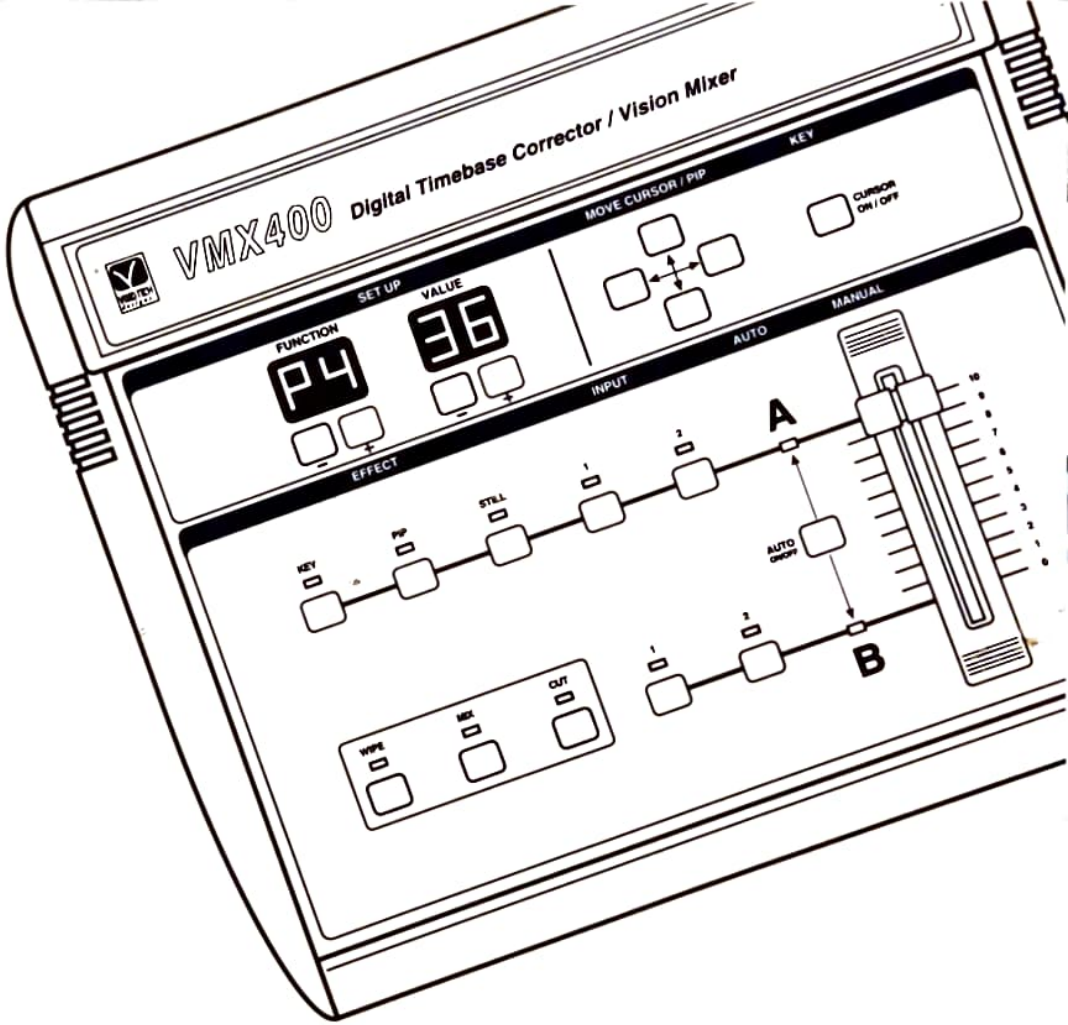


VMX400

Digital Time Base Corrector/Vision Mixer

User's Guide

Video Tech Designs plc

Thank you for choosing the VMX400 Digital Time Base Corrector/Vision Mixer. It is a high quality product, designed and manufactured in Britain by *Video Tech Designs*, which we are sure will give years of useful and reliable service.

To get the best out of your VMX400 please read this User's Guide.

The following pages will explain how to connect the VMX400 to camcorders and video recorders so you can correct, stabilise and mix pictures together. The manual also gives lots of hints and tips to enable you to produce interesting and professional looking films.

IMPORTANT

Don't forget to return the Guarantee Registration Card.

This will ensure you receive a free initial copy of our regular Newsletter which has up-to-the minute video news and creative ideas for using Video Tech Designs equipment.

Your VMX400 is supplied with:–

1 x Mains adaptor (9V, @ 1.5A DC)
2 x Phono to Phono A/V lead
2 x S to S video lead
1 x Phono to SCART input adaptor*
1 x User's Guide
1 x Quick Reference Card
1 x Guarantee Card

* NOTE: The SCART input adaptor is only suitable for use on the copy VTR.

Copyright Notices

EEC Electromagnetic Compatibility Regulations

EMC Statement

This equipment has been tested and complies with the European standards for electromagnetic emissions and immunity as applied to domestic audio and video equipment.

Radio and Television Interference

Although this equipment has been tested to the above standards, there is no guarantee that interference with, and by, other equipment will not occur in a particular installation.

The most obvious signs of interference are noises on audio and patterning on television pictures. Sources of interference can usually be identified by turning off, or bypassing, the offending equipment. If a particular piece of equipment does cause interference to others then you could try the following:–

- Try moving the equipment further apart.
- Check all the plugs are pushed fully into their sockets.
- Check the continuity of the connecting leads (especially the common screens).
- Make sure all your leads are of the screened type.
- Try connecting the offending equipment to a different mains outlet (preferably one that is connected to a different circuit breaker at the fuse box).
- Consult an experienced radio/television technician.

High levels of electromagnetic interference should not damage this equipment, but may cause it to malfunction. Should this be the case, first remove the source of the interference, then reset the equipment by turning off the power supply for 5 seconds.

♦ **Note: For full compliance with the regulations, you should always use good quality shielded cables to connect this unit to other equipment, and always use the approved mains adaptor.**

Δ **Important: Changes or modifications to this unit not authorised by Video Tech Designs plc will void its EMC Certification and guarantee.**

Contents

Chapter 1 Introduction

Precautions

The mains adaptor supplied with the VMX400 is double insulated, and has built-in thermal protection for added safety. It is quite normal for this adaptor to feel warm during use and to emit a faint buzzing sound.

- *It is* recommended that you switch off or unplug the adaptor from the mains when not in use.
- *Never* leave the mains adaptor plugged into the mains without being connected to the VMX400.
- *Do not* short circuit the supply plug from the mains adaptor.
- *Do not* use the mains adaptor with any other equipment.
- *Do not* expose the mains adaptor to moisture.

Δ **Warning: Failure to follow these guidelines may result in the internal safety fuse 'blowing'. This fuse is not resetable and so the adaptor will have to be returned to your local dealer, or *Video Tech Designs plc*, for replacement.**

◆ **Note:** It is normal for the rear of the VMX400 to get warm where it is bolted to the internal heatsink.

Compatibility

The VMX400 is designed to be connected to standard 625 line PAL video recorders, camcorders and televisions.

It is fitted with 4 pin 'S' type connectors for connecting to Super-VHS and Hi8 equipment, and phono sockets for connecting to composite video equipment such as standard VHS and 8mm.

Super-VHS and Hi8 equipment can be connected using composite video connections but a slight loss of definition will result.

Digital Video (DVC) equipment should be connected using the S(Y/C) connectors.

