DEK ALIGN 4 MANUAL

CHAPTER 1

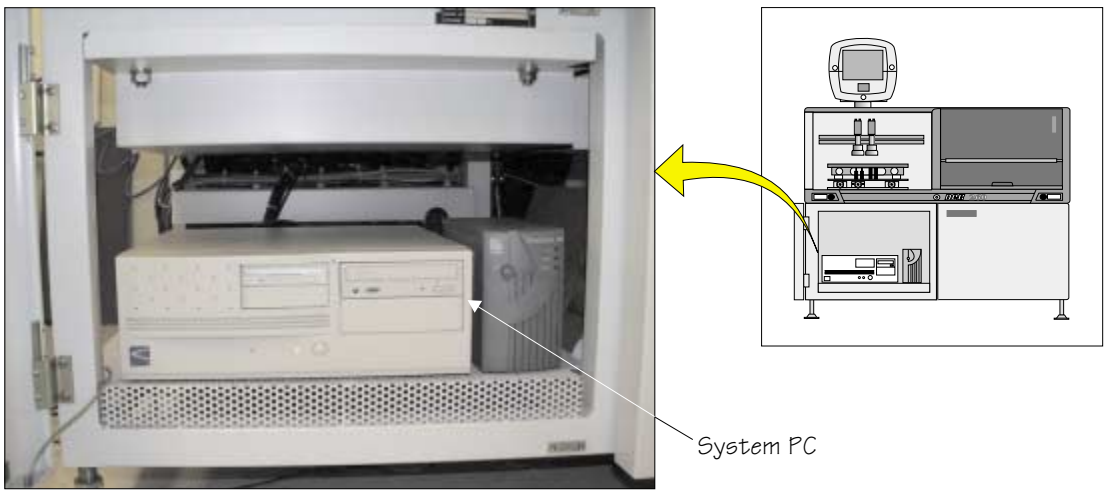
SYSTEM PC

SYSTEM PC

INTRODUCTION The System PC is sited in the relevant positions for either the 260 or 248 machine as shown below. The system PC provides the following software functions:

- DA4 Vision System

DEK 248 Machine



DEK 260 Machine

Figure 1-1 System PC Overview for 248/260 Machines

SYSTEM SCHEMATIC

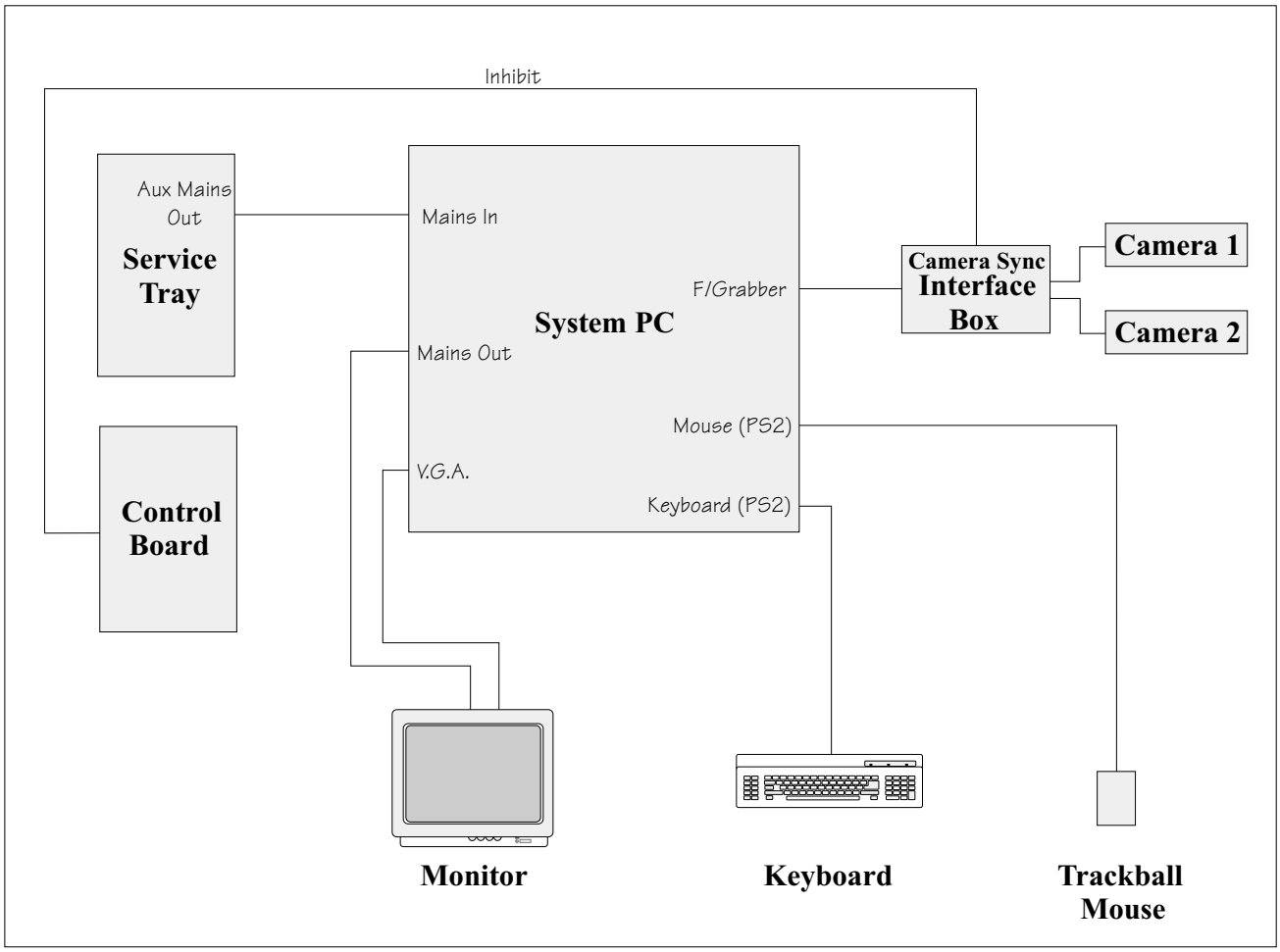


Figure 1-2 System PC Electrical Schematic

MECHANICAL DETAIL

The DA4 Machine is fitted with a standard 'off the shelf' desk top PC, compatible with the minimum specification as detailed in the table below:

Description	Item	Requirement
Desk Top Case	Mechanical Dimensions (maximum)	Width 550mm Depth 600mm Height 200mm
	Hard Disk Drive (HDD)	1 Gb minimum Windows NT Compliant
	Floppy Disk Drive (FDD)	Standard 3.5"
	CD ROM	Standard 5.25" ATAPI 16 speed minimum
	Framegrabber Card	Imagenation PCX200F DEK Part No. 144683
	Video Card	AGP Video Card with 8Mb Video Ram minimum, ie ATI Rage Pro
Power Supply	Switchable Mains Input	110V / 230V @ 50Hz / 60Hz with mains out socket
Motherboard	CPU	450 Mhz AMD K6-2 minimum L1 & L2 Cache
	RAM	64 Mbyte minimum
	L2 Cache RAM	128 KByte minimum
	Advanced Graphics Port (AGP)	Video card
	PCI connection slots (3 minimum)	Framegrabber
	EIDE Controller	HDD CD ROM
	Floppy Controller	FDD
	PS2	Keyboard and mouse
	Windows NT and Year 2000 compliant	Motherboard and BIOS
Operating System		Windows NT 4.0 OEM Workstation (Service Pack 4)

System Shutdown

The system PC uses the Windows NT operating system which, when running produces a large number of temporary files. It is therefore very important that the following Windows NT shutdown procedure is observed:

1. From the main setup page select the **EXIT TO WINDOWS** icon, this terminates the application and returns system to the Windows NT desktop.
2. Select the **START** icon.
3. From the menu select **SHUT DOWN**.
4. From the shut down window box select **Shutdown the Computer** and click the **YES** button. (Windows NT activates shutdown procedure.)
5. The monitor indicates when it is safe to turn off the system PC.
6. When the shutdown completes and the message box 'It is now safe to turn off your computer' is displayed, push and hold in the system PC **power switch** until the front panel power indicator is extinguished.
7. Shutdown the machine by switching the mains switch to **OFF**.

