or detecting if such a =
rem =   device is present.                                          =
rem = OptDisk                                                       =
rem =   Points to the Magneto-Optical disk drive.                   =
rem = CDRom                                                         =
rem =   Points to the CDRom drive. Note that this will only be present =
rem =   under the WindowsCD boot option in Config.SYS, so it should =
rem =   only be assigned a value under that option.                 =
rem = NetDisk                                                       =
rem =   Points to a networked disk drive I always connect to (my   =
rem =   Laptop)                                                     =
rem = Server                                                         =
rem =   Points to the network file server (there will be one soon, I =
rem =   hope!).                                                    =
rem = =====
if "%RamDisk%"==" " set OptDisk=D:
if not "%RamDisk%"==" " set OptDisk=E:
if "%BootOption%"=="WindowsCD" set CDRom=F:
set NetDisk=G:
set Server=Z:

rem =====
rem = Directory pointers                                           =
rem = -----
rem =   These environment variables are required by various pieces of =
rem =   software to locate specific files or directories.           =
rem = Lib                                                           =
rem =   Specifies where to search for language libraries.           =
rem = Tmp                                                           =
rem =   Directory for temporary files. Required by Microsoft languages =
rem =   (e.g. Fortran 77) and DigImage. If a RAM Disk exists, then   =
rem =   things may be slightly faster if the TMP directory is on the =
rem =   RAM Disk (the directory will then need to be created each time =
rem =   the computer is rebooted).                                  =
rem = Temp                                                         =
rem =   Directory for temporary files. Required by Windows and various =
rem =   other applications.                                         =
rem = =====
set Lib=C:\Lib

if "%RamDisk%"==" " goto NoRDisk
  set Tmp=%RamDisk%\Tmp
  md %Tmp%
goto Both
:NoRDisk
  set Tmp=C:\Tmp
:Both

set Temp=C:\Tmp

rem =====
rem = Computer and user name are useful for DOS Batch files       =

```

```

rem = "Moana" = Maori for "Sea". My laptop is called "Hauiti" =
rem = "Light breeze" and my desktop at home is "Maui" who was the
rem = god who caught the fish (the North Island) from the canoe (the
rem = South Island) and so created New Zealand.
rem =====
set CompName=Moana
set UserName=Stuart Dalziel

rem *****
rem ** Disk Access **
rem *****

rem =====
rem = Disk cache
rem = It is essential that some form of disk caching is available to
rem = boost the speed of disk transfers. In the absence of a caching
rem = controller, SmartDrv provides more than adequate performance.
rem = For optimum performance it is desirable to cache both reads
rem = and writes. This may be done for both fixed drives and
rem = removable media such as Magneto-Optical drives (not floppy
rem = drives). You must take care, however, to only remove the disk
rem = once you are sure the cache is written out. For DOS 6.x it is
rem = sufficient to wait until DOS has returned to the C:\> prompt.
rem = For version 5.x you should issue SMARTDRV /C to flush the
rem = cache.
rem =
rem = Unfortunately SmartDrv does not allow colons (:) on the drive
rem = specification so it is not possible to use our environment
rem = variables for the M-O drive.
rem =
rem = The size of cache you specify depends on how much extended
rem = memory you have available and whether or not you are using
rem = a RAM drive. Below suggested values are given for the cache
rem = size with the /INT15= settings in Config.SYS:
rem =
rem = Buffers RAM /INT15= SmartDrv RamDisk Windows
rem = 21 8MByte 5440 512 1216 No
rem = 21 8MByte 5440 704 - No
rem = 21 16MByte 5440 1024 1280 Yes
rem = 21 16MByte 5440 2048 - Yes
rem = 8 8MByte 2112 512 1216 Yes
rem = 8 8MByte 2112 1536 - Yes
rem = 8 16MByte 2112 1024 1280 Yes
rem = 8 16MByte 2112 2048 - Yes
rem =
rem = If you are running exclusively under Windows, then you do not
rem = need the /INT15= switch as you can let DPMI supply the memory
rem = for the EM buffers. You should, however, set the cache size in
rem = a similar manner to ensure memory is available for the
rem = buffers.
rem =
rem = With some SCSI controllers it may be necessary to have
rem = SMARTDRV /DOUBLEBUFFER in Config.SYS in addition to the entry
rem = here. Consult your MS-DOS documentation for further details.
rem =====
if "%OptDisk%"==" " LoadHigh C:\DOS\SMARTDRV.EXE C+ 2048 128
if not "%OptDisk%"==" " LoadHigh C:\DOS\SMARTDRV.EXE C+D+ 2048 128

rem =====
rem = CDRom
rem = Only load driver if booting with it. Can detect this either
rem = with %BootOption% set to WindowsCD or by %CDRom% existing. We
rem = shall use the latter method to reduce the number of places
rem = changes would have to be made if the strategy changed.
rem =
rem = As this is not used in all boot options, it would be wasteful
rem = to load it into upper memory.

```

```

rem =
rem = By explicitly specifying the drive letter, we can enforce a
rem = constant letter across a range of different machines.
rem = Unfortunately MSCDEX does not like a colon after the drive
rem = letter so we can not use %CDROM%.
rem =====
if not "%CDRom%"==" " C:\Dos\MSCDEX.EXE /D:MTMIDE01 /M:10 /L:F

rem =====
rem = Memory resident utilities and drivers
rem = -----
rem = DosKey
rem = Provides memory and editing functions at the DOS command
rem = prompt.
rem = KeyB
rem = Ensures the correct keyboard layout (101 key US, 102 key UK,
rem = etc.) is used.
rem = Share
rem = Looks after file sharing. Windows insists on this even if you
rem = don't explicitly use it.
rem =====
LoadHigh C:\DOS\DosKey.COM /insert
LoadHigh C:\DOS\KeyB UK,,C:\DOS\KEYBOARD.SYS /ID:166
LoadHigh C:\Dos\Share.EXE /l:500 /f:5100

rem =====
rem = Mouse
rem = The decision on whether to load a DOS mouse driver is not
rem = straight forward.
rem = For:
rem = Some DOS applications make use of the mouse, if available.
rem = DigImage can use it for moving the cursor, sizing windows and
rem = drawing.
rem = Against:
rem = A DOS mouse driver is not required for Windows, the only
rem = application where a mouse is essential.
rem = Some mouse drivers take up a lot of space.
rem = There can be serial port conflicts if a serial mouse (rather
rem = than a bus mouse) is used.
rem =
rem = Here we shall not load the mouse. If needed, it can always be
rem = loaded from the DOS prompt.
rem =====
rem Set Mouse=C:\Devices\MSMouse
rem LoadHigh C:\Devices\MSMouse\Mouse

rem =====
rem = Paths and path variables
rem = This will differ, depending on your precise machine setup. In
rem = my case many things are pointed to by batch files in C:\BATCH
rem = rather than included explicitly on the path. The DIGIMAGE\BIN
rem = directory need not be on the path if you are only using code
rem = linked with the dynamic overlay linker. If you are using the
rem = older static overlay technology, then DIGIMAGE\BIN must be
rem = on the path. (If DIGIMAGE\BIN is not on the path, then there
rem = must be batch files somewhere on the path pointing to the
rem = appropriate executables.)
rem =
rem = If a RAM disk is being used, then it should be located on the
rem = path before DIGIMAGE\BIN, and a Bin directory created in it.
rem =====
PATH C:\BATCH;C:\SYS\WINDOWS;C:\DOS;C:\BIN;%DigImage%\BIN

if not "%RamDisk%"==" " Path %RamDisk%\Bin;%Path%
if not "%RamDisk%"==" " md %RamDisk%\Bin

```

```

rem =====
rem = Network
rem = The final standard bit of setting up is starting the network.
rem = Here we are using Windows for Workgroups running TCPIP as
rem = the default protocol with NETBUEi in reserve. Note that by
rem = starting the network from DOS you must stop the network (using
rem = NET STOP) before starting Windows. This is most conveniently
rem = done by having a batch file to start Windows (hence the reason
rem = C:\BATCH was before C:\SYS\WINDOWS in the PATH specification.
rem =
rem = If you are lucky there is still some UMB left and so the
rem = network protocol manager, ethernet card driver and DOS
rem = redirector will all load high. They will do so automatically
rem = if there is space, so there is no need to LoadHigh the Net
rem = command. In fact, if you use LoadHigh then you will end up
rem = with less memory to play with! We only start the basic
rem = redirector (which is more than adequate) as it takes much less
rem = space than the full redirector.
rem =====
C:\Sys\Windows\Net Start Basic

rem !!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
rem !!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
rem !!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!

rem *****
rem ** Other Settings
rem ** These are specific to my machines and will not be required
rem ** elsewhere, although you may have other stuff you want to put
rem ** here instead. If possible, try to avoid things that steal
rem ** memory permanently!
rem *****

rem =====
rem = MultiEdit
rem = Set default mode
rem =====
set ME_Line=/X132 /Y44
set ME_Mode=51

rem =====
rem = Environment variables for LiPS system
rem =====
rem set f77=c:\bin\fl
rem set link=c:\bin\link
rem set f77lib=c:\bin\lib
rem set make=c:\bin\nmake

rem =====
rem = Printer driver
rem =====
rem C:\Sys\Printer\MltShare\MShare.EXE 11

rem =====
rem = GhostScript
rem =====
Set GS_Lib=C:\Sys\Printer\GhostScr\GS3.51;C:\Sys\Printer\GhostScr\Fonts

rem =====
rem = Virus protection
rem =====
echo.
echo Virus check...
Choice /C:YN /T:Y,10 Scan for changed files
if ErrorLevel 2 Goto DontScan
C:\Sys\Virus\TK6_67\ViVerify C: /asm /n=5 < c:\sys\virus\tk6_67\me.txt

```

:DontScan

3.6 EXAMPLE: Windows 95/98

A typical CONFIG.SYS and AUTOEXEC.BAT for use with Windows 95 or Windows 98 is listed below. Copies of these files may be found in the DigImage\Document directory as CONFIG95.DOC and AUTOEX95.DOC. It will be necessary to make minor adjustments to these files for some installations. We recommend, however, that you follow the same basic configuration. Refer to the previous subsection if you are installing Dig/mage under MS-DOS and/or Windows 3.1x.

CONFIG.SYS for Windows 95:

```
rem *****
rem ** Config.SYS for Windows 95/98 **
rem ** ***** **
rem ** ** **
rem ** This file contains a sample Config.SYS file for DigImage **
rem ** when running under Windows 95/98. For operation under MS-DOS **
rem ** and/or Windows 3.1x, please refer to Document\Config.TXT. **
rem *****

rem =====
rem = Configuration menu =
rem = DigImage21 Set up for 21 EM buffers. You should have at =
rem = least 16MBytes of RAM installed. =
rem = DigImage8 Set up for 8 EM buffers. You should have at =
rem = least 8MBytes of RAM installed. =
rem = Windows Set up with no /INT15 buffers. Can use the =
rem = onboard buffers and DPMI buffers (if DigImage =
rem = appropriately configured. =
rem = WARNING: DPMI buffers do not function correctly under =
rem = Windows 95/98 =
rem =====
[Menu]
MenuColor=15,1
MenuDefault=DigImage21
MenuItem=DigImage21 DigImage with 21 EM buffers
MenuItem=DigImage8 DigImage with 8 EM buffers
MenuItem=Windows Windows only

rem =====
rem = Reserve space for EM buffers =
rem =====
[DigImage21]
rem DigImage with 21 EM buffers
DEVICE=C:\Windows\HiMEM.SYS /int15=5440
set BootOption=DigImage21

[DigImage8]
rem DigImage with 8 EM buffers
DEVICE=C:\Windows\HiMEM.SYS /int15=2112
set BootOption=DigImage8

[Windows]
rem No EM Buffers
DEVICE=C:\Windows\HiMEM.SYS
set BootOption=Windows

[Common]

rem =====
rem = EMM386.EXE =
```

```

rem = Install memory management to free up memory in the first 640K. =
rem = At times DigImage can be very greedy on memory, so you should =
rem = ensure as much upper memory (UMB) is available as possible. =
rem = =
rem = Windows 95/98 appears to be reasonably good about determining =
rem = which bit of upper memory can be used. Normally you can leave =
rem = the allocation to it. However, if you have insufficient memory =
rem = available to run DigImage, you may wish to refer to the notes =
rem = about EMM386 and MEMMAKER in the DOS version of CONFIG.SYS =
rem = (found as DigImage\Document\Config.TXT). =
rem = =
rem = For most machines MEM should report around 600K of free memory =
rem = at the DOS prompt. =
rem =====
DEVICE=C:\Windows\EMM386.EXE NOEMS

rem =====
rem = Locate and set up DOS =
rem =====
DOS=HIGH

BREAK=ON
SHELL=C:\Windows\COMMAND.COM /E:768 /p

Buffers=10,0
Files=60
DOS=UMB
LastDrive=Z
FCBS=16,0
Stacks=0,0

rem *****
rem ** Set up devices **
rem *****

rem =====
rem = SCSI controller =
rem = Under Windows 95/98 it is likely that you will not need to =
rem = install a specific driver 16 bit for your SCSI controller. =
rem = If available, you should use the Windows 95/98 drivers in =
rem = preference as they will be (a) faster and (b) not consume =
rem = valuable MS-DOS memory in the first 640K. =
rem = =
rem = However, if you do, the following gives an indication of its =
rem = installation for a Magneto-Optical drive (Windows 95/98 =
rem = provides proper 32bit replacements for the Adaptec drivers =
rem = indicated). =
rem =====
rem DEVICEHIGH=C:\SYS\ADAPTEC\ASPI8DOS.SYS /D
rem DEVICEHIGH=C:\SYS\ADAPTEC\ASPIDISK.SYS /D

[Common]

rem =====
rem = Display card =
rem = DigImage utilises standard ANSI control sequences for =
rem = controlling screen format and colour at a Fortran level. =
rem =====
DEVICEHIGH=C:\Windows\Command\ANSI.SYS

rem =====
rem = Country specific information (UK) =
rem =====
Country=044,850,C:\WINDOWS\COMMAND\country.sys

```

AUTOEXEC.BAT for Windows 95:

```
@ECHO Off
rem *****
rem ** AutoExec.BAT for Windows 95/98 **
rem ** ***** **
rem ** **
rem ** This file contains a sample AUTOEXEC.BAT file for DigImage **
rem ** when running under Windows 95/98. For operation under MS-DOS **
rem ** and/or Windows 3.1x, please refer to Document\AutoExec.TXT. **
rem *****

rem =====
rem = Basic MS-DOS set up =
rem =====
VERIFY OFF
PROMPT $P$G
VER

rem *****
rem ** Environment Variables **
rem *****

rem =====
rem = MS-DOS settings =
rem =====
set DIRCMD=/o

rem =====
rem = DigImage pointers =
rem = ----- =
rem = DigImage =
rem = This should point to the directory in which DigImage is =
rem = installed. =
rem = Video =
rem = This should indicate the type of video recorder being =
rem = controlled by DigImage. The supported options are: =
rem = AG7330 Older Panasonic SVHS =
rem = AG7350 Newer Panasonic SVHS =
rem = BRS822 Expensive JVC SVHS =
rem =====

set DigImage=C:\Img\DigImage
set Video=AG7350

rem =====
rem = Disk Driver pointers =
rem = ----- =
rem = On our systems these variables are used by standard batch =
rem = files on a number of different machines with different =
rem = configurations and drive assignments. They provide a standard =
rem = way of accessing a particular device, or detecting if such a =
rem = device is present. =
rem = OptDisk =
rem = Points to the Magneto-Optical disk drive. =
rem = CDRom =
rem = Points to the CDRom drive. =
rem = NetDisk =
rem = Points to a networked disk drive I always connect to (my =
rem = Laptop) =
rem = Server =
rem = Points to the network file server (there will be one soon, I =
rem = hope!). =
rem =====
set OptDisk=D:
set CDRom=F:
```

```

set NetDisk=G:
set Server=Z:

rem =====
rem = Directory pointers =
rem = ----- =
rem =   These environment variables are required by various pieces of =
rem =   software to locate specific files or directories. =
rem = Lib =
rem =   Specifies where to search for language libraries. =
rem = Tmp =
rem =   Directory for temporary files. Required by Microsoft languages =
rem =   (e.g. Fortran 77) and DigImage. =
rem = Temp =
rem =   Directory for temporary files. Required by Windows and various =
rem =   other applications. =
rem =====
set Lib=C:\Lib
set Tmp=C:\Tmp
set Temp=C:\Tmp

rem =====
rem = Computer and user name are useful for DOS Batch files =
rem =   "Moana" = Maori for "Sea". My laptop is called "Hauti" =
rem =   "Light breeze" and my desktop at home is "Maui" who was the =
rem =   god who caught the fish (the North Island) from the canoe (the =
rem =   South Island) and so created New Zealand. =
rem =====
set CompName=Moana
set UserName=Stuart Dalziel

rem =====
rem = Memory resident utilities and drivers =
rem = ----- =
rem = DosKey =
rem =   Provides memory and editing functions at the DOS command =
rem =   prompt. =
rem = KeyB =
rem =   Ensures the correct keyboard layout (101 key US, 102 key UK, =
rem =   etc.) is used. =
rem =====
LoadHigh C:\Windows\Command\DosKey.COM /insert
LoadHigh C:\Windows\Command\Keyb uk,,C:\WINDOWS\COMMAND\keyboard.sys

rem =====
rem = Paths and path variables =
rem =   This will differ, depending on your precise machine setup. In =
rem =   my case many things are pointed to by batch files in C:\BATCH =
rem =   rather than included explicitly on the path. The DIGIMAGE\BIN =
rem =   directory need not be on the path if you are only using code =
rem =   linked with the dynamic overlay linker. If you are using the =
rem =   older static overlay technology, then DIGIMAGE\BIN must be =
rem =   on the path. (If DIGIMAGE\BIN is not on the path, then there =
rem =   must be batch or .PIF files somewhere on the path pointing to =
rem =   the appropriate executables.) =
rem = =
rem =   Note that the original DOS directory is included on this path, =
rem =   even though we are running Windows 95/98. Normally this will =
rem =   not be required. =
rem = =
rem =====
PATH C:\Batch;C:\Bin;%DigImage%\Bin;C:\DOS

rem !!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
rem !!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
rem !!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!

```