Δ **Important: The VMX400 will not work directly with RF (Aerial) signals or RGB signals from TVs and computers.**

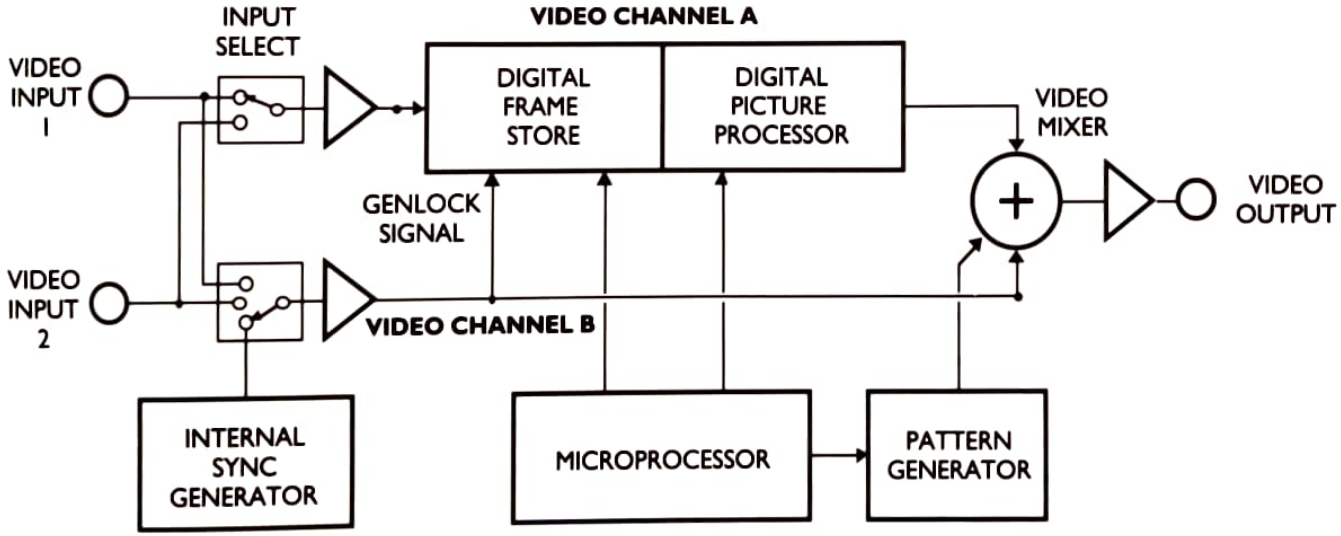
System Overview

The VMX400 uses the very latest digital techniques to stabilise and synchronise video signals so they can be either timebase corrected or mixed together.

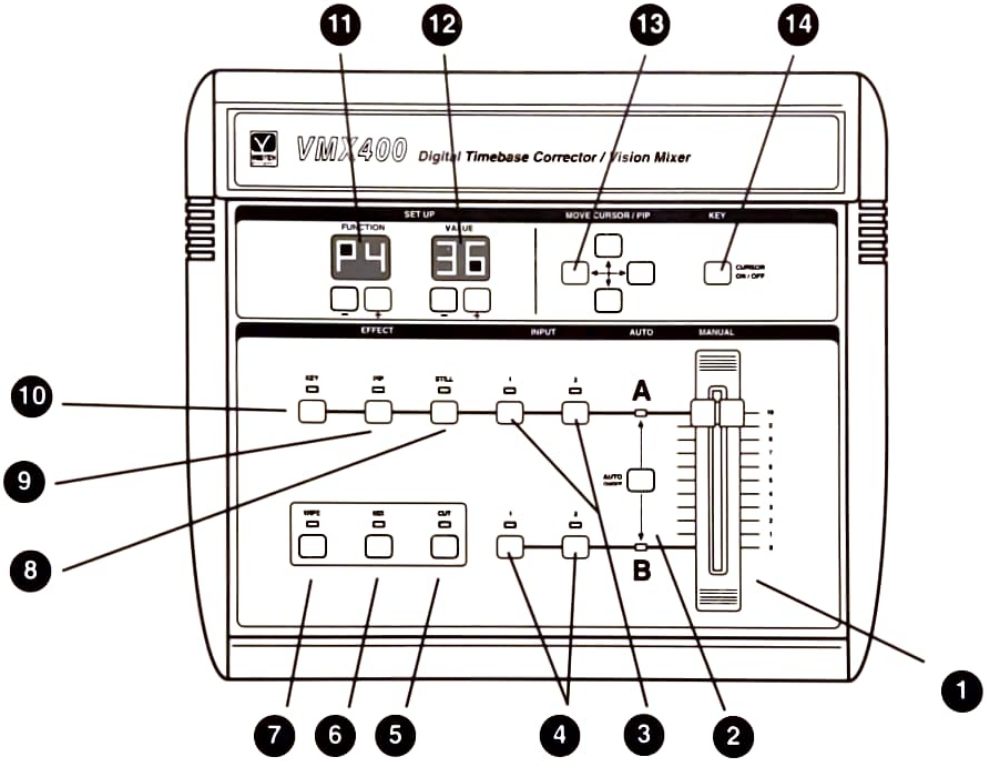
At the heart of the VMX400 is an 8 megabit high speed digital dual field video frame store. This frame store enables a number of digital effects to be performed on the picture passing through channel A such as providing a perfect still frame, picture in picture effects and chroma keying.

The most important feature of this frame store is that it can synchronise channel A with channel B, so that when channel B is set to either video input 1 or video input 2, the VMX400 can wipe, mix or cut between pictures without break-up.

When no video input is selected for channel B, channel B becomes a black picture and channel A is synchronised to an ultra-stable clock so its output is fully timebase corrected to virtually broadcast standards.



Chapter 2 Control Functions



1 MANUAL CONTROL
Manually controls the video Wipe, Mix and Cut effects. Only works when one of the WIPE, MIX or CUT lights is ON.

2 AUTO ON/OFF
Pressing this button turns the automatic Wipe, Mix and Cut effects on or off. When AUTO is ON all the red Wipe, Mix and Cut lights are off, and one of the red A or B lights is ON. The automatic effect is performed when one of the Wipe, Mix or Cut buttons is pressed. The speed of the automatic Wipe or Mix effect can be changed by setting the FUNCTION (11) display to E3 and the VALUE (12) display between 0 and 9.

3 VIDEO INPUT – CHANNEL A
Selects either video input 1 or video input 2 for channel A. When no input is selected, channel A is a plain colour. The colour can be changed by setting the FUNCTION display to E4 and the VALUE display between 0 and 99.

4 VIDEO INPUT – CHANNEL B

Selects video input 1 or 2 for channel B. When a video input is selected, channel B is black and channel A is synchronised to a stable clock so the VMX400 can be used as a timebase corrector.

5 CUT

During automatic operation, pressing this button instantly switches between video channels A and B. In manual mode, channels A and B will change when the MANUAL (1) slider moves through its central position.

6 MIX

During automatic operation, pressing this button will dissolve video channel A into B, and vice versa. In manual mode, channels A and B will be mixed according to the position of the MANUAL (1) slider.

7 WIPE

During automatic operation, pressing this button will wipe video channel A into B, and vice versa. In manual mode, channels A and B will be wiped according to the position of the MANUAL (1) slider.

8 STILL

Selecting STILL freezes the picture into channel A. STILL also works in conjunction with PIP (9) and KEY (10).

9 PIP

Pressing PIP (Picture In Picture) reduces the size of the channel A picture and superimposes it over the channel B picture. The size and border of the PIP can be changed *(see pages 16 and 17)*. The position of the PIP can be altered by pressing the MOVE (13) buttons.

10 KEY

When KEY is ON and the MANUAL slider (1) is set to B, all of a selected colour in the picture on channel A is replaced by the picture from channel B. The KEY colour is selected using the CURSOR KEY *(see page 20)*. KEY also works in conjunction with STILL (9) and PIP (10) *(see pages 15 & 16)*.