Shutdown Sequence Label

The Shutdown Sequence Label is affixed at the rear of the machine above the service tray and is used as an aid to the operator for correct machine shutdown

WARNING

SHUT DOWN PC BEFORE ISOLATING MAINS SUPPLY TO THE MACHINE

1. CLICK THE >EXIT TO WINDOWS< BUTTON.
2. CLICK THE >START< BUTTON ON THE TASK BAR.
3. CLICK THE >SHUTDOWN....< BUTTON.
4. SELECT >SHUT DOWN COMPUTER?<.
5. CLICK THE >YES< BUTTON.
6. WAIT UNTIL WINDOWS DECLARES >IT IS NOW SAFE TO TURN OFF YOUR COMPUTER<.
7. TURN THE PC OFF.
8. ISOLATE MACHINE FROM THE MAINS.

Figure 1-3 Machine Shutdown Sequence Label

REPLACEMENT PROCEDURES

WARNING

LETHAL VOLTAGE. DANGEROUS VOLTAGES EXIST IN THIS EQUIPMENT.

Carry out the following procedure when replacing the system PC:

1. Power down the machine as described in the System Shutdown section of this chapter.
2. All LED's are extinguished on the front panel of the system PC.
3. Access the rear connectors of the System PC.
4. Remove all the connectors from the rear of the system PC.

   NOTE
   All D-type connectors are secured into position by screwed fixings.
5. Remove the unit from the printer.
6. Replacement of system PC is carried out in reverse order to above.

   NOTE:
   Check the input voltage selector switch (if present) on the rear of the system PC before installing into the machine. Ensure that the selected voltage is correct for the ac voltage being supplied to the printer.

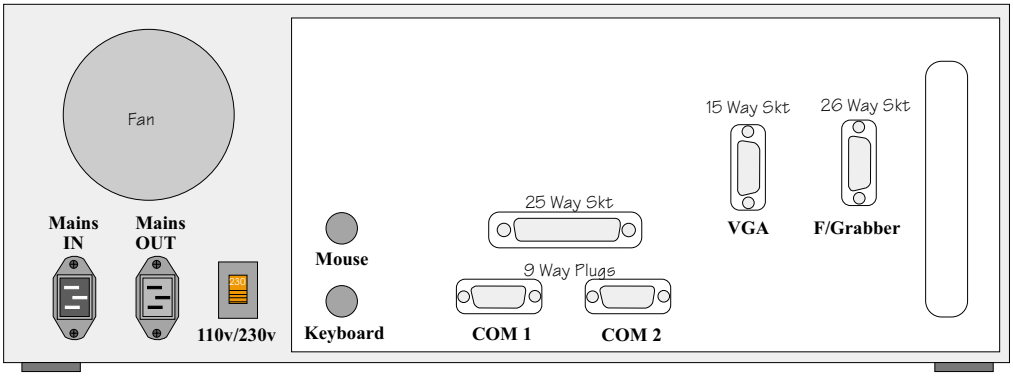


Figure 1-4 Typical PC Connector Configuration

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PC BIOS SETTINGS

The BIOS (Basic Input/Output System) is the section of the operating system that interfaces with the actual hardware of the microprocessor. Certain system components such as disk drives, peripheral support, boot sequences etc, are stored in the CMOS battery backed RAM and can be configured using the set up routine, which resides in the BIOS ROM. This set up is available each time the PC is powered up.

After installation of a replacement system PC or if the BIOS battery supply fails the configuration should be checked and configured as necessary with reference to the settings table detailed below.

NOTE
*The settings can be accessed during the initial phase of the system PC boot-up sequence by pressing **DELETE**.*

Great care must be taken to ensure that any changes/corrections made to the BIOS settings are carried out correctly, any incorrect settings may either cause the system to become inoperable or to give unexpected results.

BIOS Feature Set Up

BIOS FEATURES SETUP	
CPU Level 1 Cache	: Enabled
CPU Level 2 Cache	: Enabled
CPU L2 Cache ECC Checking	: Enabled
Quick Power On Self Test	: Enabled
Boot Sequence	: CDROM, C, A

Power Management Set Up

POWER MANAGEMENT SETUP	
Power Management	: Disable
PM Control by APM	: Yes
Doze Mode	: Disable
Standby Mode	: Disable
Suspend Mode	: Disable
IDE HDD Power Down	: Disable
Power Button	: Instant Off
Power On by Ring	: Enabled

PNP/PCI Configuration

PNP/PCI CONFIGURATION	
PNP OS installed	: No
Rescources Controlled by	: Auto
Reset Config Data	: Disabled

PC RECOVERY PROCEDURE

CAUTION

FILE RECOVERY. Only the original PC configuration is recovered. Any additional programmes or files that have been installed will be lost.

Carry out the following procedure:

1. Load the Recovery CD into the PC CD ROM drive and restart PC.
2. When prompted, key in the six figure machine serial number and press **ENTER**. (If the PC does not boot from the Recovery CD, refer to note below.)
3. When prompted remove the CD from the CD ROM drive and press **CTRL + ALT + DEL** on the keyboard.
4. The PC re-boots and autostarts the DEK Align 4 application.
5. Re-train the vision system.

   NOTE

   If the PC does not boot from the CD ROM, carry out the following procedure:

   *a. Restart the PC and hit the **DEL** key when prompted to enter BIOS setup.*

   *b. Using the down arrow key highlight '**BIOS FEATURES SETUP**' and press **ENTER**.*

   *c. Using the down arrow key highlight '**BOOT SEQUENCE**'.*

   *d. Using the page up/down keys, change boot sequence to '**CD ROM, C, A**'.*

   *e. Press **ESC** key.*

   *f. Using the arrow keys, highlight '**SAVE AND EXIT**' and press the **ENTER** key.*

   *g. Type '**Y**' and then press **ENTER**.*

   The PC should now boot from the CD ROM.

FAULT FINDING

Symptom	Possible Solution
No display on monitor	Check main machine isolator on the rear of the printer is set to **ON**
	Check PC front panel for illuminated power indicator
	Check for power availability at monitor
	Check VGA connection between monitor and system PC
Display is corrupted or unusable	Check VGA connection between monitor and system PC
	On boot up use the Windows NT VGA mode and check display properties
Machine fails to start-up Windows NT™	Check system PC BIOS configuration
Machine fails to start-up the application software	Shutdown and restart PC
	Re-configure PC using the recovery disk
Application hangs then displays error message	Shutdown and restart PC
	Re-configure PC using the recovery disk
An unexpected Windows NT™ error is reported	Shutdown and restart the machine
	Re-configure PC using the Recovery CD ROM
The picture in picture display from the camera is blank	Is the camera LED lighting **ON**?
	Has the camera aperture setting been adjusted?
	Check the system wiring is connected between the system PC, the camera sync interface box and the camera units themselves

ERROR MESSAGES

There are no application error messages.

ASSOCIATED DRAWINGS

Electrical

Description	Drawing Number
DA4 Vision Circuit	144803
DA4 Interface Box Circuit	144804

CHAPTER 2

MAN MACHINE INTERFACE

MAN MACHINE INTERFACE

SVGA MONITOR

WARNING

LETHAL VOLTAGE. DANGEROUS VOLTAGES EXIST IN THIS EQUIPMENT. ENSURE ALL ELECTRONICS COVERS AND MAIN MACHINE COVERS ARE FITTED BEFORE OPERATING THIS EQUIPMENT.

The SVGA Monitor is housed on a plinth on top of the machine and is the operators visual interface with the machine vision system.

The monitor specification is:

- Colour SVGA resolution - 800 pixels x 600 pixels.
- Operating voltage -110V / 230Vac (to suit local supplies) supplied from the system PC.