```

rem *****
rem ** Other Settings **
rem ** These are specific to my machines and will not be required **
rem ** elsewhere, although you may have other stuff you want to put **
rem ** here instead. If possible, try to avoid things that steal **
rem ** memory permanently! **
rem *****

rem =====
rem = MultiEdit =
rem = Set default mode =
rem =====
set ME_Line=/X132 /Y44
set ME_Mode=51

rem =====
rem = GhostScript =
rem =====
Set GS_Lib=C:\Sys\Printer\GhostScr\GS3.51;C:\Sys\Printer\GhostScr\Fonts

```

3.7 INSTALLATIONS WITH MORE THAN 12MBYTES OF RAM

The frame grabber card is mapped into the computer's memory space through a 512KByte window which must be located somewhere in the first 16MBytes of address space. With older computers this limited the amount of RAM to 8 or 12 MBytes as the frame grabber card will not function if RAM occupies the same address space as the frame grabber. However, with the newer "Plug and Play" machines, the BIOS often allows a "hole" to be created somewhere in the first 16MBytes of the address space, thus allowing the frame grabber to be used even if 16MBytes or more of memory are actually installed. The amount of useful memory may be less than that actually installed due to the existence of this hole. The method of setting up this hole depends on the machine's BIOS. In most cases the hole can be created from the BIOS setup utility. This is often accessible by pressing a particular key combination during bootup.

If you have 16MBytes or more RAM installed and you wish to run Windows (3.1x or 95/98), you may do so using a single configuration and avoid rebooting the PC when switching between Windows and *Dig/mage*. Simply choose the *Dig/mage* configuration from the example above which offers the required number of buffers. This will reserve some memory for exclusive use by *Dig/mage*, but still allow around 11MBytes for Windows in a 16MByte machine, or 27MBytes in a 32MByte machine.

At present *Dig/mage* supports a maximum of 32 buffers (16 in extended memory for the DT2861 or 32 for the DT2862). There is thus no point in reserving more than this for use exclusively by *Dig/mage*. Some of the additional memory left in the XMS pool will also be used as a cache for Dynamic Overlays, significantly increasing the speed of *Dig/mage* when compared with having to load the overlays from hard disk. Thus there are a number of advantages to having more than the minimum amount of memory required for *Dig/mage*.

Unfortunately not all BIOSes appear to handle the creation of the hole correctly. The end result of this incorrect handling appears to be that the memory above the 16MByte mark is not accessible. The following discussion assumes you have 32MBytes or more memory installed. With Windows 95/98 you can determine how much memory Windows thinks it has by looking at the System Properties properties sheet. This is accessed by right-clicking on "My Computer" then selecting "Properties". If everything is working correctly, Windows 95/98 will report more than 16MBytes of memory. The precise amount is difficult to estimate as it

depends on the other cards installed and the system BIOS. In any event, it will probably be slightly less than the amount of installed memory less the amount reserved by the /INT15 switch and less the 1MByte hole.

If Windows 95/98 reports less than 16MBytes and you believe there should be more, either your BIOS is not handling the creation of the hole correctly, or Windows 95/98 is failing to compute the memory correctly. One way of checking to see if Windows 95/98 can access the memory above the hole is to reserve all the memory below the hole using the /INT15 switch. On our machines (Gateway 2000 Pentiums with AMI BIOSes), which handle the hole correctly, the following is observed after setting /INT15 and rebooting:

Hole size	Switch setting	Behaviour	Comments
1MByte	/INT15=13312	Windows starts but hangs after "logon" prompt	Reserve 13MBytes. This leaves only the 640KByte base memory plus 1MByte extended memory. The machine appears to hang when trying to connect to our network. This is probably due to the network card requiring memory in the first 16MBytes (it is an ISA bus card) in order to function correctly, and 1MByte is not enough. It is possible that the display adapter may also require memory in the first 16MBytes.
1MByte	/INT15=12288	Windows starts correctly	Reserve 12MBytes. Windows functions normally. It reports the expected amount of memory relative to no /INT15 switch but with a hole in memory.
1MByte	No /INT15 switch	Windows starts correctly	Windows reports 29MBytes of memory.
No hole	No /INT15 switch	Windows starts correctly	Windows reports 32MBytes of memory.

On machines which do not handle the hole correctly, Windows reports that there is insufficient memory and does not boot correctly.

3.8 RUNNING UNDER WINDOWS

From version 2.0, *Dig/mage* has been able to run at a DOS prompt under Windows 3.1, 3.11 and 95/98 (but not NT 3.5, 3.51, 4.0, 2000 or ME). To achieve this, *Dig/mage* requires in the vicinity of 570KBytes of RAM to run in at the DOS prompt. If there is insufficient memory available, one of a variety of error messages may be generated, either on trying to start *Dig/mage* or at a later stage when *Dig/mage* is attempting to open a file. If there is insufficient memory, return to the optimisation phase in section 3.5 and attempt to free additional memory. There is generally no difficulty freeing up sufficient memory when running under Windows 95/98, but it can be problematic under Windows 3.1 especially when running a network adapter.

The four main components of *Dig/mage* – DIGIMAGE, TRK2DVEL, DIGIPLLOT and DIGIFILE – are each supplied with Program Information Files (PIF) to inform Windows of their requirements. They are also supplied with a variety of icons which may be used to set them up as items in a Program Manager group (Windows 3.1x), or the Start Menu/Desktop (Windows 95/98). Installation of these is a purely manual process and should be undertaken in the normal manner. The icons and PIF files will be found in DIGIMAGE\BIN.

Most users, however, find it more convenient to start *Dig/mage* from a DOS prompt rather

than double clicking on an icon. This may be done with the DOS prompt running either in a window or full screen.

Some users may wish to set up associations within File Manager/Explorer so as to start certain components of *Dig/mage* if a double-click is performed on a file name. Suggested associations are:

File Extension	Application	Comments
.CMD	DIGIMAGE	Will start <i>Dig/mage</i> with the specified command file running. Note that the command file may be intended for Trk2DVel rather than <i>Dig/mage</i> !
.DIG	DIGIMAGE	Starts <i>Dig/mage</i> and leaves it in the main menu
.JNL	DIGIMAGE	Starts <i>Dig/mage</i> and attempts to run it as a command file.
.PLT	DIGIPLLOT	Starts DigiPlot and displays the corresponding plot.
.IND	TRK2DVEL	Starts Trk2DVel and leaves it in the main menu
.PAR	TRK2DVEL	Starts Trk2DVel and leaves it in the main menu
.PRT	TRK2DVEL	Starts Trk2DVel and leaves it in the main menu
.GRD	TRK2DVEL	Starts Trk2DVel and leaves it in the main menu
.PIC	DIGIFILE	Starts DigiFile, converts the image file to PostScript and downloads it to the printer specified in CONFIGUR.
.DPS	DIGIFILE	Starts DigiFile, converts the .DPS file (a special form of PostScript lacking the normal header information) into a normal printable (.PS) PostScript file and downloads it to the printer specified in CONFIGUR.

WARNING: Only one *Dig/mage* component may access the frame grabber at any given instant. If you attempt to start *Dig/mage* while there is already a component running, *Dig/mage* will only allow it to start without frame grabber support.

4 Installing Software

After the PC/AT has been rebooted you are ready to install the **Dig/mage** software. Place distribution disk **one** in A: (or B:) drive and change to that drive. Type `INSTALL` to start the installation procedure. Insert the appropriately labelled disk when prompted by the installation program. After all the files have been copied and (under Windows 95/98) the various shortcuts have been created, the **Dig/mage** configuration utility will be run automatically. This utility is the subject of the next section.

5 Configuration Utility

The *Dig/mage* configuration utility will be found in the directory %DIGIMAGE%\LUTS (where %DIGIMAGE% is the directory specified by the DIGIMAGE environment variable). This will be run automatically by the installation program. If you need to reconfigure *Dig/mage* for any reason, rerun the utility by entering this directory and typing CONFIGUR.

The configuration utility produces a menu with the following entries:

```
                                DigImage Configuration
A Addresses for frame grabber
B Number of buffers
C Colours
F Fields per second
G Beeps
M VDU screen mode
N Screen saver
P Printer configuration
S Size of buffer
T Serial port configuration
V Video recorder parameters
Q Quit configuration utility
f Help
```

All the documentation required to configure the system using this utility is available through the Help System which is an integral part of the *Dig/mage* programs. By pressing <f1> at any stage, a help screen will be displayed about the current activity. Within the menu, the Help will give general details on all the menu options. After a given option has been started, pressing <f1> will bring up more detailed help about that option including details on all the prompts. A more general form of Help is available through <shift><f1> which gives general details about the operation of *Dig/mage* as a whole (not all of the details are relevant to the configuration utility), including history lists, editing functions *etc.*

Once the configuration has been completed (for the first installation all menu items should be accessed), press Q to return to the MS-DOS prompt. *Dig/mage* is now ready to run, although it will not be able to control the video recorder until the RS232 interface has been modified and installed and the computer attached to the VTR. Starting *Dig/mage* may be achieved simply by moving to some working directory then typing DIGIMAGE to the MS-DOS prompt. You should then utilise the *Dig/mage* Help System to become familiar with the use of *Dig/mage*. The Help System may be accessed by <f1> for the current activity, <shift><f1> for a more general help, or <ctrl><f1> for a summary of the function keys.

If *Dig/mage* fails to run, check that the %DIGIMAGE%\BIN directory is specified in the PATH command in your C:\AUTOEXEC.BAT (refer to section 3 for more details). If *Dig/mage* starts, but then hangs up, check the settings you made using the configuration utility. If there are any other problems, check that all the *Dig/mage* software has been properly installed on your hard disk.

For further details on the operation of *Dig/mage*, please consult the User Guide and Overview.

6 Setting up the Video Tape Recorder

In order for *Dig/mage* to control the Panasonic AG-7330 or AG-7350 Super VHS video tape recorder with the required degree of accuracy, it is necessary to modify and fit the optional AG-IA232 (AG-7330) or AG-IA232TC (AG-7350) RS-232C interface between the VTR and the host computer. This section deals with the modification required to the interface, the DIP switch settings, the wiring of the cable, connecting the computer and VTR, some basic warnings about the usage of the VTR and interface, and finally some notes about the connection of video sources.

6.1 MODIFICATIONS TO INTERFACE

Using the standard AG-IA232 or AG-IA232TC interface, the computer is able to control the VTRs state through a simple command protocol, and inquire from the VTR what it is doing, how it is set up, and where it is. Unfortunately the VTR is only able to tell the computer where it is in units of one second; this does not offer sufficient resolution for *Dig/mage* to operate successfully. Moreover, the VTR is subject to the occasional error when reversing direction, so that even if the computer were to have full access to the VTR's own internal clock or strobe, there would still be some positional error.

Dig/mage has adopted a combination of two techniques to ensure sufficiently accurate positioning of the video tape. The first is a modification to the interface to make the VTR's own internal strobe available (the modification is covered in this section), and the second is a

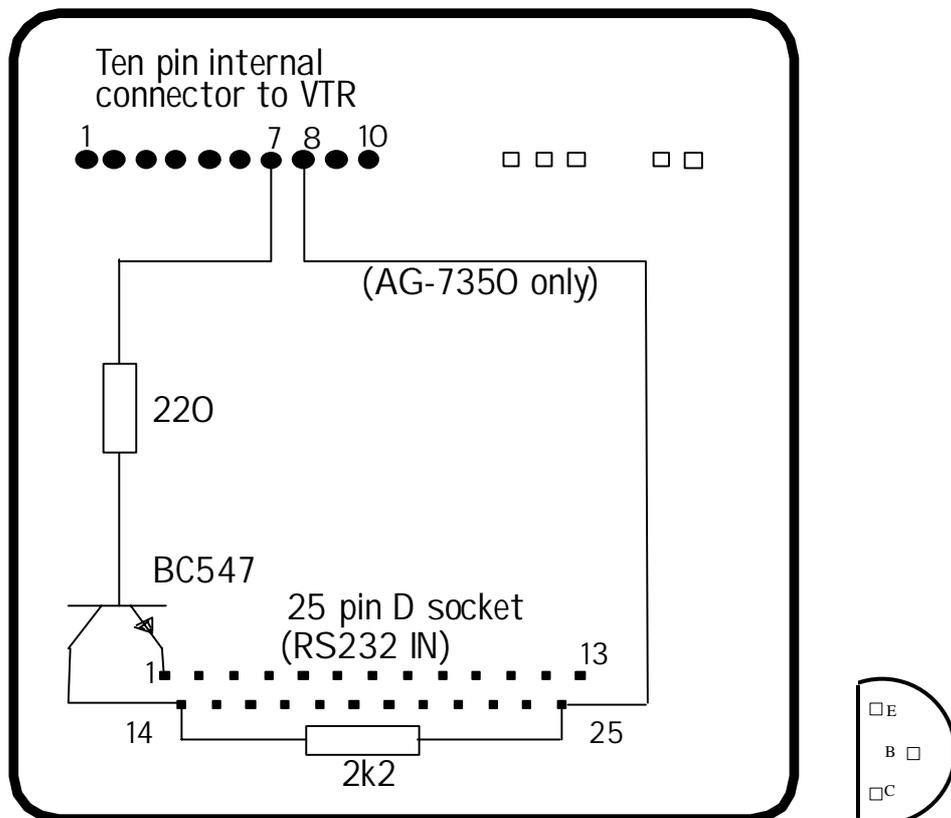


FIGURE 2: Modification to AG-IA232 and AG-IA232TC serial interfaces for AG-7330 or AG-7350 VTRs. Viewed from circuit board side. Ensure additional components insulated from circuit board.

consistency check produced by recording tone pulses on one of the two audio tracks (see section 6.2 and the Dig/mage Help System).

Figure 2 is a schematic of the modification required to either the AG-IA232 or the AG-IA232TC interface. Any general purpose *npn* transistor could be used in place of the specified BC547, provided it has sufficient current capacity and power dissipation. The purpose of the transistor is to convert the TTL level voltages (a 5V square wave at 25Hz while in PLAY mode) supplied through pin 7 of the internal connector to the interface to the RS-232 level voltages required to communicate with the computer's serial ports. Care must be taken with this modification to ensure that none of the other electronics in the interface are affected. The output from the transistor (a 12V square wave) will be connected to the CTS hand-shake line of COM2: (or COM4:, if a mouse is connected) and used to generate an interrupt which will in turn allow the computer to keep track of each passing video field. Pin 14 is not normally used on the RS-232 connector and so is a convenient point to make the signal available.

For the AG-IA232TC used with the AG-7350, the 12V supply at pin 8 of the internal connector must be made available at pin 25 of the serial D socket (this is not necessary for the AG-IA232 with the AG-7330 as 12V is already available on this pin). In order to make these modifications for the AG-IA232TC, it will be necessary to temporarily remove the piggy-backed circuit board from the interface. This board unplugs after squeezing the plastic mounting pins to release it. After the modification has been made to the inner board, the interface must be reassembled prior to installing in the AG-7350.

In addition to this modification, the DIP switches on the interface should be set up in the following manner:

AG7330				
SW1: *	SW2: 1	SW3: 1	SW4: 1	
SW5: 0	SW6: 1	SW7: 1	SW8: *	

AG7350			
Switch One			
SW1.1: 1	SW1.2: 0	SW1.3: 1	
SW1.4: 1	SW1.5: 1	SW1.6: 1	
Switch Two			
SW2.1: 0	SW2.2: 0	SW2.3: 0	
SW2.4: 0	SW2.5: 0	SW2.6: 1	

where 1 is on, 0 is off and * means "do not care" (these switches are not used by the interface). Note that this set up is for the preferred 4800 baud with the AG-7330 or 19200 baud with the AG-7350 (the baud rate is controlled by the DIP switches; consult the VTR's manual for more details).

6.2 INTERFACE CABLE

Due to the requirements of the computer over to control the VTR, **Dig/mage** requires a non-standard cable to connect them together. Figure 3 gives a schematic for the wiring of this cable. Note that some electronics must be included in the plug shell at the VTR end (**Plug A**). Shielded cable should be used for the video strobe and two audio pulse lines to prevent interference from the computer and between each other. At the computer end, **Plug B** and **Plug C** are connected to two of the computer's serial ports. These ports may be either COM1: and COM2: or COM3: and COM4:. The serial ports may have either 25 pin or 9 pin connectors. Pin numbers are given first for 25 pin connectors with the 9 pin equivalents indicated in brackets. The socket on the back of the VTR interface, to which **Plug A** is connected is always 25 pin.

Plug E and **Plug F** are used to record and read the audio pluses **Dig/mage** records on the audio channel to ensure correct synchronisation between computer and VTR.

Plug D, marked *optional*, may be used to connect a serial device (such as a printer or another computer) into COM2: or COM4: at the same time as the computer is connected to the VTR. Both XON/XOFF and RTS/CTS handshaking are supported. When fitted, the serial device should be connected to **Plug D** instead of directly to the computer. If you do not wish to connect an additional serial device to the computer, or use the computer as a terminal over a serial line, there is no need to fit **Plug D**. As before, pin numbers are given for both 25 pin and 9 pin variants.

If you have a serial mouse connected to COM1: or COM2: then it will be necessary either to disconnect the mouse prior to using **Dig/mage**, or to install a second serial card and utilise COM3: and COM4: for controlling the video recorder. **Dig/mage** For details on how to configure

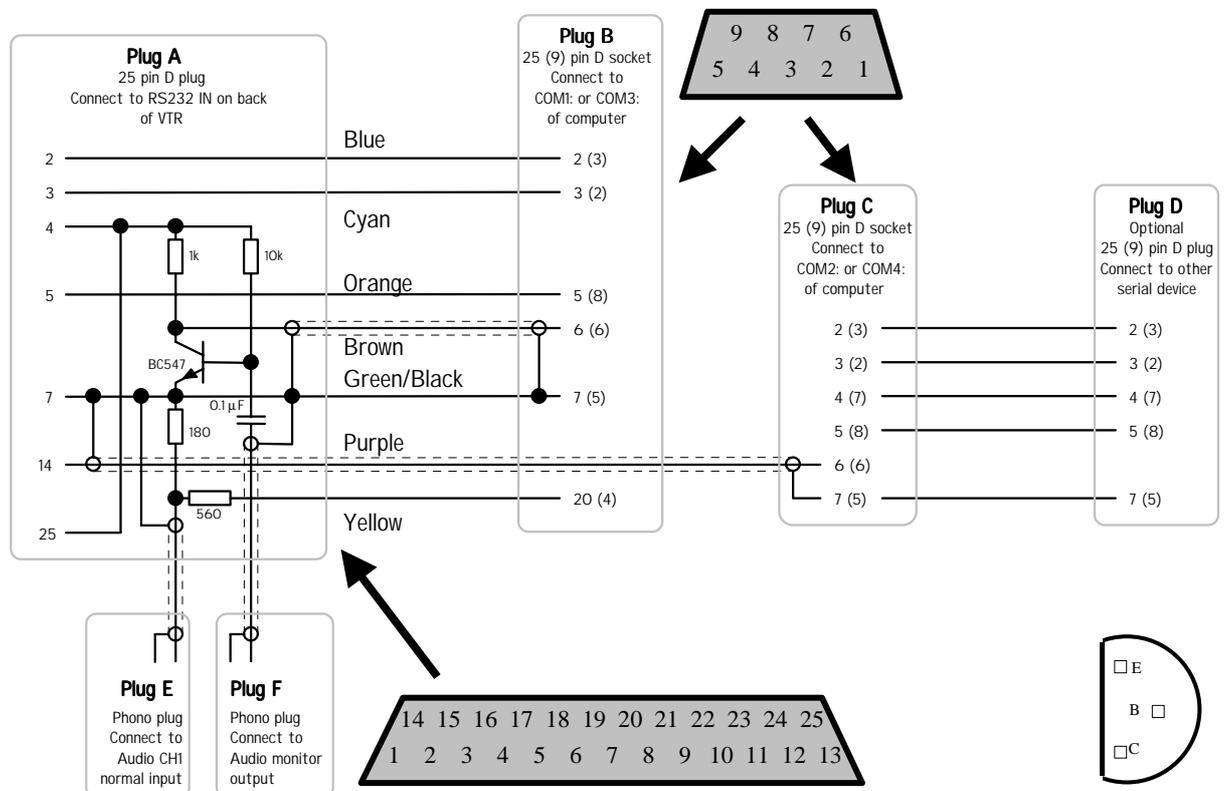


FIGURE 3: Interface cable for Panasonic AG-IA232 and AG-IA232TC. Pin numbers in brackets are for 9 pin serial ports. Numbers not in brackets are for 25 pin serial ports.

Dig/mage to utilise the different combination of serial ports, please consult the help on the [;T Configure serial ports] option in the configuration utility. Note that if you have three or more serial ports, then **Dig/mage** is able to make use of a mouse connected to COM1: or COM2: for positioning the cursor and specifying windows. See the System Overview for details.

Once the VTR and computer are connected through the above interface and cable, the computer is able to control most of the features of the VTR. With the AG-7350 the computer and the keys on the front of the VTR may be used interchangeably to control the VTR. However you should not normally use both forms of control at the same time. As an option the keys on the VTR may be disabled by setting the MODE LOCK switch to the ON position.

With the AG-7330 simultaneous computer and front panel operation is not possible. The OPERATION switch, located near the right-hand end of the closing control panel on the VTR is used to switch the VTR between LOCAL (*i.e.* from the VTR's own keys) and REMOTE (*i.e.* using the RS-232 adapter) control. When **Dig/mage** is exerting control over the VTR this switch must be set in the REMOTE position. **Failure to do so will prevent Dig/mage from being able to exercise the required control.**

For details on the operation of the VTR from **Dig/mage** refer to [f1 Help] within [;V: Video tape recorder control].