11 FUNCTION

This display indicates which of the VMX400's many functions you can change in the VALUE display. The +/– buttons below the display change the function. For a full list of the functions available see page 25.

12 VALUE

This display indicates the value of the current function. The +/– buttons below the display change the value. For a full list of the functions and values available see page 29.

HINT: It may help if you think of the FUNCTION display as showing you which 'knob' to adjust and the VALUE display showing you where you have set that 'knob'.

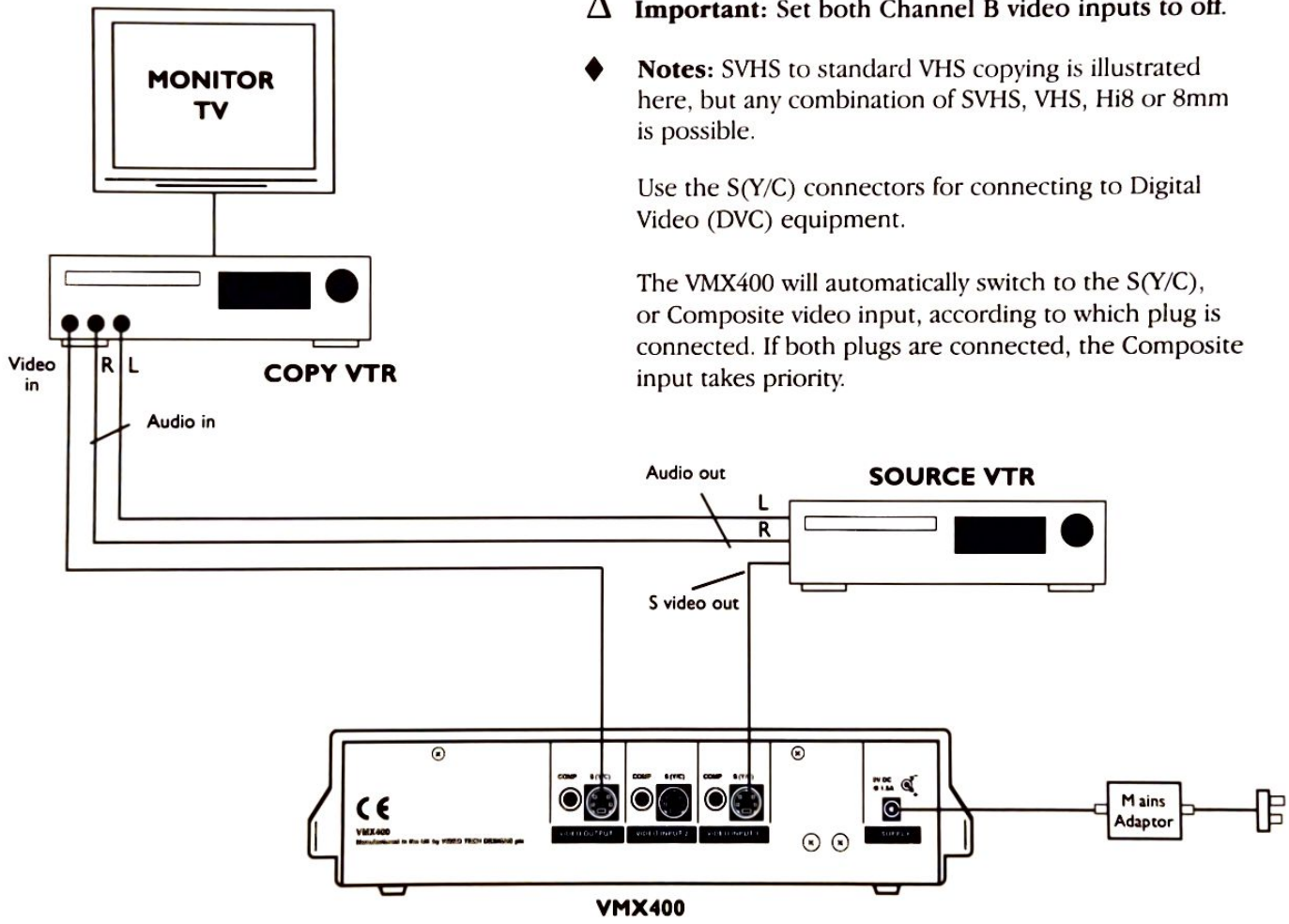
13 MOVE

These 4 buttons move either the PIP or the Key Cursor around the screen.

14 CURSOR ON/OFF

Pressing the CURSOR ON/OFF button changes the picture to channel A only, and reveals a cursor box with which the 'Key Reference Colour' for the KEY effect is selected. The cursor box can be moved around the screen using the MOVE (13) buttons.

A – Simple tape to tape copying using the VMX400 as a video processor/timebase corrector.



Δ **Important:** Set both Channel B video inputs to off.

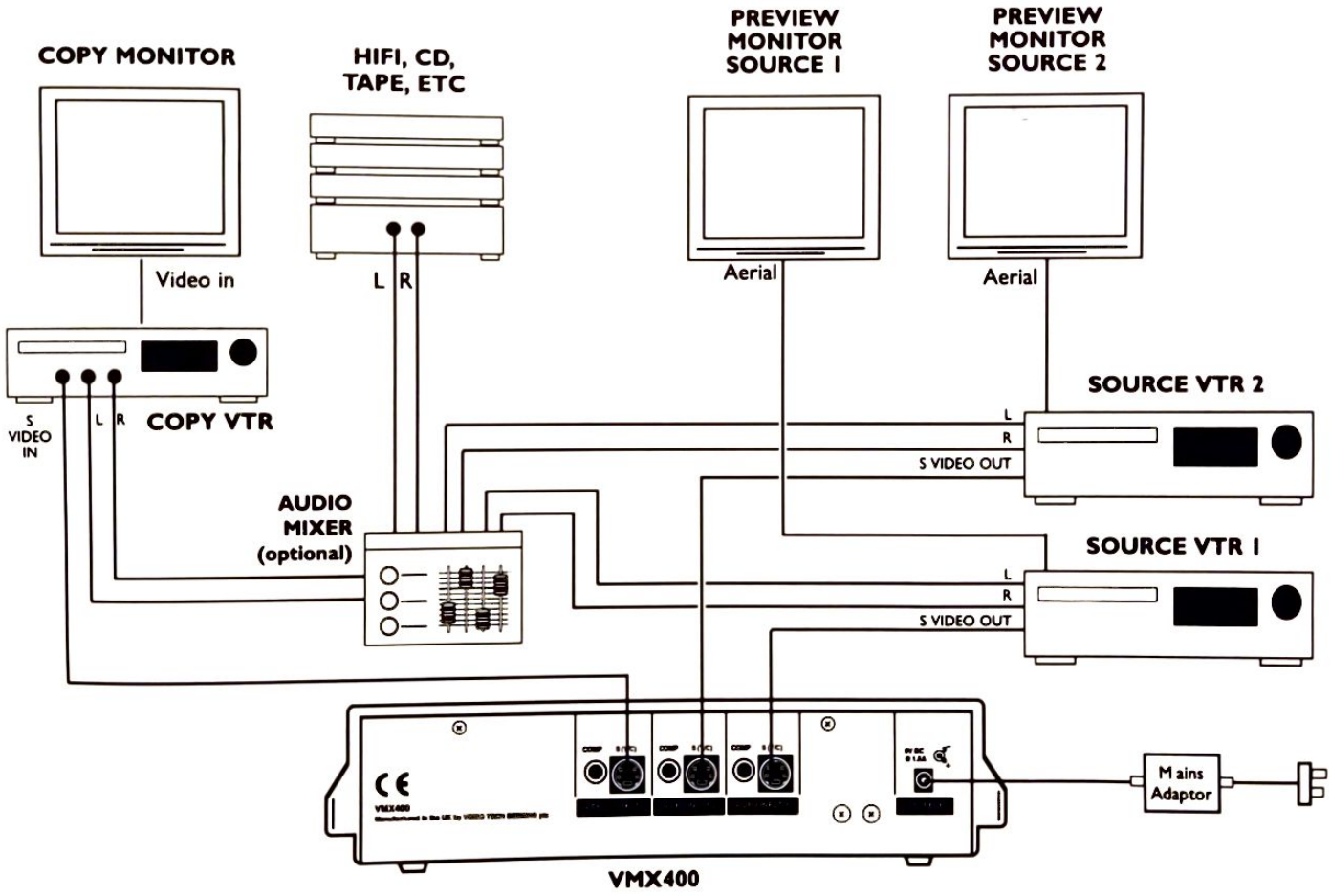
♦ **Notes:** SVHS to standard VHS copying is illustrated here, but any combination of SVHS, VHS, Hi8 or 8mm is possible.