NOTE
Figure represents an example of the monitor type used on the Machine, (monitor control panels may vary slightly).

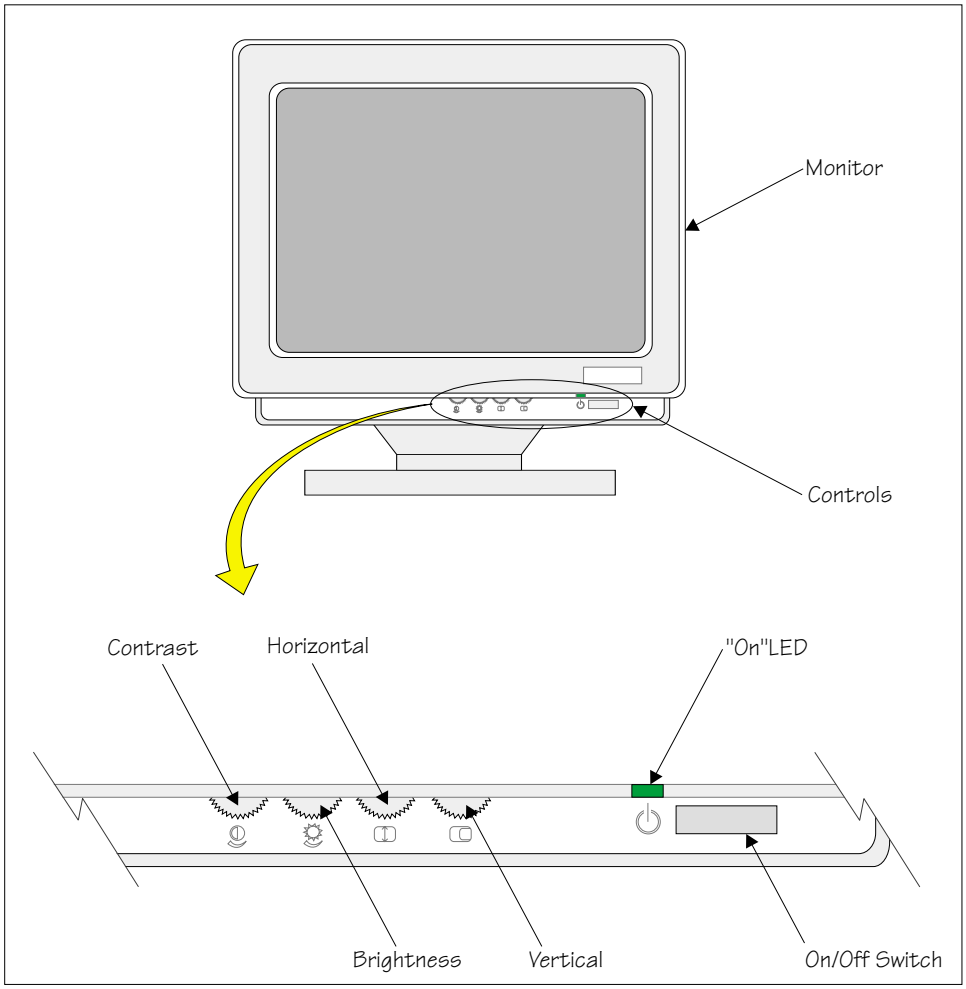


Figure 2-1 Monitor Controls

KEYBOARD

The Keyboard is a qwerty, low-height, lightweight model. It is for the use of the service engineer for the following functions:

- Setting up the machine.
- Carrying out off-line diagnostics.

TRACKBALL MOUSE

The Trackball Mouse unit is an environmentally sealed handheld trackball mouse utilizing an opto-mechanical encoder system.

During operation the device can be hand held or surface mounted onto a magnetically suitable surface.

The following controls are available on the unit:

- Two Mouse Buttons
- Trackball Mouse

Mouse Buttons

The Mouse Buttons (left and right) are situated on each side of the trackball. The DEK Align 4 software only requires the use of the left hand mouse button, this can be set up for left or right handed use in the NT Control Panel (mouse setup).

Trackball

The trackball device is used for moving the screen cursor, this can be operated by middle finger whilst held in the hand or placed on a surface.

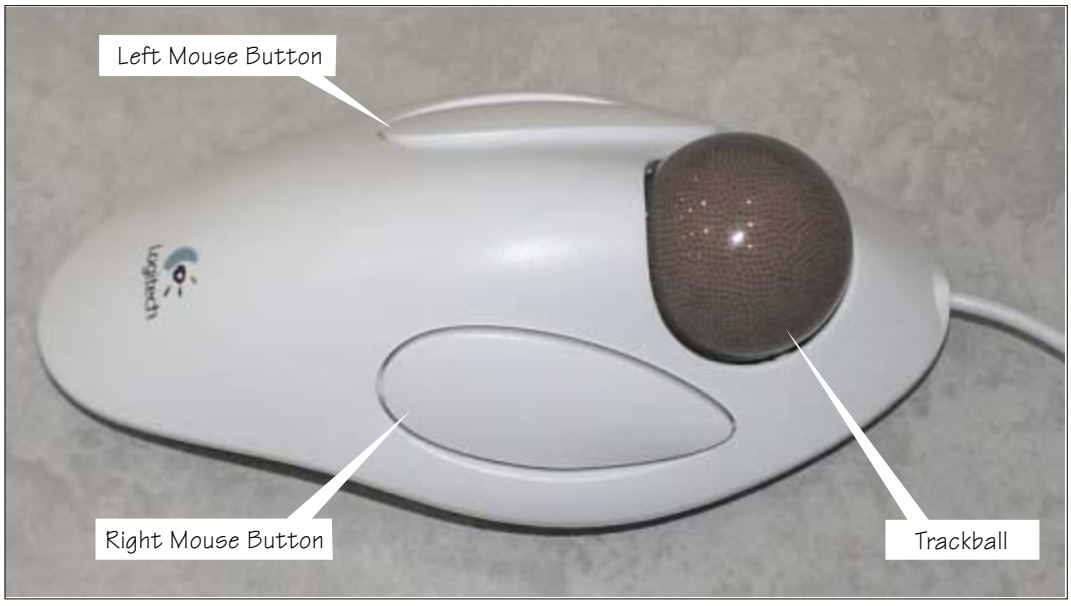


Figure 2-2 Trackball Mouse

SYSTEM POWER UP

To power up the system carry out the following procedures:

1. Switch the main system switch on the rear of the machine to **1** (ON). This provides power to the machine control hardware.
2. Activate the front panel power switch of the system PC (lower shelf of machine). The system PC boots up and the sequence may be observed via the machine's monitor.

   NOTE
   The system is pre-configured to auto log the user into the Windows NT operating system and then to start the application software. Therefore after pressing the system PC power switch no further operator intervention is required until the final application is loaded.

Display information data for the monitor is provided from the:

- DA4 Vision software

Vision Software Interface

The Vision data is displayed as picture-in-picture windows (one for each camera) in the upper half of the display. Vision command icons are also displayed in the lower half of the display area (Vision Display Example figure refers).

NOTE
For information on the vision module refer to the Camera and Vision chapter of this manual.