Normally **Dig/mage** will take control of the VTR whenever [;V: Video tape recorder control] is entered, or any other option which implicitly requires control of the VTR (such as [;UH Start particle tracking]). While **Dig/mage** has control of the VTR, the second last character in the top row of the screen will flash with each passing frame and an arrow in this position will indicate the direction **Dig/mage** believes the tape to be moving. If this character does not flash while in PLAY mode, check the wiring of the serial cable to COM2: and the modification to the interface. These may be checked using an oscilloscope.

If **Dig/mage** is unable to complete an operation for one reason or another then it will produce the message "VTR not responding...". Should this occur, check the cabling and, for the AG-7330, the position of the OPERATION switch. Note that manual repositioning of the VTR (switched to LOCAL for the AG-7330) is allowable while the computer has nominal control of the VTR, but such repositioning may cause the record of the position stored by **Dig/mage** to disagree with the true position of the tape, especially if rapid tape movements or sudden changes of direction are used.

6.3 CONNECTING VIDEO SOURCES

The DT-2861 and DT-2862 are grey-scale devices. They operate best when they receive a simple monochrome signal without any colour information. While there are links on the frame grabber board to filter out any colour signal present, installing these links; reduces the spatial resolution of the board. Moreover, particularly at low signal strengths, there can be an interference between the intensity and chrominance signals. Experience has shown that better results may be achieved by filtering out the chrominance signal at the VTR. With the AG-7330 the MODE switch should be set to MONO. For the AG-7350 you must use the video's on-screen menu to change between colour and mono. Results are also improved if the frame grabber is connected to the SVHS output socket of the VTR rather than the BNC output connector. The connection should be made to the Y (luminescence) signal and Y ground pins of the miniature DIN plug, with a 75 ohm terminator across the other pair of pins (chrominance). Looking into the socket with the notch to the top and the locating pin to the

bottom, the signal pins are the top pair with the chrominance to the left and luminance to the right. The lower pair are the ground pins, again with chrominance to the left and luminance to the right.

When recording the video, unless it is desirable to maintain colour information, it is again preferable to have the MODE switch in the MONO position (AG-7330) or on-screen menu set to mono (AG-7350). When using a monochrome source, connect it through the luminescence pins of the SVHS input socket rather than the BNC socket. As before, terminate the chrominance pins with a 75 ohm terminator. Connecting some high resolution monochrome cameras via the BNC connector can confuse the video recorder into thinking a colour signal is connected if the video recorder MODE switch is left in the AUTO position. This is due to the high bandwidth of the monochrome camera overlapping the frequencies used to carry colour information in composite video output from colour video cameras.

6.4 VIDEO RECORDER SETTINGS

This section summarises the necessary settings for the switches (both mechanical and software) on the supported video recorders.

6.4.1 Settings for AG-7330

The front panel switches should normally be set as follows:

Switch	Setting	Notes
CH2 METER	TRACKING	The meter may be used to monitor the video tracking.
AUDIO MONITOR	CH1	Audio channel 1 is connected to the computer through the audio monitor socket on the rear of the VTR.
AUDIO MONITOR	NORM	Dig/mage uses the audio channels as part of the control system. The conventional linear tracks should be used rather than the hi-fi.
AUDIO OUT	NORM	Normally only the conventional linear audio tracks will be recorded.
HIFI REC	OFF	Normal audio sufficient.
INPUT	SVIDEO	The four pin SVHS input socket should be used in preference to the composite video BNC socket (LINE).
TV SYSTEM	PAL	Whichever system is to be used.
SYNC	NORM	The sync signal is normally embedded in the video signal.
VIDEO MODE	B/W	Monochrome is preferred for most applications.
	AUTO	When colour signals must be used.
NOTCH	OFF	The notch filter should not be required.
SVHS	ON	Record as SVHS when SVHS tapes are used.
IMAGE	DETAIL	Use as much of the information in the image as possible.
SENSOR REC	OFF	Prevent the VTR entering record mode due to some external event.
AUDIO DUB	CH1	When dubbing the Dig/mage time code pulses.
OPERATION	LOCAL	For operating VTR manually.
	REMOTE	For computer controlled operation.

EXT TIMER	OFF	This switch should be covered to prevent accidental setting to REC (in the REC position the VTR automatically enters record mode when it is switched on).
CH1: AUDIO LEVEL - NORM	<i>maximum</i>	Dig/mage uses this audio channel to record time-code pulses to aid with the control of the video recorder.
CH1: AUDIO LEVEL - HIFI	<i>minimum</i>	The HIFI channel is not used.
CH2: AUDIO LEVEL - NORM	<i>minimum</i>	CH2 is used for linear time code signals instead of audio - see below.
CH2: AUDIO LEVEL - HIFI	<i>minimum</i>	The HIFI channel is not used.

The set up menu (entered by simultaneously pressing the DOWN and SCREEN DISPLAY buttons) should be set as follows:

Item	Setting	Notes
AUDIO LIMITER	OFF	Need to make audio pulses as loud as possible. Distortion is not a problem.
DOLBY NR	OFF	No need for noise reduction.
AUDIO CH2	AUDIO	The VTR does not have a time code generator.
TAPE SELECT	NORMAL	Unless 240 minute tapes are being used (not advisable).
TAPE IN MODE	STOP	The tape does not start to play when inserted.
TAPE END MODE	REW	When the tape gets to the end, rewind to the beginning.
AUTO BACKSPCE	ON	This prevents gaps between sequences of recordings.
FRAMING	ON	It is not clear what effect this has.
DIRECT SEARCH	OFF	The tape does not go into shuttle mode automatically on start up.
REMOTE PIN		Does not matter.

6.4.2 Settings for AG-7350

The front panel switches should normally be set as follows:

Switch	Setting	Notes
CH2 METER	TRACKING	The VTR is set up for linear time codes to be recorded on audio channel 2. Hence the meter may be used to monitor the video tracking.
AUDIO MONITOR	CH1	Audio channel 1 is connected to the computer through the audio monitor socket on the rear of the VTR.
AUDIO MONITOR	NORM	Dig/mage uses the audio channels as part of the control system. The conventional linear tracks should be used rather than the hi-fi.
AUDIO OUT	NORM	Normally only the conventional linear audio tracks will be recorded.
INPUT	SVIDEO	The four pin SVHS input socket should be used in preference to the composite video BNC socket (LINE).

SYNC	NORM	The sync signal is normally embedded in the video signal.
TV SYSTEM	PAL	Whichever system is to be used.
REMOTE REC	OFF	In the VIDEO mode the VTR will automatically record whenever a video signal is detected, erasing any existing contents of the video tape.
EXT TIMER	OFF	This switch should be covered to prevent accidental setting to REC (in the REC position the VTR automatically enters record mode when it is switched on).
MODE LOCK	OFF	The computer may control the VTR without changing this switch. In the ON position manual control is not possible.
CH1: AUDIO LEVEL - NORM	<i>maximum</i>	Dig/mage uses this audio channel to record time-code pulses to aid with the control of the video recorder.
CH1: AUDIO LEVEL - HIFI	<i>minimum</i>	The HIFI channel is not used.
CH2: AUDIO LEVEL - NORM	<i>minimum</i>	CH2 is used for linear time code signals instead of audio - see below.
CH2: AUDIO LEVEL - HIFI	<i>minimum</i>	The HIFI channel is not used.

The set up menu (entered by simultaneously pressing the DOWN and SCREEN DISPLAY buttons) should be set as follows:

Item	Setting	Notes
AUDIO LIMITER	OFF	Need to make audio pulses as loud as possible. Distortion is not a problem.
DOLBY NR	OFF	No need for noise reduction.
AUDIO CH2	TIME CODE	We will record the linear time code track on audio channel 2.
AUDIO DUB	CH1	If wanting to dub Dig/mage time code pulses only.
	CH2	If wanting to dub linear time code track only.
	CH1.CH2	If the linear time code track is to be rewritten at the same time as the Dig/mage time code pulses.
HIFI REC	OFF	The standard audio track is better for the DigImage time code pulses.
S-VHS	ON	The VTR will automatically record as Super VHS if a Super VHS tape is used.
EDIT	ON	Allows edit operations.
VIDEO MODE	MONO	For most applications a mono signal is preferred, but the AUTO option is also acceptable.
	AUTO	When a colour signal is required, set to auto detection.
NOTCH	OFF	The notch filter should not normally be required.
TAPE IN MODE	STOP	The tape does not start to play when inserted.
TAPE END MODE	REW	When the tape gets to the end, rewind to the beginning.
AUTO BACKSPCE	ON	This prevents gaps between sequences of recordings.

DIRECT SEARCH	OFF	The tape does not go into shuttle mode automatically on start up.
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7 Other Software

This section describes briefly issues relating to the installation of other software which may be of use in conjunction with **Digi/mage**.

7.1 GHOSTVIEW

GhostView is a freeware product providing the ability to see PostScript output on-screen and convert PostScript to a range of other printer languages, thus broadening the range of possible printers for use with **Digi/mage**. GhostView itself is readily available for download over the web (<http://www.cs.wisc.edu/~ghost/>) and should be installed in the normal manner.

While most of **Digi/mage** is not aware of the existence of GhostView, GhostView may still be used for viewing the PostScript (.ps or .eps) files produced by **Digi/mage**. However, if the DigiGV method of starting DigiPlot is to be used (see the DigiPlot User Guide for details), then *either* GhostView must be accessible from the system search PATH (if it is then typing GSVIEW32 at a command prompt will start GhostView), *or* the file DigiImage\Bin\GSView32.BAT needs to be altered to point to GhostView.