Use the S(Y/C) connectors for connecting to Digital Video (DVC) equipment.

The VMX400 will automatically switch to the S(Y/C), or Composite video input, according to which plug is connected. If both plugs are connected, the Composite input takes priority.

B – 'Studio' set-up using the VMX400 as a vision mixer.

- **Note 1:** The 'Preview Monitors' are very useful for showing what is playing back on the SOURCE machines, but they could be omitted for simpler set-ups.
- **Note 2:** The source VTRs can be replaced by cameras/camcorders for 'live' recording.



Demonstration Mode

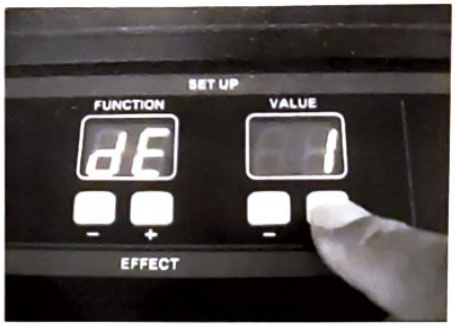
The VMX400 has a built-in demonstration facility which illustrates some of the video effects it can perform.

- **Note: Before the demonstration can be run properly, the input of the VMX400 must be connected to two different video sources.**

  The demonstration can be run using just one video source but the effects will not be so impressive.

To run the demonstration, first put the VMX400 into 'demo mode' by pressing the FUNCTION + or – buttons until the letters 'dE' are shown in the FUNCTION window.

To start the demonstration, press the VALUE '+' button to change the display from '0' to '1'.



The lights and displays on the console will indicate the status of each effect while the demonstration runs.

To stop the demonstration press the VALUE button to return the VALUE display to '0'.

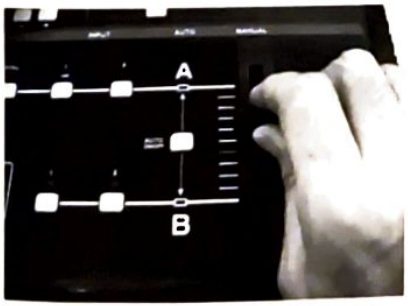
Chapter 4 Using the VMX400 as a Vision Mixer

The VMX400 works by synchronising the picture passing through channel A with the picture from channel B. For maximum flexibility, each of the two channels can be switched to either Video Input 1 or Video Input 2. However, for most applications channel A would be set to video input 1 and channel B to video input 2.

♦ **Note: When used as a Vision Mixer, the video output from the VMX400 is only as stable as the video source into channel B. It is therefore recommended that you always use the most stable source for channel B.**

When both channel B video inputs are turned off, channel A is synchronised to a very stable internal clock and the VMX400 becomes a timebase corrector. The result is a video output that is completely re-timed and corrected to virtually broadcast standards.

∇ **Caution: To prevent picture break-up, ALWAYS change sources using the WIPE, MIX or CUT facilities.**



Manual Control

Initial set-up

- Connect the VMX400 as shown in diagram B on page 9. The video sources can be VTRs or cameras (camcorders).
- Set channel A to video input 1 and channel B to video input 2.
- Make sure the red AUTO lights are off (press the AUTO ON/OFF button if they are on).
- Set the MANUAL slider control fully up or fully down.

To WIPE pictures together

- Set the desired wipe pattern (See *'Setting Wipe Pattern'* on page 13).
- Press the WIPE button so the WIPE light is on.
- Move the MANUAL slider up or down to WIPE one picture into another.

To MIX pictures together

- Press the MIX button so the MIX light is on.
- Move the MANUAL slider up or down to dissolve one picture into another.

To CUT from one picture to another

- Press the CUT button so the CUT light is on.
- Move the MANUAL slider fully up or fully down. The picture will 'cut' from one to another as the slider passes through its central point.

Automatic Control

Initial set-up

- Connect the VMX400 as shown in diagram B on page 9. The video sources can be VTRs or cameras (camcorders).
- Set channel A to video input 1 and channel B to video input 2.
- Set the MANUAL slider control fully up or fully down.
- Press the AUTO ON/OFF button so that one of the red 'AUTO' lights is on. (Note that the red light that comes on is the one nearest to the current position of the MANUAL slider control, and that the red WIPE, MIX and CUT lights are all off.)
- The speed of the automatic effects can be changed using the FUNCTION and VALUE buttons in the SET-UP section.
  For example: Press the FUNCTION buttons until the display reads E3. Press the VALUE buttons so the display reads the desired speed. (0 = fast, 9 = slow).

To WIPE pictures together

- Set the desired wipe pattern (See *'Setting the Wipe Pattern'* on page 13).
- Press the WIPE button.

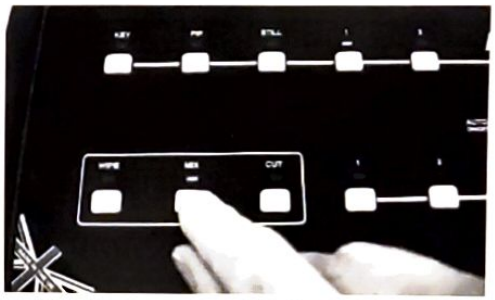
To MIX pictures together

- Press the MIX button.

To CUT from one picture to another

- Press the CUT button.

Δ **Important:** The AUTO lights indicate which of the two channels A or B are are currently active. While an effect is being performed automatically the AUTO light of the current active channel will flash to indicate that something is happening. The light will stop flashing when the effect has finished.



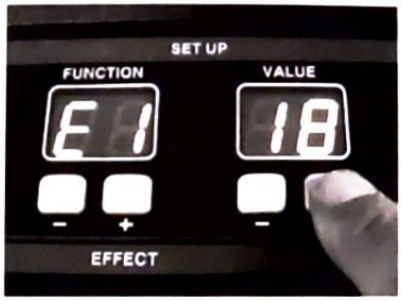
Hint: To change smoothly back from automatic control to manual control, be sure to set the position of the MANUAL slider to correspond to whichever red AUTO light is on, before you press the AUTO button.