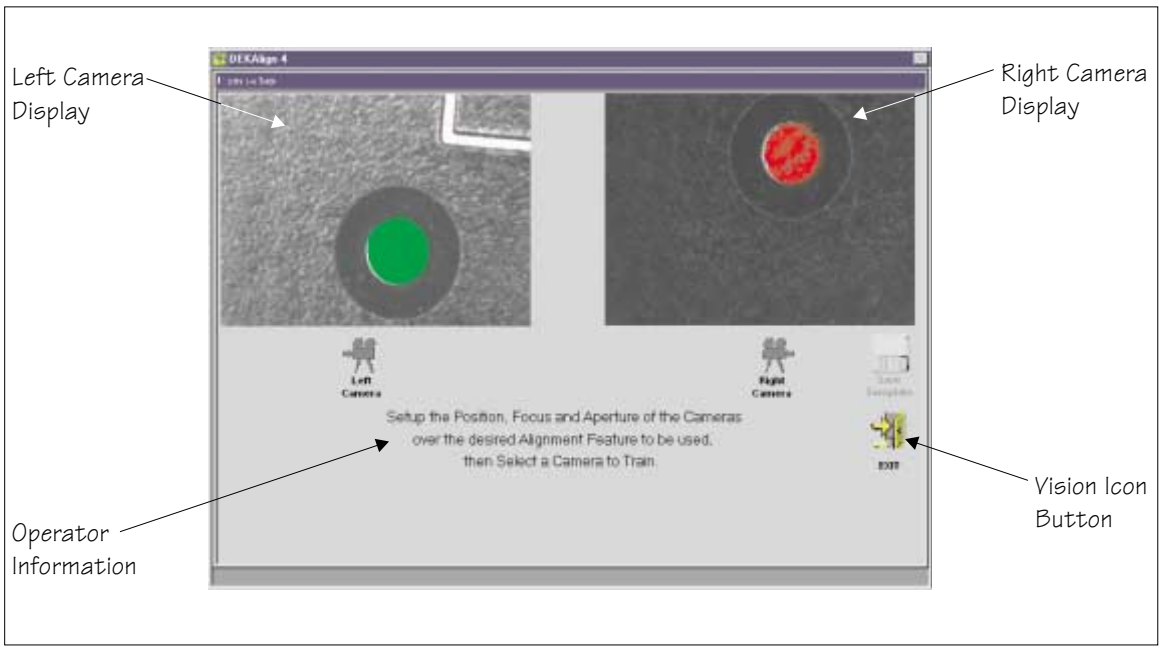


Figure 2-3 Vision Display Example

CHAPTER 3

CAMERA & VISION SYSTEM

CAMERA & VISION SYSTEM

MODULE OVERVIEW

Purpose

The Vision Module option is used to create a vision template (reference image) from the first board to be printed, ideally by utilizing a printed image of the Screen. This reference image is then used when aligning the remainder of the batch of boards to be printed.

Elements

The main elements of the DEK Align 4 (DA4) camera and vision system are:

- Cameras (2 units)
- X and Y Camera Arm Assembly
- DA4 Vision Software
- System PC (refer to System PC Chapter of this manual)
- Vision Monitor
- Camera Sync Interface Box

Operation

The function of the camera and vision system is to use the reference image at the board loading position. This is achieved by printing the stencil onto a white 'Mylar Flap' fitted on top of the board. The operator then uses the vision system to acquire an image of selected solder features (from the white Mylar flap). The Mylar flap is then removed and the board aligned to the previously acquired images. With the board now aligned to the stencil image the final reference image is created. This may be carried out on the same pads, or the cameras may be moved to utilize alternative features, eg fiducials.

MECHANICAL DETAIL

Cameras

The left and right monochrome camera units consist of the following:

- Charged coupled device (CCD) units - allowing live board featuress to be displayed.
- LED lighting control system.
- Optical lens unit with manual image focus and manual aperture settings.

Camera movement is manually adjusted in the X and Y axis by moving the camera support arms to the required positions. The arms are then locked in position by turning the control knobs on the top of the camera arms.

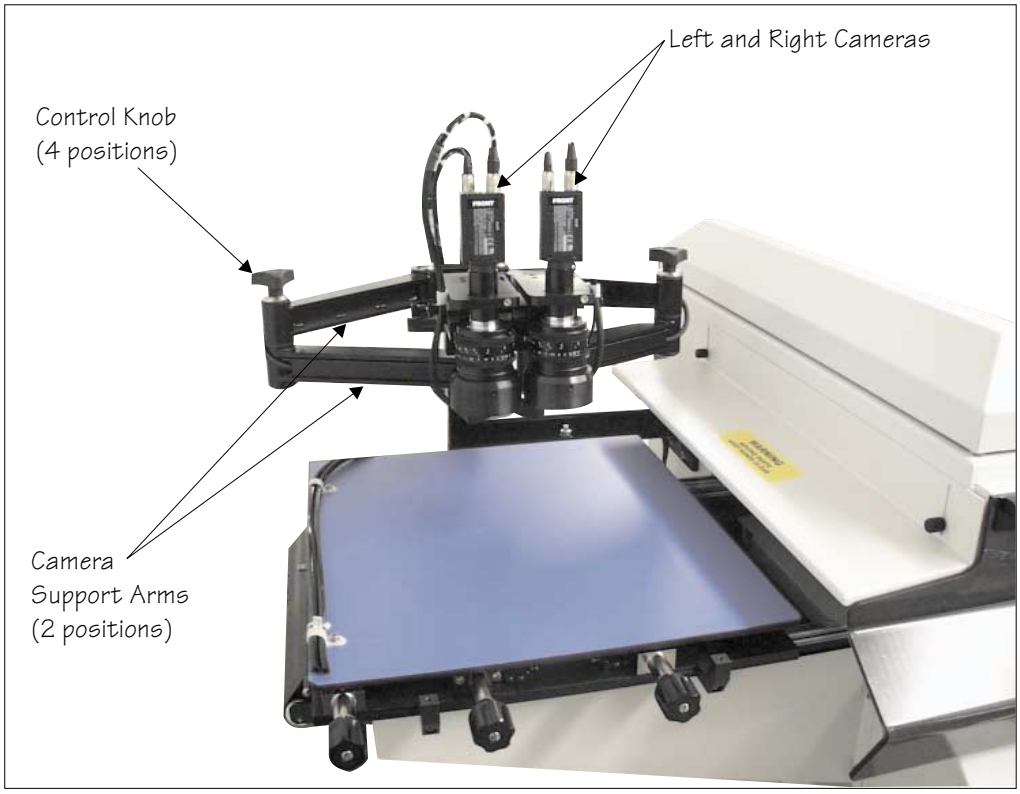


Fig 3-1 Camera OverviewExample (248 Machine)

Camera Sync Interface Box

The Camera Sync Interface Box provides an electrical interface between the camera system, the system PC and the control board.

This provides an inhibit signal from the vision system to the machine when the vision system does not accept that the board is aligned, and also boosts the synchronization signals to the cameras.

The interface box is positioned on the left hand side of the machine, below the camera arms.

ADJUSTMENTS AND SETTINGS

The following display pages are presented to the operator during DA4 vision setup procedures:

- Vision Access Page
- Main Setup Page
- Camera Selection Page
- Region of Interest Setup Page
- Template Setup Page
- Advanced Template Setup Page
- Overlay Setup Page
- Configuration Page

Vision Access Page

The Vision Access Page is the first presentation page when switching the system on.