7.2 ADOBE ACROBAT READER

The **Digi/mage** user guides are provided in three formats: PostScript, HTML and Adobe Acrobat. The last of these replicates the PostScript version in a more compact file, provides for on-screen viewing and more control over printing.

Acrobat Reader is widely available over the web for free download. No special action is required during installation.

8 Other Hardware

In this section we discuss briefly some aspects of setting up other hardware items commonly used in conjunction with *Dig/mage*.

8.1 COHU CAMERA

The Cohu 4910 and 4990 series video camera offers a high quality and cost effective option for imaging experiments. There are, however, a number of factors which need to be considered in order to attain the best results.

8.1.1 Jumper Settings

The Cohu camera contains a number of internal jumpers and external switches.

The optimal setting for the internal jumpers is given in the table below. Note that there are at least four different versions of the camera, not all of which have all the jumpers noted below. Moreover, versions of the camera later to D may have additional jumpers. If in doubt, please contact DL Research Partners.

Jumper	Preferred Setting	Factory Default	Notes
JB1 XTAL/LL	LL (Line Lock)	XTAL (Crystal Lock)	To use the camera in Line Lock you need to have an AC power supply, whereas the factory default Crystal Lock may be used with either AC or DC supplies. While the default Crystal Lock setting offers a slightly more stable image, it can suffer from a beating with the mains frequency, particularly in conjunction with fast shutter speeds and fluorescent lights. Moreover, if a mechanical shutter is desired (see §8.1.2) then this may be achieved much more easily if the camera is locked into mains frequency.
JB2,JB3 NOR/RESET	N/A		Do not change.
JB4 FRAME/ FIELD	FRAME (Frame Integration)	FIELD	This setting provides the maximum vertical resolution for the camera and, when used in conjunction with a mechanical shutter (see §8.1.2) provides the ability to capture both video fields at the same time rather than with the normal 1/50s (1/60s for NTSC) lag between the odd and even fields. See also JB7.
JB5 AUTO BLACK	OFF	ON	When activated, this automatically adjusts the “black” level of an image if the mean intensity becomes low. For most applications this, like automatic gain (see below) is detrimental to obtaining experimental measurements.
JB6 VD/PRE	N/A		Do not change.
JB7	OFF	ON	Only on Revision D, or later, cameras. If this jumper is left in the factory default setting, then Frame Integration does not function correctly.
JB60	N/A		Do not change.
JB80 75 Ohm	N/A		Do not change.

Sync Sel.			
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For the external controls, the optimal settings are

Control	Preferred Setting	Factory Default	Notes
ELECT IRIS	Off	On	This only plays a role if the optional Electronic Iris board is fitted. The effect is similar to an automatic iris on the lens, except that it adjusts the shutter speed. The net result is that the intensity output by the camera is affected by the mean light level, a situation undesirable for quantitative measurements.
Shutter Speed Switch	Off	Off	Controls the electronic shutter. This can be used to “stop” fast motion, but note that as it is applied to each field separately, it does not remove the 1/50s (1/60s) time lag between the two video fields. Better performance may be achieved by leaving in the Off position (which gives a 1/25s or 1/30s integration time when using Frame Integration) in combination with a mechanical shutter. See next section for details.
PEAK/AVG	N/A	Midrange	This only has an effect if the Automatic Gain control is in the On position.
GAIN	Minimum	Midrange	The manual gain potentiometer is a valuable tool in producing an image of appropriate brightness. However, as the gain amplifies both the noise and the signal, it is preferable to keep the gain to a minimum and increase the light level or lens aperture.
AGC (Automatic Gain Control)	Off	On	If “On”, the Automatic Gain control will adjust the gain of the camera to provide an almost constant mean intensity to the output signal regardless of changes in the light level. In almost all circumstances this is not desirable. Rather, quantitative measurements require a fixed relationship between the intensity and camera output, so this switch should be turned off.
GAMMA	1.0		Normal CRT display devices are nonlinear. To counteract these nonlinearities, most video cameras produce the opposite nonlinearity, called a gamma correction, normally of the form of the intensity raised to some power $\gamma \approx 0.45$. This is, however, undesirable for quantitative measurements. Setting the gamma correction potentiometer to 1.0 effectively turns off this “correction” and makes the output of the camera close to linear in the intensity.
SHARPNESS	Minimum	Minimum	This provides the ability to sharpen or soften an image by introducing a high pass or low pass filter to the video signal. Normally such manipulations are a disadvantage.

8.1.2 Mechanical Shutter

One of the fundamental problems with video technology is that a single frame consists of two interlaced fields transmitted sequentially. The first field contains all the even numbered video lines, and the second the odd numbered lines. The field rate (50Hz PAL, 60Hz NTSC) is therefore twice the frame rate (25Hz or 30Hz). Most modern CCD cameras have effective shutters that open and close at the field rate with an exposure time less than or equal to the field period. This means that the information contained in the even field represents the state at a time 1/50s or 1/60s earlier than the information in the odd field. In a large number of

applications this time delay between the two fields is not acceptable, and it is therefore necessary to discard one of the two fields and thus reduce the vertical resolution. In many cases this reduced resolution is acceptable.

When tracking particles it is desirable to keep the particles as small as possible. The lower limit on the size of the particles is imposed by the wish to locate them with subpixel accuracy. Subpixel accuracy requires that the particle extends at least two pixels in both directions. However, if the particles are moving more than approximately 50% of their diameter between one video field and the next, it is possible to use information in only one of the video fields. In order that the particle extends at least two pixels vertically in the reduced resolution of a single field, it must extend at least four pixels vertically relative to a complete frame, thus requiring the particles to be twice the size. Moreover, while this gives subpixel resolution, it is subpixel relative to pixels twice the size.

To complicate matters further, different cameras construct the two video fields in different manners. In some cameras the even field corresponds to the even lines of pixels in the CCD chip, and the odd field to the odd lines of pixels in the CCD chip. In such cameras not only must the vertical resolution be reduced by discarding one of the fields, but because there is no information about what is happening in the other set of pixels, the effective resolution for small entities such as particles is significantly worse than half the full frame resolution.

Slightly better are cameras which produce an average of the even lines and the preceding odd lines for the even field, and the odd lines and the preceding even lines for the odd field. With such cameras it is still necessary to discard one of the fields, but at least the remaining field has information from all the pixels in the CCD chip.

Many more recent cameras, such as the Cohu 4910 & 4990 series, offer the choice of either of the above methods of generating the video fields. In "field integration" mode it uses the average of the even and odd rows of pixels for each field, while in "frame integration" mode it uses only the even rows for the even field and the odd rows for the odd field. With "field integration" the shutter speed can be set anywhere between 1/50s (1/60s NTSC) and 1/10000s. Realistically shutter speeds up to 1/250s are of practical value for particle tracking. Most useful, however, is the ability to have a separate 1/25s (1/30s NTSC) shutter for each of the fields in "frame integration" mode.

For normal cameras the slowest shutter speed is equal to the field period (*i.e.* 1/50s or 1/60s), with both the even and odd rows of pixels being reset at the same time. Both rows are also transferred to the CCD shift registers at the same time, with the adjacent even/odd pairs of rows being summed. In *frame integration* mode the camera proceeds as follows: the accumulators for the even rows of pixels are reset at some point up to 1/25s (1/30s NTSC) before the even rows are transferred to the shift registers. 1/50s (1/60s NTSC) after the even rows were reset, the odd rows of pixels are reset, and 1/50s (1/60s NTSC) after the even rows were transferred to the shift register, the odd rows are transferred to the shift registers.

The following diagrams illustrate the timings of the two integration modes. The resetting of the accumulators is indicated by R, and transfer to the shift registers by T. The frame boundary is indicated by F and field boundary within a frame by \mathfrak{f} . The contents of the shift registers is e for even lines only, o for odd lines only, \mathfrak{e} for the sum of the even and preceding odd lines, or \mathfrak{p} for the sum of the odd and preceding even lines. The field read out is given by EEEEE for the even fields and OOOOO for the odd fields, with S representing the vertical sync.

FIELD INTEGRATION:

```

Timing      ---F-----f-----F-----f-----F-----f-----F-----f---
Even pixels R--T---R--T---R--T---R--T---R--T---R--T---R--T---R--T---
Odd pixels  R--T---R--T---R--T---R--T---R--T---R--T---R--T---R--T---
Shift reg.  ppp ffffffff ppppppp ffffffff ppppppp ffffffff ppppppp ffffffff ppp
Read Out    000SEEEEEEESS0000000SEEEEEEESS0000000SEEEEEEESS0000000SEEEEEEESS00
    
```

FRAME INTEGRATION:

```

Timing      ---F-----f-----F-----f-----F-----f-----F-----f---
Even pixels R--T-----R--T-----R--T-----R--T-----R--T-----
Odd pixels  -----R--T-----R--T-----R--T-----R--T-----
Shift reg.  ooo eeeeeeee oooooooo eeeeeeee oooooooo eeeeeeee oooooooo eeeeeeee ooo
Read Out    000SEEEEEEESS0000000SEEEEEEESS0000000SEEEEEEESS0000000SEEEEEEESS00
    
```

The frame integration feature is not by itself a major improvement over standard field integration video cameras. However, if a mechanical shutter is used with the camera in conjunction with a 1/25s (1/30s NTSC) electronic shutter, it is possible to expose the two fields at the same instant in time, thus allowing the full vertical resolution to be used. The diagram below uses the same symbols as those above but with a full frame electronic shutter. The external mechanical shutter is open for the period indicated by MMM.

FULL RESOLUTION FAST SHUTTER:

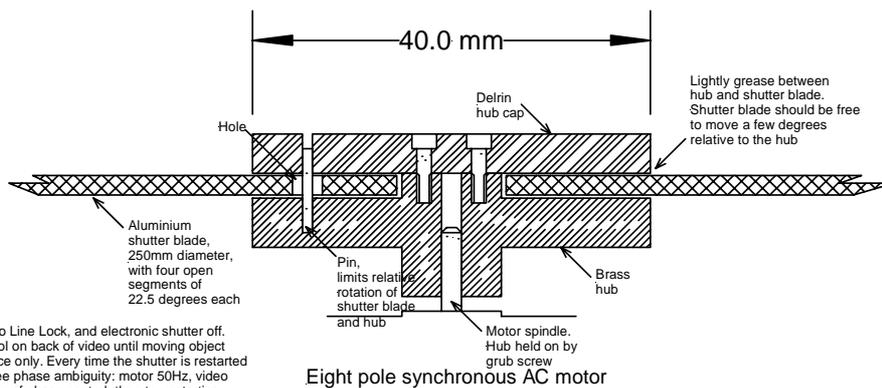
Mechanical

```

Shutter      M          MMM          MMM          MMM          M
Timing      ---F-----f-----F-----f-----F-----f-----F-----f---
Even pixels  ---TR-----TR-----TR-----TR-----TR-----
Odd pixels   -----TR-----TR-----TR-----TR-----TR---
Shift reg.   ooo eeeeeeee oooooooo eeeeeeee oooooooo eeeeeeee oooooooo eeeeeeee ooo
Read Out     000SEEEEEEESS0000000SEEEEEEESS0000000SEEEEEEESS0000000SEEEEEEESS00
    