Setting the Wipe Pattern

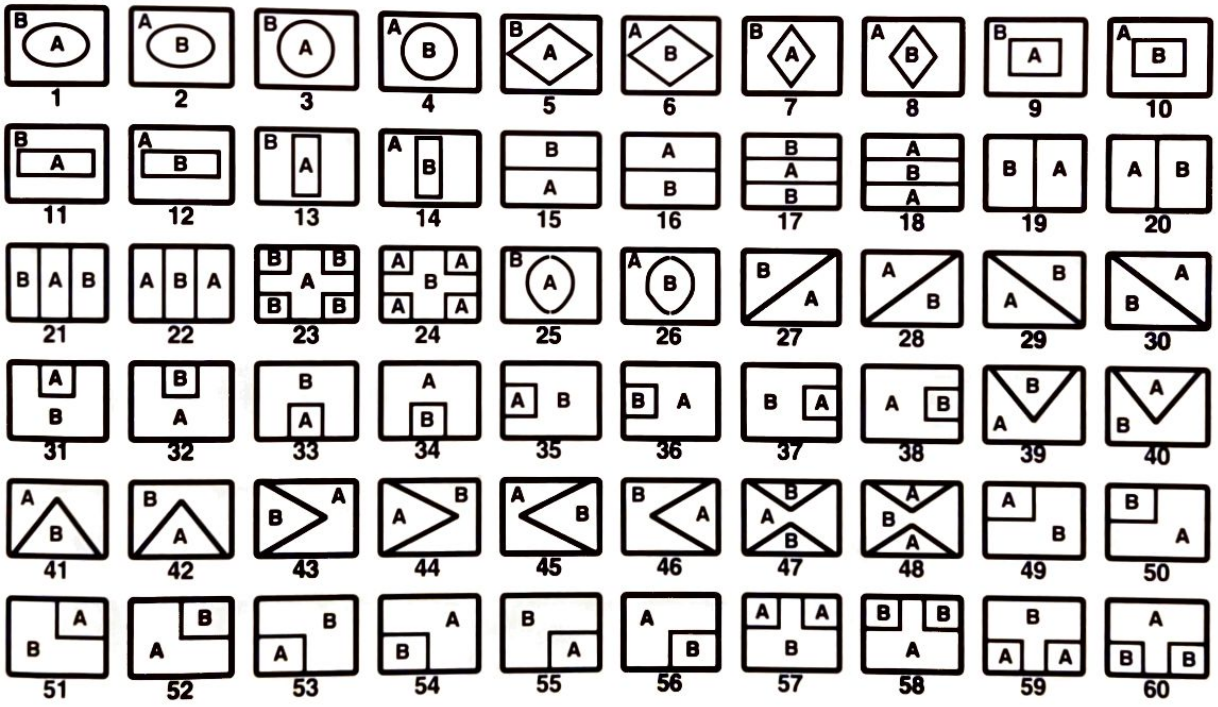
The same wipe patterns apply to both Manual and Automatic control.

To change the wipe effect

Press the + or – button under the FUNCTION display until the display reads E1. Press the + or – button under the VALUE display until the display indicates the number of the pattern you want. The VALUE can be set anywhere between 1 and 60, the corresponding patterns are shown below.



HINT: Holding down both + and – VALUE buttons together resets the display to 1.



The table indicates roughly where the picture for each video channel A and B are when the wipe is halfway through the effect.

To change the 'softness' of the wipe edge

Press the + or – button under the FUNCTION display until the display reads E2.

Press the + or – button under the VALUE display to adjust the degree of softness. The number can be set between 1 and 4 (1 = hard, 4 = very soft).

For example:

Hard Wipe

Soft Wipe

HINT: You can experiment with the wipe and wipe edge effects by setting the VMX400 to manual wipe and positioning the MANUAL slider so the effect is visible on screen.

Fading the Picture (using MIX)

Pictures can be manually faded or automatically faded by turning both video inputs off on either channel A or channel B.

For example: If both the video input lights 1 and 2 are turned off on channel A, the picture passing through channel B can be faded in or out either by moving the MANUAL slider up or down or by operating the automatic MIX facility.

The colour of the fade can be changed by setting the FUNCTION display to E4 and adjusting the VALUE display to between 0 and 99.

Values 0-99 cover the whole spectrum of colours in 5 ranges:–

0-3	are Black, Grey, White and Extra White
4-35	are Bright Pure colours
36-51	are Bright Pastel colours
52-83	are Dark Pure colours
84-99	are Dark Pastel colours

If you turn off both video input lights on channel B, the picture passing through Channel A can only be faded or wiped to black.

∇ **Caution: Changing video inputs while recording is not recommended because the picture will jump.**

Masking the Picture to a Colour

1. Switch off both video inputs 1 and 2 to channel A.
2. Select either video input 1 or video input 2 for channel B.
3. Partially wipe out the picture using the manual slider.
4. The colour of the mask can be changed by setting the FUNCTION display to E4 and adjusting the VALUE display to between 0 and 99.
5. The shape and edge of the mask are selected in the same way as the wipe effect. (See page 13).

♦ **Note: If you switch off both video inputs to channel B, you can only have a black mask.**

Hard Mask

Soft Mask

Still

Pressing the STILL button, so the STILL light is on, freezes the channel A picture on the screen. Holding down the STILL button produces a strobe effect.

STILL can be operated in conjunction with PIP and KEY.

STILL has two modes of working:

Normal This is the default mode.

High definition In this mode the picture is fully interlaced and provides the highest quality pictures. However, when applied to fast moving scenes some flickering between alternate picture fields may be noticeable.

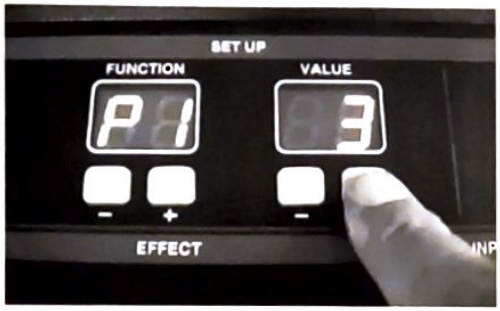
To change the STILL mode, press the FUNCTION + or – buttons until the FUNCTION display shows the characters 'F1', then press the VALUE + or – buttons to set mode '0' or '1'.

For example:

Function	Value	Effect
F1	0	Normal Still frame
F1	1	High Definition Still frame

PIP (Picture-in-Picture) Size

At any time the size of the PIP can be changed using the FUNCTION and VALUE displays in the SET-UP section.



To change the PIP size, press the FUNCTION + or – buttons until the FUNCTION display shows the characters 'P1', then press the VALUE + or – buttons until the VALUE display indicates the desired size.

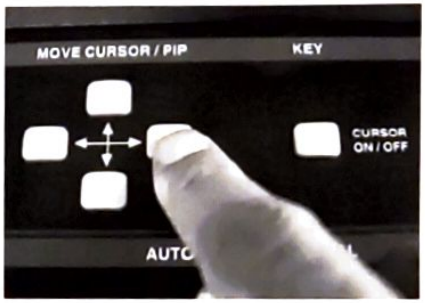
For example:

Function	Value	Effect
P1	1	PIP = 3/4 screen width
P1	2	PIP = 2/3 screen width
P1	3	PIP = 1/2 screen width
P1	4	PIP = 1/3 screen width
P1	5	PIP = 1/4 screen width

◆ **Note: Changing the size of the PIP while STILL is on will turn STILL off.**

PIP Position

When PIP is on, the PIP can be moved around the screen by pressing the MOVE CURSOR/PIP buttons. Holding down the buttons will move the PIP continuously. Individual presses nudge the PIP into position. The PIP will stop moving when the edge of the screen is reached.



HINTS:

Simultaneously holding down the left and right buttons centres the PIP horizontally on the screen.

Simultaneously holding down the up and down buttons centres the PIP vertically on the screen.

Simultaneously holding down any other pair of buttons moves the PIP diagonally.

PIP Border

To make the PIP stand out from the picture underneath it, a coloured border can be added.

To change the PIP border, press the FUNCTION + or – buttons until the FUNCTION display shows the characters 'P2', then press the VALUE + or – buttons to turn the border on or off.

For example:

Function	Value	Effect
P2	0	No PIP border
P2	1	Put border around PIP

The colour of the border can be changed using Function E4 and setting it to a value between 0 and 99.