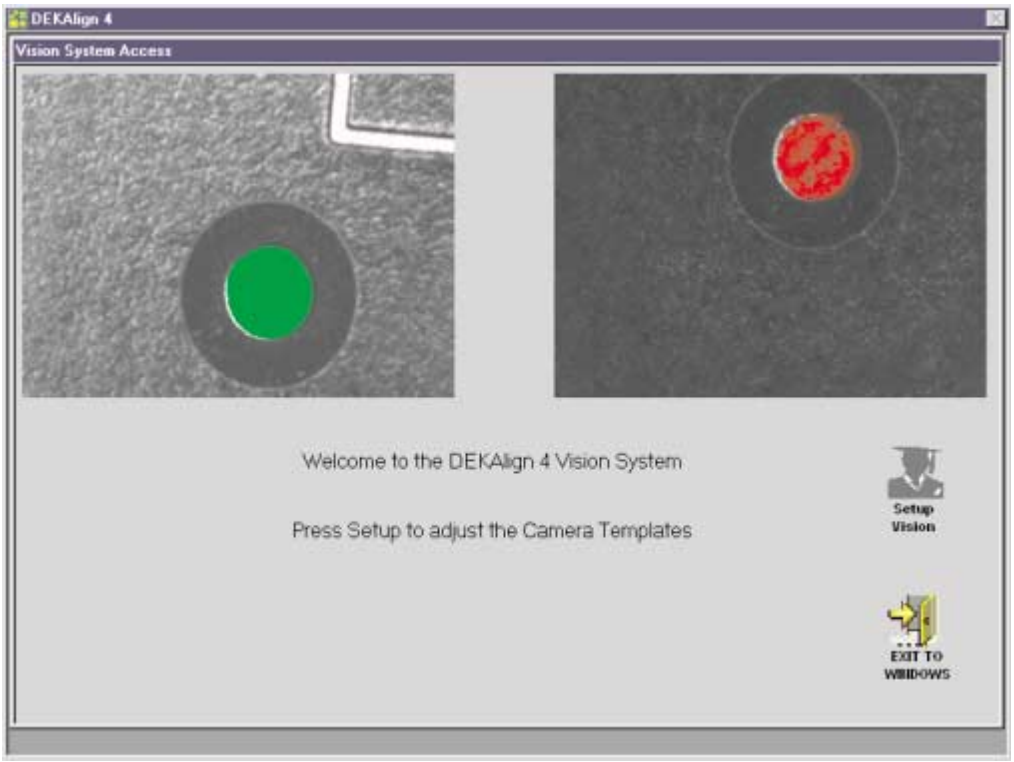


Figure 3-2 Vision Access Page

Main Setup Page

The Main Setup Page is used to access the following setting up pages:

- PCB Setup
- Mylar Setup
- Configuration

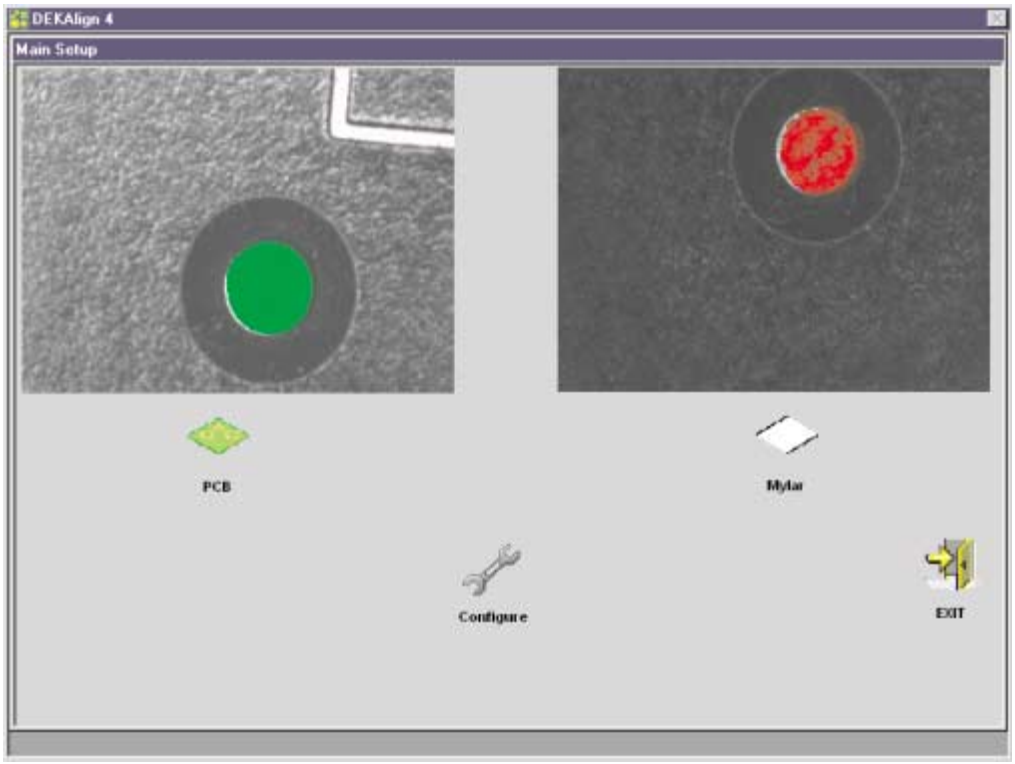


Figure 3-3 Main Setup Page

PCB — Selecting the PCB button opens the camera selection page for PCB templates. The vision system is looking for a light foreground on a dark background.

Mylar — Selecting the Mylar button opens the camera selection page for Mylar templates. The vision system is looking for a dark foreground on a light background.

Configuration — Pressing the Configuration button opens the vision configuration page enabling vision parameter changes.

Exit — Pressing the Exit button returns the user to the vision system access page.

Camera Selection Page

The Camera Selection Page is used to select the left or right camera in order to setup that particular vision template, and save when both are set up.

Figure 3-4 Camera Selection Page

Left Camera — Selecting the Left Camera button opens the region of interest page for the left camera template.

Right Camera — Selecting the Right Camera button opens the region of interest page for the right camera template.

Save Template — The Save Template button only becomes active when both templates have been aligned. Selection then saves these templates to hard disk.

Exit — The Exit button, when selected, returns the user to the main setup page.

Region of Interest Setup Page

This page is opened without a region of interest. The bounding box (red dotted line) is created by carrying out the following:

1. Using the trackball mouse, position the cursor to the top left corner of where the bounding box is to be created.
2. The bounding box is opened up by holding down the left mouse button, at the same time moving the mouse to required box size.
3. The box is complete when the user releases the mouse button (the red dotted line changes to red unbroken line). This process can be repeated until the user is satisfied with the region of interest created.

The selected camera is indicated in the top right hand corner of the screen.

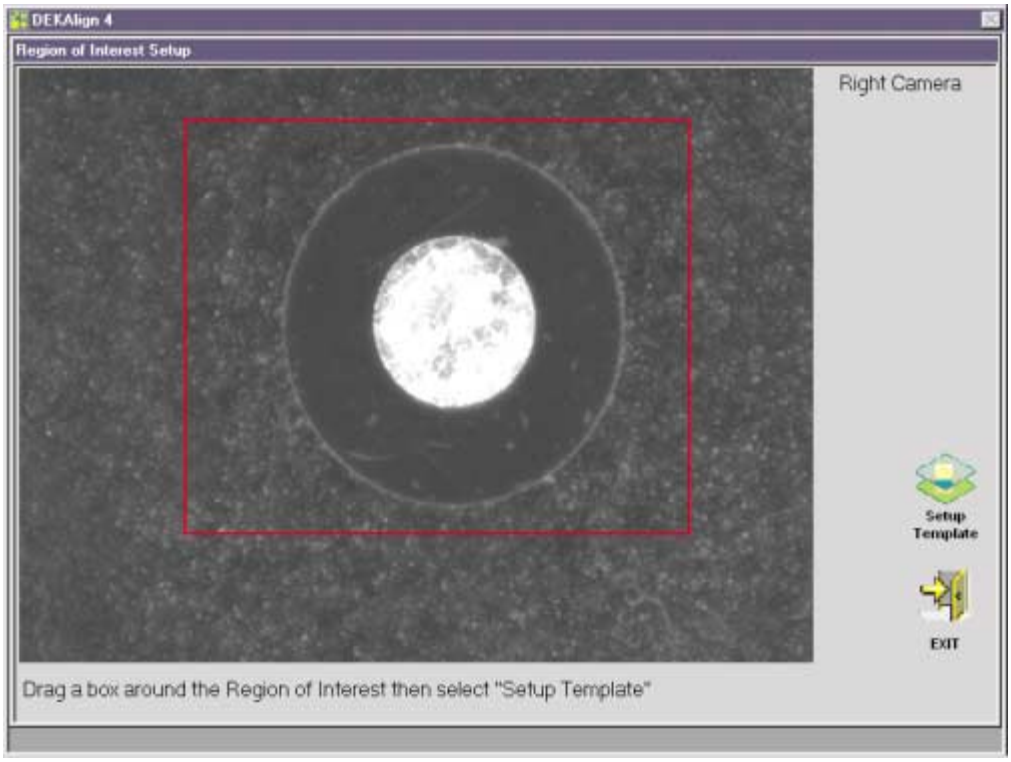


Figure 3-5 Region of Interest Setup Page (with bounding box)

Setup Template — Pressing the Setup Template button accepts the region of interest created and opens the template setup page.