```

The mechanical shutter is opened while the odd field is being displayed, shortly before the end of the even field integration period, and shortly after the start of the odd field integration field, thus exposing both fields associated with the next frame at the same time.

Mechanical shutter for DigImage



Set video camera to Line Lock, and electronic shutter off. Adjust phase control on back of video until moving object appears in one place only. Every time the shutter is restarted there is a 180degree phase ambiguity: motor 50Hz, video 25Hz. If out of range of phase control, then try restarting shutter.

Normally the synchronous motor does not have enough torque to start shutter if the shutter is rigidly attached to the hub. The small amount of relative movement provided by the pin and hole allow the shutter to start. The shutter should make clicking noise as it starts, but will quieten down once it is up to speed. There should be no vibration while running if the shutter blade is well balanced.

If camera mounted vertically, the weight of the shutter blade must be supported by an additional bearing or the spindle will pull out of the armature.

The shutter blade should always be protected by a guard to prevent injury and damage (the motor spindle is very small).

All parts of the shutter and guard should be painted mat black.

Figure 4: Sketch of mechanical shutter.

Extensive trials have shown a slight improvement in the horizontal velocity resolution for rapid flows, and a dramatic improvement in the vertical resolution. Some of this improvement is due to an improved signal to noise ratio when compared with the standard camera used in this trial, but most of it is due to the improved vertical resolution.

There are a number of ways of producing a mechanical shutter. However, the easiest and most effective is to lock the camera in to mains frequency then use a synchronous AC motor to drive a disk with the appropriate number of clear and opaque sectors. We recommend using an 8-pole motor attached to a disk approximately 250mm in diameter with four open sectors covering approximately 25% of the circumference. A sketch of a suitable hub for this shutter is provided in figure 4. Further details are available on request.

8.2 LIGHT SOURCES

Producing suitable light sheets is often a difficult task. Many resort, unnecessarily, to lasers if a standard slide projector does not provide a suitable light sheet. The following subsections include brief details of two alternative and cost effective methods of producing light sheets.

8.2.1 *Photographic Lamps*

Figure 5 shows the physical arrangement used to produce a light sheet from a 1kW halogen photographic lamp, and figure 6 shows the optical paths schematically. Key features are:

- A spherical lens on the front of the case to focus either the lamp filament or the adjustable slide (less light but more uniform than the filament). There is a trade off between the focal length and diameter of the lens. The larger the diameter and shorter the focal length, the more light you will get into the sheet. Our lenses are approximately 100mm diameter with a focal length of about 150mm.
- Cooling fan. The 1kW input into the compact size of the photographic lamp means that if it is to be turned on for extended periods (more than about five minutes), forced cooling is required to prevent overheating.
- Linear filament 1kW photographic lamp. These lamps are much more intense and have a much higher colour temperature than the type used in normal flood lamps. Physically they are somewhat more compact. Note these lamps **must** be mounted horizontally. If you mount them vertically the neighbouring coils in the filament will short, decreasing the resistance and ultimately burning out the lamp. The lamp holders are available through, for example, RS Components.
- Adjustable slide. The adjustable slide may be used to decrease the numerical aperture of the lamp and thus increase the in-focus depth of field of the sheet. The cost of shutting down the aperture of the slide is, of course, a reduced light level. We typically use a 2 to 4mm aperture.
- Baffle. The baffle is designed to both prevent excess light leaving through the ventilation holes. Ideally a cylindrical baffle with its axis close to the filament would be best, but at the danger of overheating the light. In practice it may be better to have the baffle reflect the light away from the slide - we do not want light from far from the filament otherwise the depth of field will be reduced. In line with this, the baffle should probably be black and perhaps slightly convex.
- Focus adjustment. It is necessary to be able to adjust the position of the lamp and slide relative to the lens to focus the light sheet. We have found it easiest to mount the baffle,

lamp and adjustable slide off the support and have the position of the support adjustable relative to the lens.

- Case. Our original ones were 5 1/4" BBC disk drive cases, but these are no longer available. The latest one was folded out of aluminium sheet and electro-phoretic painted (black) both inside and out. This is significantly better than the earlier versions.
- Safety. A thermal cut-out should be fitted. We recommend a 150°C thermal switch fitted to the bottom of the case near the rear end. The original versions also had a thermal switch to turn on the fan and keep it on until the lamp had cooled, but we found it was a bit too slow at turning the fan on. The mains switch is also near the rear end of the case to prevent it getting too hot.

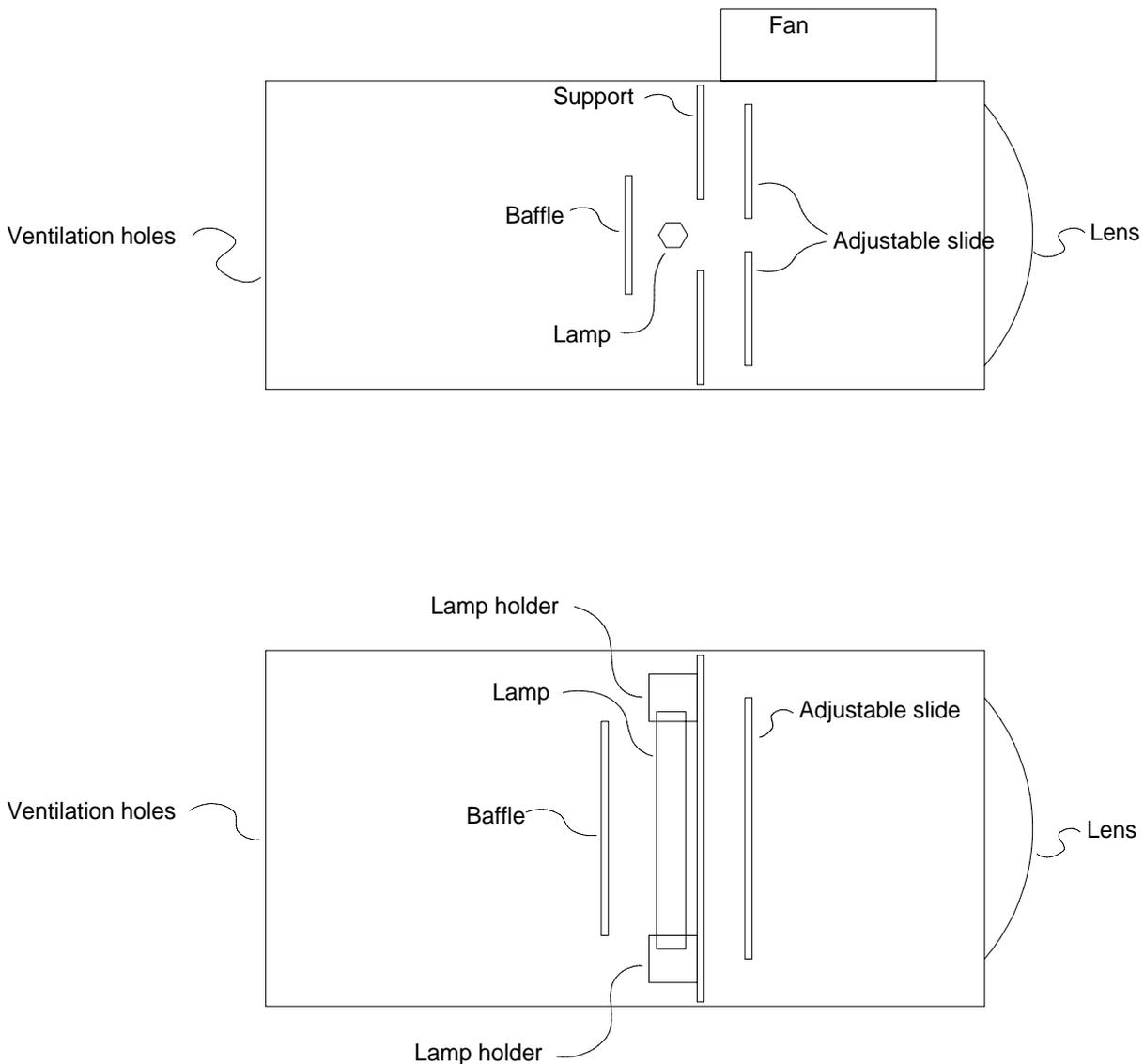


Figure 5: Sketch of halogen lamp elevation (top) and plan (bottom).

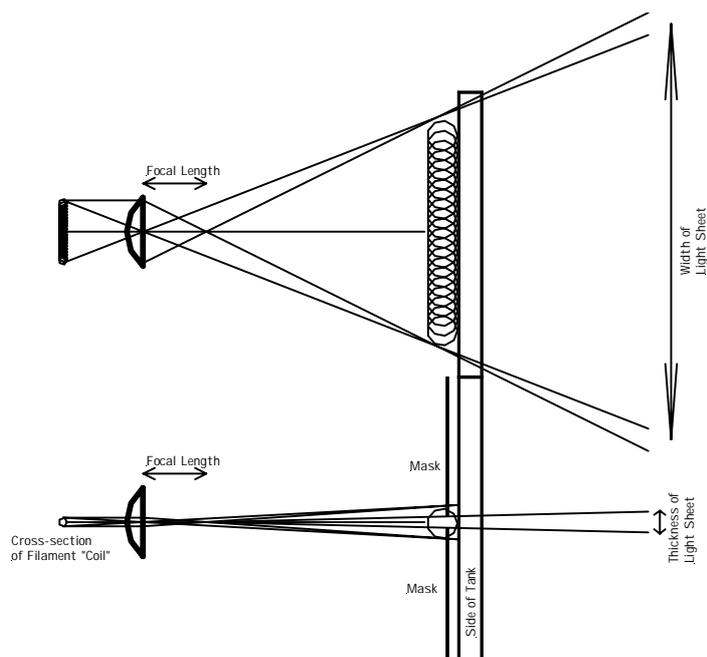


Figure 6: Sketch of optical arrangement for halogen lamp.

8.2.2 Arc Lamp

Arc lamps have a number of advantages over halogen lamps. First, they provide a much higher intensity for a given power input. Second, the light emanates from a much smaller region, thus allowing better collimation. Finally, the colour temperature of the light is higher, which is particularly valuable for LIF work.

For a number of years we have been using 300W xenon arc lamps with an integral dichroic parabolic reflector. Higher power 500W and 1kW versions are also available, with the light output of the 1kW version approximately five times that of the 300W version. These lamps are sold as “Cermax” and are made by ILC Technology (399 Java Drive, Sunnyvale, Ca 94089, USA; Ph: +1 (408) 745 7900; <http://www.ilct.com/>).

The beam of light produced by the lamp is well collimated by owing to the large ratio between the size of the arc (around 1mm) and the relatively long focal length of the reflector. The higher power lamps have a larger reflector and smaller arc, producing a higher degree of collimation.

The method of producing a light sheet from the 300W lamp is extremely simple and is sketched in figure 7. The basic idea behind it is to take the lamp well back from the region to be illuminated, letting the well-collimated beam expand far enough to illuminate the entire length of the sheet required, and control the thickness of the sheet by masking things at the sides of the tank, thus selecting only a tiny fraction of the light, but ensuring it is extremely well collimated (in the cross-sheet direction).

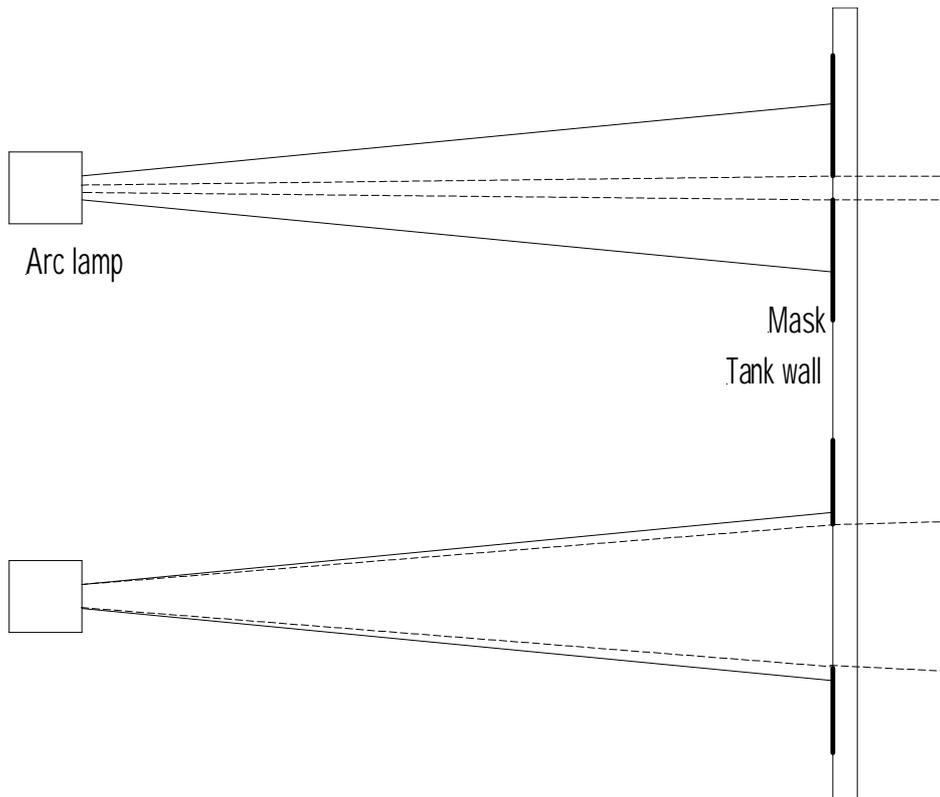


Figure 7: Sketch of optical arrangement for creating a light sheet with an arc lamp.

The improved collimation of the 500W and 1kW versions makes the optics slightly more difficult as it will normally be necessary to spread the light to obtain a sufficiently large sheet. This is most conveniently achieved through a very long focal length cylindrical lens. When using the higher power lamps we strongly recommend that you use a heat mirror or window to reduce the heat content of the light reaching the tank.

Note that for all the lamps there are two sets of light rays. The first set leaves the lamp unit directly, radiating radially from the arc. Such rays effectively emanate from a point source and decrease in intensity as $1/r^2$. These light rays contain a significant amount of infrared and, as a result, the light beam is very hot close to the lamp. However, at typical working distances of 3m or more from the tank, the light intensity is much smaller than the second set, and the heat content does not represent a problem for many flows. The second set of light rays make up the collimated beam which we make use of. These light rays originate at the same arc, but are directed towards the dichroic reflector. Most of the heat is transmitted through the reflector to be dissipated, while the visible light is focused into the beam.

Warning: These lamps should never be operated directed vertically upwards as we are told (but have not experienced) that instabilities in the arc in combination with strong convection heating the front window can cause the lamps to explode.