PIP

PIP with border

♦ **Note: When PIP is used in conjunction with KEY the borders are disabled.**

Using PIP as a Picture Window

When PIP is on, the PIP shape can be used as a window through which the channel A picture can be seen. It has the advantage over the normal masking patterns because it is a box that can be positioned anywhere on the screen using the MOVE buttons.

To turn on this effect, first set the MANUAL slider or AUTO lights to channel A, press the PIP button so the PIP light is on, then use the SET-UP section to set FUNCTION P3 to VALUE 1.

For example:

Function	Value	Effect
P3	0	Normal PIP
P3	1	PIP replaced by window

♦ **Notes:** A border can be turned on or off around the PIP window using FUNCTION P2 in the same way as the normal PIP.
The colour of the surrounding area can be changed using Function P4 and setting it to a value between 0 and 99.
Setting the MANUAL slider to B puts the PIP window into the B channel picture.

Using PIP with Other Facilities

The PIP can be used in combination with other VMX400 effects.

For example: Because the manual and automatic Wipe, Mix and Cut effects still work when PIP is selected, we have provided 4 ways that they can interact with the PIP. The default mode (when the unit is switched on) is A6 = 0 which wipes or fades the channel B picture out underneath the PIP.

Examples of the 4 modes are shown below. In each case we show a wipe effect (Pattern 20) and mix effect halfway through their operations.

To fully appreciate and understand what these effects will do it is recommended that you experiment with each one on your own pictures.

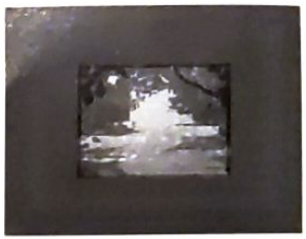
Function	Value	Effect
A6	0	Fades or Wipes out the channel B picture leaving behind the PIP/KEY effect.

Wipe

Mix

Function	Value	Effect
A6	1	PIP wipes/dissolves into 'Window'

Wipe



Mix

Function	Value	Effect
A6	2	Wipe/mix 'Window' into picture B

Wipe

Mix

Function	Value	Effect
A6	3	Dissolve or Wipe out the PIP/KEY effect leaving the channel B picture.

Wipe

Mix

Key

The KEY effect is turned on and off by pressing the KEY button. For the KEY effect to be visible, the MANUAL slider should be set to channel B.

The KEY effect replaces a selected colour in the channel A picture with the channel B picture. The effect is frequently used on television during presentations such as the weather forecast, where the presenter is 'cut-out' and superimposed over the weather map. It can also be used for special effects such as flying sequences, matté effects and titling.

A typical studio set-up would consist of a camera pointing at a presenter who is standing against a blue or green background. The background is then electronically replaced by a picture from another camera or tape.

The VMX400 has been designed so it can use any colour, including black, grey or white, as the 'key reference' colour. (See page 20).

To increase its flexibility, the VMX400 has 4 modes which define how the 'key' effect is extracted from the video signal.

For example:

Value 1 uses a combination of the colour (C), and black & white (Y), components of the picture to provide the 'key reference'. This is the normal default mode.

Value 2 uses just the black & white (Y) part of the picture to provide the 'key reference', and ignores the colour (C) part (sometimes called Luma-Key).

Value 3 uses just the colour (C) part of the picture to provide the 'key reference', and ignores the black & white part.

Value 4 uses a mixture of Y+C with a blue bias to provide the 'key reference'.

To change the key mode, press the FUNCTION + or – buttons in the SET-UP section until the FUNCTION display shows the characters 'C1', then press the VALUE + or – buttons to select the key mode.

For example:

Function	Value	Effect
C1	1	Y+C Key reference
C1	2	Y only Key reference
C1	3	C only Key reference
C1	4	Y+C with blue bias

The choice of which mode to use will depend on the subject and the effect you want to create.

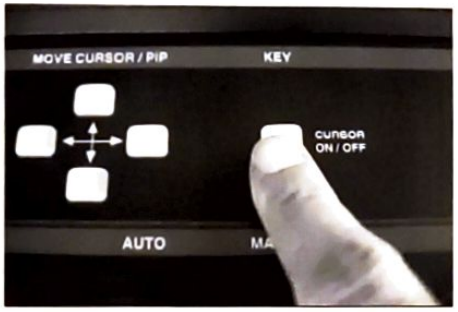
In the same way that the wipe and mix controls interact with the PIP, the key effect can also be wiped or dissolved in or out in 4 different ways.

For example:

Function	Value	Effect
A6	0	Fade/Wipe CH B leaving PIP/KEY
A6	1	Fade/Wipe PIP/KEY into window
A6	2	Fade/Wipe window into PIP/KEY
A6	3	Fade/Wipe PIP/KEY leaving CH B

Setting the 'Key Reference' colour

To set which colour or shade you want to replace in the picture (the 'Key Reference' colour), press the CURSOR ON/OFF button. The picture will switch to just display the channel A picture with a small white cursor square in it. Using the MOVE buttons, move the white cursor around the screen until the spot in the centre of the cursor is over the colour you want to replace. Press the CURSOR ON/OFF button again to turn off the cursor and load the selected colour into memory. Press the KEY button to restore the KEY effect.



Δ **Caution: Every time you press the CURSOR ON/OFF button you re-define the 'Key Reference' colour. So if you have spent some time getting the colour just right, think carefully before you press the CURSOR ON/OFF again.**

Setting the 'Key' Thresholds

It is sometimes difficult to get an even shade of colour over the whole of the key area, which can cause the key effect to break up. With the VMX400 you can individually adjust the Luminance (Y) thresholds and the Chrominance (C) thresholds. The Luminance (Y) threshold sets how much variation of the black and white component of the 'Key Reference' colour is allowed, and the Chrominance (C) threshold sets how much variation of the Colour component of the 'Key Reference' colour is allowed.

To change the key threshold, press the FUNCTION + or – buttons, in the SET-UP section, until the FUNCTION display shows the characters 'C2' or 'C3', then press the VALUE + or – buttons to select the key threshold value.

For example:

Function	Value	Effect
C2	1–16	Set Luma Key switching thresholds
C3	1–16	Set Chroma Key switching thresholds

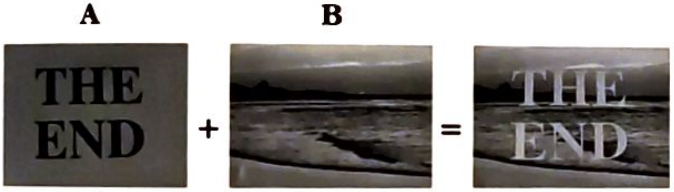
A value of 1 is the narrowest range which does not allow for much variation in the Key Reference colour. A value of 16 is the widest range which allows for the most variation. These values should only be changed while looking at their effect on the screen. If, after trying all values, you do not get the desired effect, try resetting the 'Key Reference' colour and/or adjusting the lighting on the subject.

Using the 'Key' Effect

With a bit of imagination and experimentation, you can create some quite amazing effects with the VMX400 keying facilities. You can superimpose your own titles over a picture, mask out the picture with any shape you want, create fascinating matté effects and even 'fly' someone across a picture.

The Key effect can also be used in conjunction with other effects such as PIP, STILL, WIPE, MIX and CUT. The following examples are just a few of the possible effects you can create.