Exit — The exit button returns the user to the camera selection page.

Template Setup Page

When the Template Setup page is opened an optimum threshold value is automatically determined and this, with the current value of the minimum feature parameter, are used to create a 'cleaned up' image (the alignment feature is binarised black and white).

NOTE
If setting up a Mylar template the image is black on a white background. If setting up a PCB template the image is white on a black background.

The selected camera is indicated on the top right hand corner of the screen.

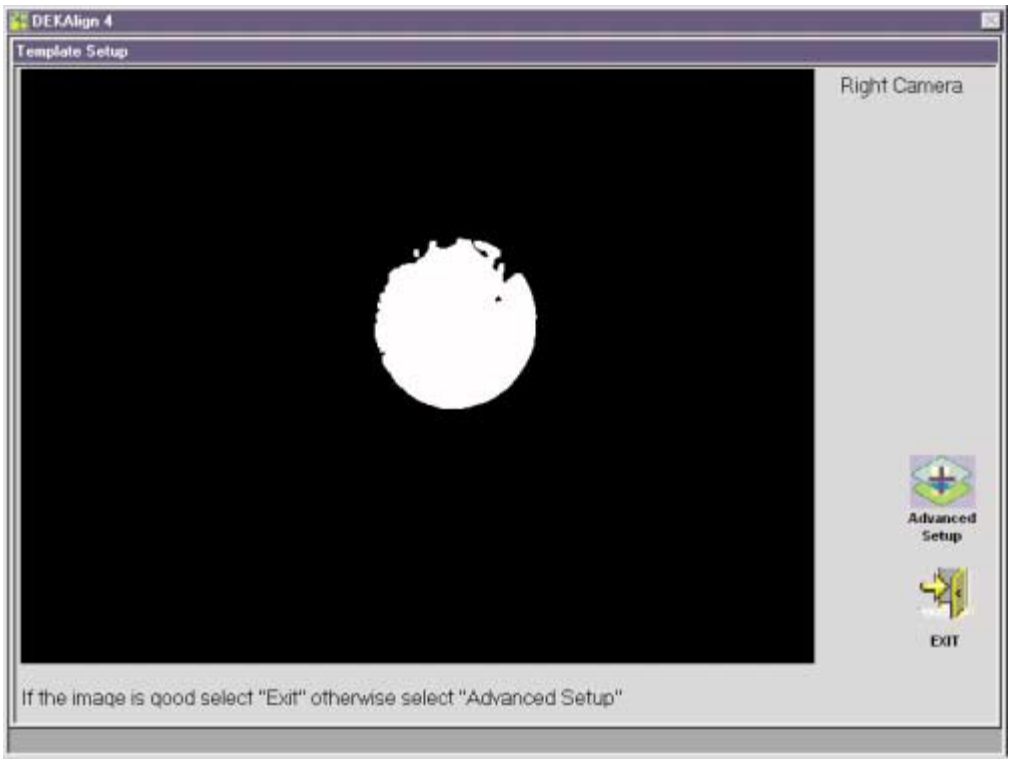


Figure 3-6 Template Setup Page (PCB image)

Advanced Setup — Selecting the Advanced Setup button opens the advanced setup page to enable modification of appropriate parameters.

Exit — Pressing the Exit button accepts the image and returns the user to the region of interest setup page.

Advanced Template Setup Page

The Advanced Template Setup page offers full control over the two parameters which affect the quality of the template.

NOTE
If setting up a Mylar template the image is black on a white background. If setting up a PCB template the image is white on a black background.

The selected camera is indicated on the bottom left hand corner of the screen.

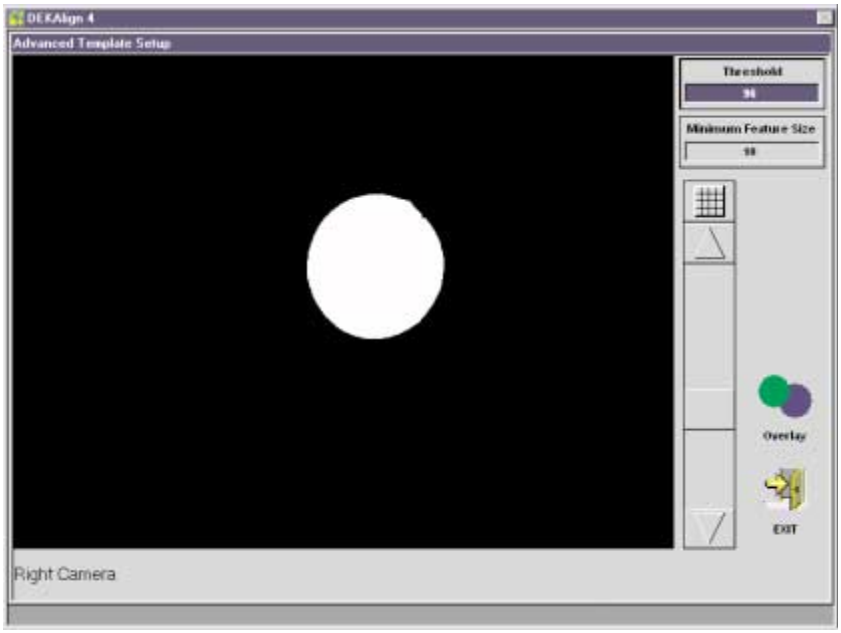


Figure 3-7 Advanced Template Setup Page

Threshold

Pressing the Threshold button connects the threshold parameter to the slidebar control allowing adjustment. The threshold parameter determines the value of the grey scale, below which the image is converted to black and above it is converted to white. Each time a new parameter is entered the template is re-calculated and displayed.

Maximum	255 (black)
Minimum	0 (white)
Default	125
Increment	1

Minimum Feature Size

Selecting the Minimum Feature Size button connects this parameter to the slide bar control allowing adjustment. This determines the minimum number of adjacent pixels that are to be treated as a feature and NOT cleaned up (removed).

Maximum	200 pixels
Minimum	4 pixels
Default	10 pixels
Increment	1pixel

Overlay

Pressing the Overlay button opens the overlay setup page.

Exit

The Exit button when selected, returns the user to the template setup page.

Overlay Setup Page The Overlay Setup Page enables adjustment for all template overlay parameters.

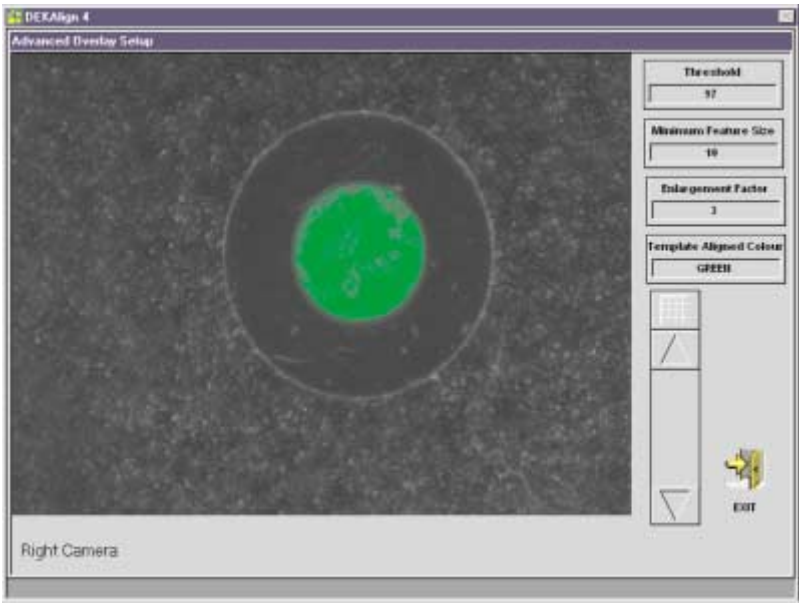


Figure 3-8 Overlay Setup Page

Threshold

Pressing the Threshold button connects the threshold parameter to the slidebar control allowing adjustment. The threshold parameter determines the value of the grey scale, below which the image is converted to black and above it is converted to white. Each time a new parameter is entered the template is re-calculated and displayed.