1 Titling

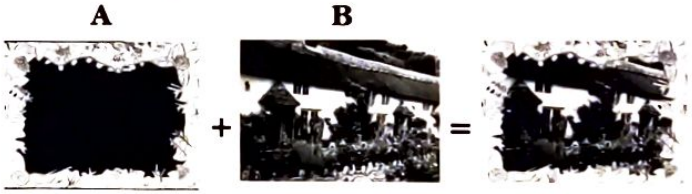


Point a camera/camcorder at a title. (The title could simply be hand drawn using black felt tipped pen onto white paper, or it could be laser printed). Set the 'Key reference' colour to the white paper area. If you want the superimposed title to be white, make the camera picture negative by setting Function 0 to Value 3 and be sure to reset the 'key reference colour'. Titles can be scrolled by moving the camera or title card. Still can be used to store the title.

2 Shaped mask

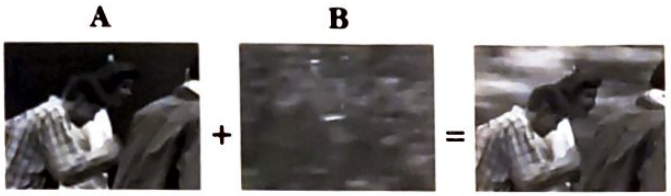
This is done in a similar way to the previous 'titling' example, but with a large black area defining the mask shape. Set the 'key reference' colour in the black area. Other shapes you could try are binoculars, keyholes, etc.

3 Interesting Borders



In this example we have drawn a flowery border and replaced the black area in the centre with another picture.

HINT: When you are setting up any type of key effect it is very important to have bright and even lighting and to have a good contrast between the background and the subject. For example, when a presenter stands against a blue background, make sure the person does not cast a shadow on the background and the background does not cast a blue 'halo' around the person.



In this example, we have 3 youths 'pretending' to run against a blue Lastolite* portable chroma key screen. The screen was set up outside on a cloudy day to give good contrast and minimum shadow.

The camcorder was mounted on a tripod and recorded the scene with its lens set to manual focus and fixed aperture. The camcorder was played back through Channel A on the VMX400 and the moving background (a recording of a camera pointing out of a car window) was switched through channel B.

By tilting the camera, the same process as above can be used to make someone appear to 'fly' across the moving background.

*Lastolite specialise in the supply of chroma key video screens and lights. For more information telephone 01530 813381.

Mixing Computer Generated Graphics

If you have a computer, such as an Amiga, with a standard video output, you can use the VMX400 KEY effect to superimpose the computer generated titles over live pictures.

For example:

1. Plug the computer into Video Input 1 and switch channel A to video input 1.
2. Plug the camcorder/VTR into video input 2 and switch channel B to video input 2. Run the VTR or switch the camcorder to camera mode.
3. Initially set the MANUAL slider down and make sure the AUTO light is off.
4. Make sure you create all your computer graphics on a black background.
5. Press the CURSOR ON/OFF button and move the cursor, using the MOVE buttons, to be over any black area of the computer graphic.
6. Turn off the cursor by pressing the CURSOR ON/OFF button again and press the KEY button.
7. Any part of the computer graphic that is not black will now be superimposed over the picture.

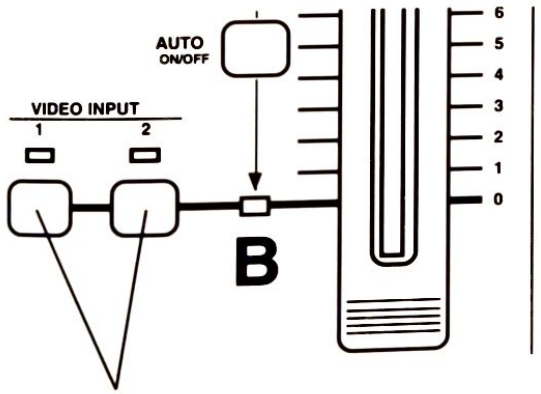
Using combinations of manual and automatic wipe, mix and cut effects, together with different settings for FUNCTION A4, you can now experiment with the titles.

Chapter 5 Timebase Correction

Because video tape is a mechanical medium, pictures played back from video tape always contain timing errors. In general televisions do quite a good job at locking onto these 'jittery' signals to produce quite reasonable pictures from original tapes, but unfortunately every time you copy a tape, during editing for example, these timings get considerably worse and the picture deteriorates rapidly.

The VMX400 can correct these errors by writing the whole picture asynchronously into a digital memory, then synchronously reading the picture from the memory using an ultra-stable clock signal as a reference. The resulting picture is completely re-timed and stabilised to virtually broadcast standards.

To set the VMX400 as a timebase corrector, turn off the channel B Video Input 1 and 2 lights, and set the Manual slider control up.



Both lights off

When used as a timebase corrector, digital effects such as STILL and PIP can still be applied. The difference when compared with its use as a vision mixer, is that channel B is black, so any effects involving channel B will be to a black picture.

For example: If you select Manual or Automatic MIX, the picture will fade to black.

> **HINT: For the best picture quality and stability, it is recommended that you turn off both channel B video inputs whenever you are copying tape to tape and do not need the mixing facilities.**

An important point to mention about the VMX400 is that when it is used as a vision mixer, the stability of the output signal is only as good as the stability of the video source into channel B. Therefore, if you have made an edited 'master tape' using the mixing facilities of the VMX400, it is a good idea to use the VMX400 as a timebase corrector while running off copies from this edited master.

> ∇ **Caution: To prevent picture break-up, do not change channel A or channel B video inputs while recording. Always use the manual or automatic Wipe, Mix or Cut facilities to change inputs.**

Special Locking Modes

When the VMX400 is first turned on, the digital system defaults to a standard method of locking onto the incoming video signal. This will be satisfactory for most properly maintained and standard video sources.

However, it is possible that in some circumstances where the video signal has become badly distorted or corrupted, that the VMX400 (and other video equipment) will not lock properly and the resulting picture will be unstable.

The VMX400 has a number of special 'sync lock' and 'colour lock' modes to help recover problem tapes. These special system **A**ttributes (A1 to A5) are selected and changed using the FUNCTION and VALUE displays.

A1 Sync Lock 3?

Change this mode if the picture is unstable or rolling.

Value 2 is particularly good for recovering tapes that suffer from excessive head switching noise and missing field pulses. However, because it uses a special line counting technique it can get out of step if you pause or stop and start the source VTR. If this is the case it can easily be reset by momentarily switching the VALUE back to 0.

Function	Value	Effect
A1	0	Normal
A1	1	Special Mode 1
A1	2	Special Mode 2
A1	3	Special Mode 3

A2 Colour Lock Mode

Change this mode if the colour is intermittent or flashing.

Function	Value	Effect
A2	0	Normal
A2	1	Special Mode

A3 Display Mode

Switch to this mode if the video source is black and white with no colour burst. Typical sources are B&W security cameras. It removes colour patterning on a black and white picture.

Function	Value	Effect
A3	0	Normal
A3	1	Black & White Mode

A4 Colour Lock Constant

Change the Time Constant to 'Slow' if the video source is very weak and noisy, such as poor 'Off Air' transmissions.

Function	Value	Effect
A4	0	Fast (Normal)
A4	1	Slow

A5 Colour Subcarrier Locking

The best colour stability is usually obtained by locking the Colour Subcarrier to the line frequency, but there are some situations where the picture can be improved by turning off the line locking and making it free run.

Function	Value	Effect
A5	0	Line Locked (Normal)
A5	1	Free running

♦ **Note: All special locking modes are reset to their NORMAL values each time the VMX400 is turned on.**

Chapter 6 Digital Video Processing

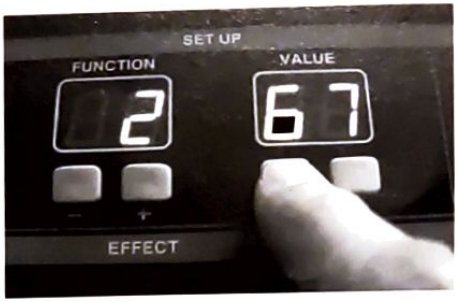
The digital video processing functions enable the picture passing through channel A to be adjusted. One of the reasons you may need to adjust the channel A picture is so that it closely matches the channel B picture. This is especially useful when you want to WIPE, MIX, or CUT between different sources.