Maximum	255 (black)
Minimum	0 (white)
Default	125
Increment	1

Minimum Feature Size

Selecting the Minimum Feature Size button connects this parameter to the slide bar control allowing adjustment. This determines the minimum number of adjacent pixels that are to be treated as a feature and NOT cleaned up (removed).

Maximum	200 pixels
Minimum	4 pixels
Default	10 pixels
Increment	1pixel

Enlargement Factor

Selecting the Enlargement Factor button connects this parameter to the slide bar control allowing adjustment. This controls the misalignment tolerance. Acceptable alignment is when the live image is located within the enlarged area.

Maximum	20 pixels
Minimum	0 pixels
Default	3 pixels
Increment	1 pixel

Template Aligned Colour

Pressing the Template Aligned Colour button opens the aligned colour selection list enabling the colour of the aligned template to be set to either green or blue.

Exit

Selecting the Exit button returns the user to the advanced template setup page.

Configuration Page

The vision configuration page offers access to, and control over all saved parameters. To access the configuration page carry out the following:

In the vision setup page select the **Configuration** button.

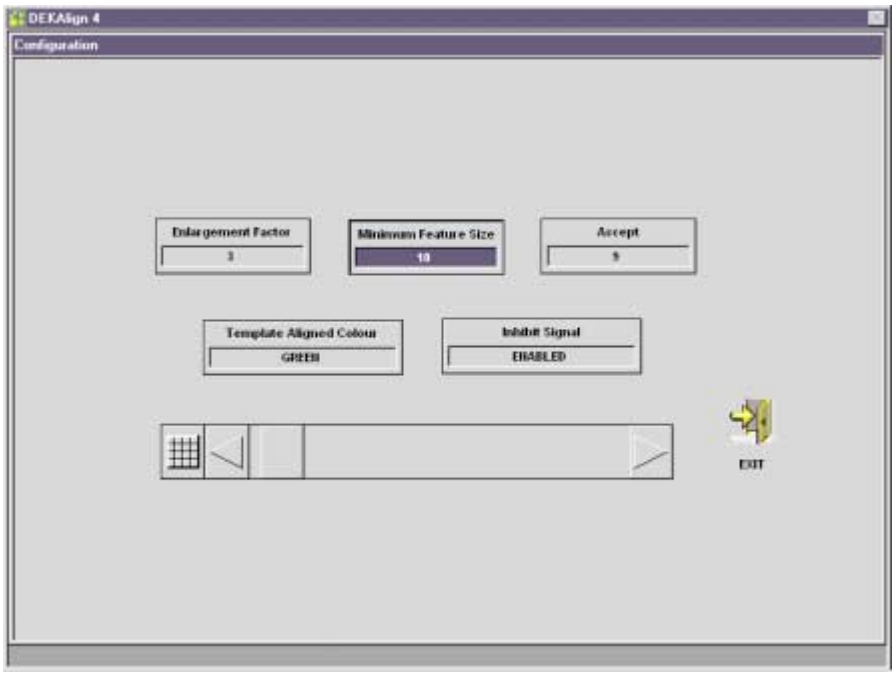


Figure 3-9 Configuration Page

Enlargement Factor

Selecting the Enlargement Factor button connects this parameter to the slide bar control allowing adjustment. This controls the misalignment tolerance. Acceptable alignment is when the live image is located within the enlarged area.

Maximum	20 pixels
Minimum	0 pixels
Default	3 pixels
Increment	1 pixel

Minimum Feature Size

Selecting the Minimum Feature Size button connects this parameter to the slide bar control allowing adjustment. This determines the minimum number of adjacent pixels that are to be treated as a feature and NOT cleaned up (removed).

Maximum	200 pixels
Minimum	4 pixels
Default	10 pixels
Increment	1pixel

Accept	Pressing the Accept button connects to the slide bar control allowing adjustment of the 'noise' parameter that is acceptable within the alignment feature template.
	Maximum 10
	Minimum 1
	Default 9
	Increment 1
Template Aligned Colour	Pressing the Template Aligned Colour button opens the aligned colour selection list enabling the colour of the aligned template to be set to either green or blue.
Inhibit Signal	Selecting the Inhibit Signal button opens the selection list control.
	Enabled (Signal enabled)
	Disabled (Signal disabled)
Exit	Selecting the Exit button saves any updated parameters and returns the user to the main setup page.

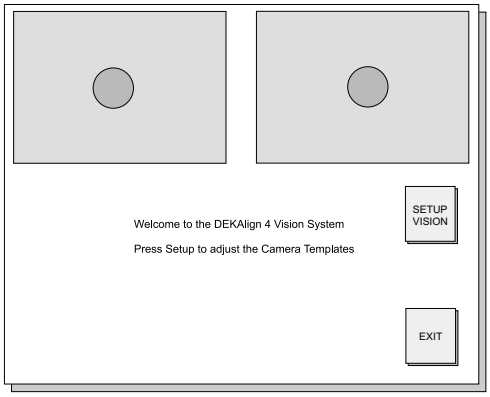
Vision Setup

Before print operations can be carried out the vision system requires setting up so that a reference image of the stencil is obtained. This is achieved by using a white Mylar flap.

Setting up the reference image is achieved using the following procedures:

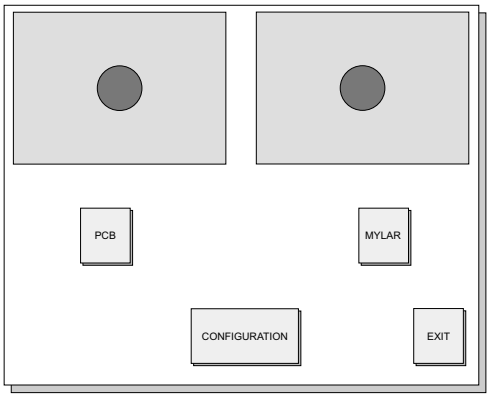
Vision System Access Page

STEP 1
Select **Setup Vision**



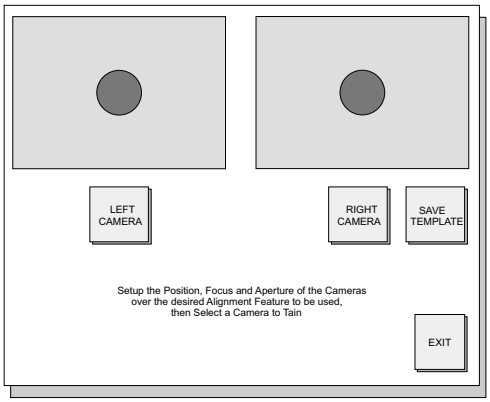
Main Setup Page

STEP 2
(Select type of template required)
Select either **Mylar** or **PCB** button
- For Mylar proceed to Step 3
- For PCB proceed to Step 9



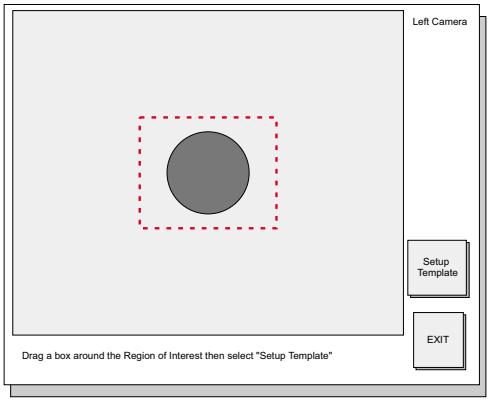
Camera Selection Page

STEP 3
Select **Left Camera** to train for Mylar template.



Region of Interest Setup Page

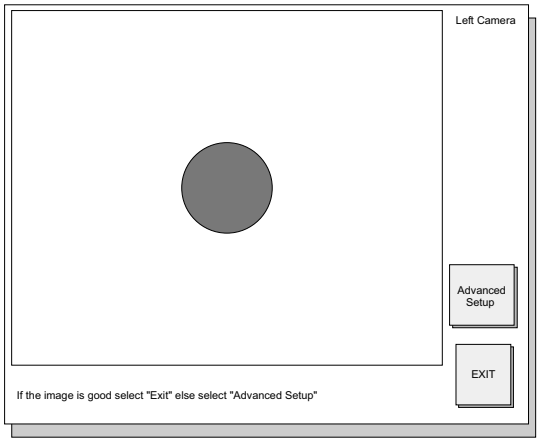
STEP 4
Create region of interest around image by creating bounding box using trackball mouse. When region is defined press **Setup Template** button.
NOTE
Drag out bounding box by using left mouse button whilst moving the mouse.



Template Setup Page

STEP 5

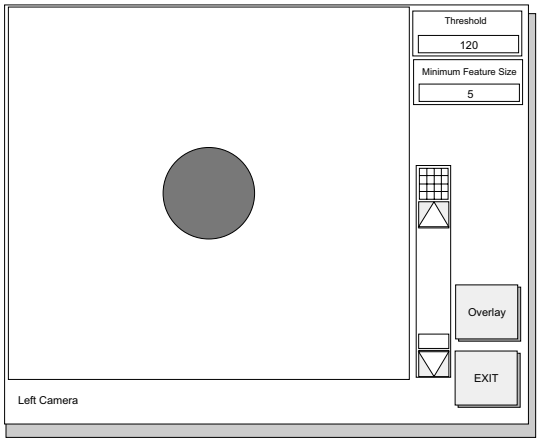
The optimum threshold value and cleaned up image is displayed.
If template is acceptable select **Exit** button **twice** and proceed to Step 7.
Otherwise select **Advanced Setup** button to proceed to Step 6.
NOTE
Mylar - black image on white background
PCB - white image on black background



Advanced Template Setup Page

STEP 6

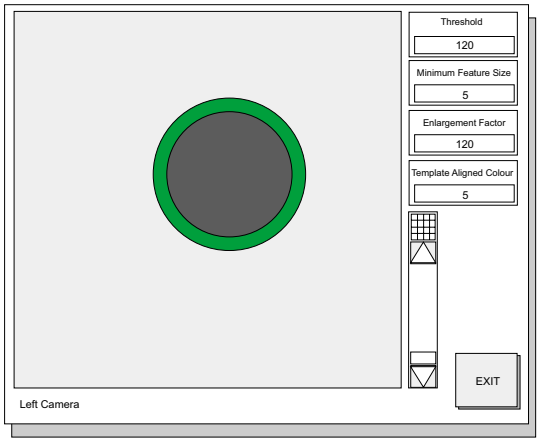
Advanced Setup facility enables modification of selected parameters.
Pressing **Overlay** opens the overlay setup page.
Selecting **Exit** moves page back to Template Setup page.



Overlay Setup Page

STEP 6a

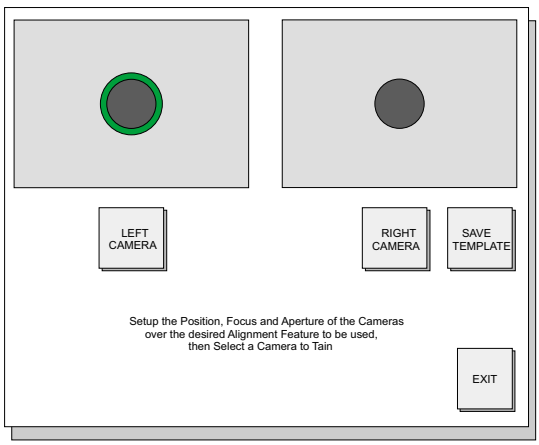
The image represents a **PCB** Template Overlay.
Outer area - live image of the board
Outer circle - overlay
Inner circle - live video image of alignment feature seen through the overlay.
Select **Exit** button **4** times until the **Camera Selection Page** is highlighted.



Camera Selection Page

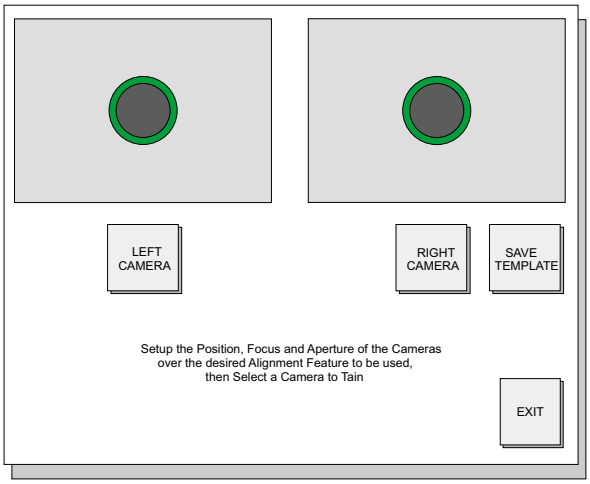
STEP 7

Repeat Steps 3 - 6a for right hand camera setup.



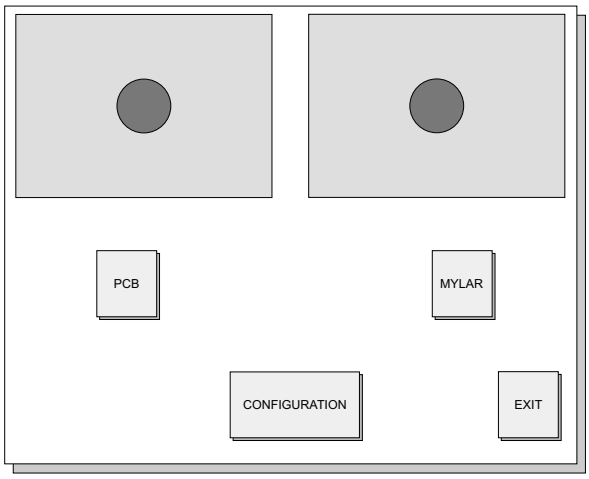
Camera Selection Page

STEP 8
On completion of both camera alignments select **Save Template**. Press **Exit** to return to Main Setup Page.



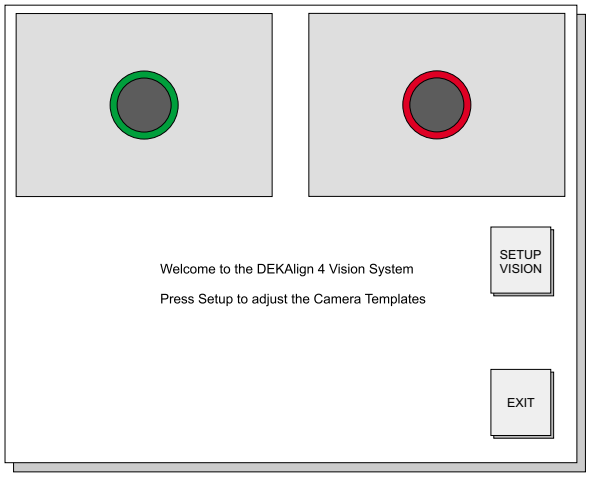
Main Setup Page

STEP 9
Select **PCB** button
Repeat Steps 3 to 8.
Select **Exit** to return to System Access Page.



Vision Access Page

STEP 10
Align PCB to stored images.
(If required re-position board by X,Y and Theta Adjusters.



FAULT FINDING

Symptom	Possible Solution
Output from Camera Unstable	Check lighting is available
	Check camera aperture
	Check camera sync interface box connections

ERROR MESSAGES

There are no system error messages.