To help identify which functions are processing functions, all the digital processing functions start with a single number from 0-7.

To see the effect of the picture processing, or to balance the A and B video channels, you can split the TV screen into two using one of the manual wipe effects. But beware – you may find that the A & B video channel pictures, when switched to the same source, are not exactly the same, even with all the digital processing values set to normal. This is because the A channel uses an AGC (Automatic Gain Control) system to optimise the picture before it is digitised.

You will also notice that the channel A picture is lagging one frame behind the channel B picture, which can produce some odd effects on fast moving scenes.

The digital video processing system used in the VMX400 can significantly improve most pictures. However, like all picture enhancement systems, the results are very subjective and depend on the source material. A bit of experimentation may be required and care must be taken not to 'over-do' it.



To adjust the picture using the digital processing functions, set the FUNCTION display to the function number (0–7) using the + or – buttons below the display.

Change the number in the VALUE display to produce the desired effect on the picture using the + or – buttons below the display.

Any combination of Functions 0 - 7 can be used

HINTS: VALUES can be reset to their default (normal) setting by holding down both VALUE + and – buttons together.
It may help if you think of the FUNCTION display as showing you which 'knob' to adjust and the VALUE display showing you where you have set that 'knob'.

- **Note: All picture processing functions are reset to their normal values each time the VMX400 is turned on.**

0 Negative

This facility enables either the whole picture, or the separate B&W (Y) and colour (C) parts of the picture, to be turned into a negative.

Function	Value	Effect
0	0	Normal
	1	Set Y (B&W) Negative
	2	Set C (Colour) Negative
	3	Set Y&C Negative

1 Brightness

This adjusts the black area of the picture and can be used to compensate for poor backlighting.

Function	Value	Effect
1	0 – 99	Adjust Brightness (Normal = 50)

2 Contrast

This adjusts the white area of the picture and can be used to compensate for poor exposures. Note that you may need to readjust the brightness setting when you change the contrast.

Function	Value	Effect
2	0 – 99	Adjust Contrast (Normal = 50)

3 Colour

This adjusts the colour saturation of the picture. When set to 0 all colour is removed and the picture is B&W. When set to 99 the amount of colour in the picture is approximately doubled.

Function	Value	Effect
3	0 – 99	Adjust Colour Saturation (Normal = 50, B&W = 0)

4 Vertical Colour Shift

This facility moves the colour part of the picture up and down the screen independently of the B&W part. It is used to re-register the colour from videotape sources and removing vertical colour smearing. It has a range of from 0 to 3 TV lines up.

Function	Value	Effect
4	0 – 3	Vertical Colour Shift (Lines)

5 Horizontal Colour Shift

This facility moves the colour part of the picture left and right across the screen independently of the B&W part. It is used to re-register the colour from video tape sources and reduce the horizontal colour smearing. It has a range of –400nS to +300nS which corresponds to approximately 1.3% of the width of a TV picture.

Function	Value	Effect
5	–4 to +3	Horizontal Colour Shift (100nS steps)

6 Composite Picture Enhancement

This facility enables the detail in the Composite Video Input to channel A to be digitally enhanced.
The characteristics of this filter are suited to sources that have a horizontal resolution of up to 300 lines. The normal setting for a flat response is 0.

Function	Value	Effect
6	0	Composite Video I/P – Normal
6	1– 9	Composite Video I/P – Enhanced

7 S(Y/C) Picture Enhancement

This facility enables the detail in the S (Y/C) Video Input to channel A to be digitally enhanced. The normal setting for a flat response is 11. Settings above 11 progressively enhance the picture. Although settings below 11 are mainly intended for signals that were originally composite (they have virtually the same filtering characteristics as Function 6), you may find them useful for reducing picture noise and grain.

Function	Value	Effect
7	0 – 10	S video I/P – Enhanced as composite signal
7	11	S video I/P – Normal
7	12 – 17	S video I/P – Enhanced as S(Y/C) signal

Chapter 7 Summary of Control Settings

DEMO

dE	0	Normal
dE	1	Demo Mode Running

EFFECTS

E1	1-60	Wipe Pattern
E2	1-4	Wipe Edge
E3	0-9	Auto Speed Value
E4	0-99	'A' channel Colour when both video inputs are off. Also sets PIP border colour

STILL

F1	0	Normal Still Frame
F1	1	High Definition Still Frame

PIP

P1	1	PIP size = 3/4 screen
P1	2	PIP size = 2/3 screen
P1	3	PIP size = 1/2 screen
P1	4	PIP size = 1/3 screen
P1	5	PIP size = 1/4 screen
P2	0	No border around PIP
P2	1	Border around PIP
P3	0	Normal PIP
P4	1	PIP replaced by window
P4	0-99	PIP surround and PIP window colour

KEY

C1	1	Y+C key reference
C1	2	Y only key reference
C1	3	C only key reference
C1	4	Y+C key reference with blue bias
C2	1-16	Y key switching thresholds
C3	1-16	C key switching thresholds

LOCKING

A1	0	Normal Sync Lock Mode
A1	1	Special Sync Lock Mode 1
A1	2	Special Sync Lock Mode 2
A1	3	Special Sync Lock Mode 3
A2	0	Normal Colour Lock Mode
A2	1	Special Colour Lock Mode
A3	0	Normal Display mode
A3	1	Black & White Mode
A4	0	Fast Colour Lock Time Constant
A4	1	Slow Colour Lock Time Constant
A5	0	Colour Subcarrier locked to line
A5	1	Colour Subcarrier free running

PIP/KEY

A6	0	Fade/Wipe CH B leaving PIP/KEY
A6	1	Fade/Wipe PIP/KEY into window
A6	2	Fade/Wipe window into PIP/KEY
A6	3	Fade/Wipe PIP/KEY leaving CH B

Chapter 8 Troubleshooting Guide

No lights come on

- Check that the mains adaptor is plugged in and switched on at the mains, and that the plug from the mains adaptor is fully plugged into the power socket of the VMX400.

Unit does not respond correctly to button presses

- Check you have not accidentally pressed the CURSOR ON/OFF button.
- Reset the unit by turning off the power for 5 seconds.

Unit is on but picture is missing

- Check that video inputs are selected for channel A and/or channel B.
- Check the position of the Wipe, Mix or Cut effect.
- Check the video source(s) are playing back.
- Check the continuity of the video connecting leads (by using another lead if possible).
- Check you have not accidentally pressed the CURSOR ON/OFF button.
- Check you have not bypassed the unit with your connections.
- Reset the unit by turning off the power for 5 seconds.

Distorted picture

- You may find that the picture on some televisions bends where there is a sudden change in brightness. This can happen on some wipe and masking effects and is not a fault of the VMX400.

Unstable picture

- Put the VMX400 into timebase corrector mode by turning off both video inputs to channel B. (It is worth remembering that when the VMX400 is used as a vision mixer, the video output is only as stable as the video input to channel B. It is therefore advisable to route the best video source through channel B. Therefore, even if you are displaying the A channel picture, pausing, stopping or rewinding a VTR switched through channel B will result in picture breakup.
- Try alternative sync lock modes – Function A1 (see page 24).

Key effects breaks up

- Ensure you have plenty of contrast between the key area and the rest of the picture.
- Make sure the lighting over the key area is as 'flat' as possible.
- Check the 'key reference colour' is set correctly (See page 20).
- Adjust the 'key threshold' (See page 20).
- When used with STILL, set FUNCTION 'F1' to VALUE '0'.

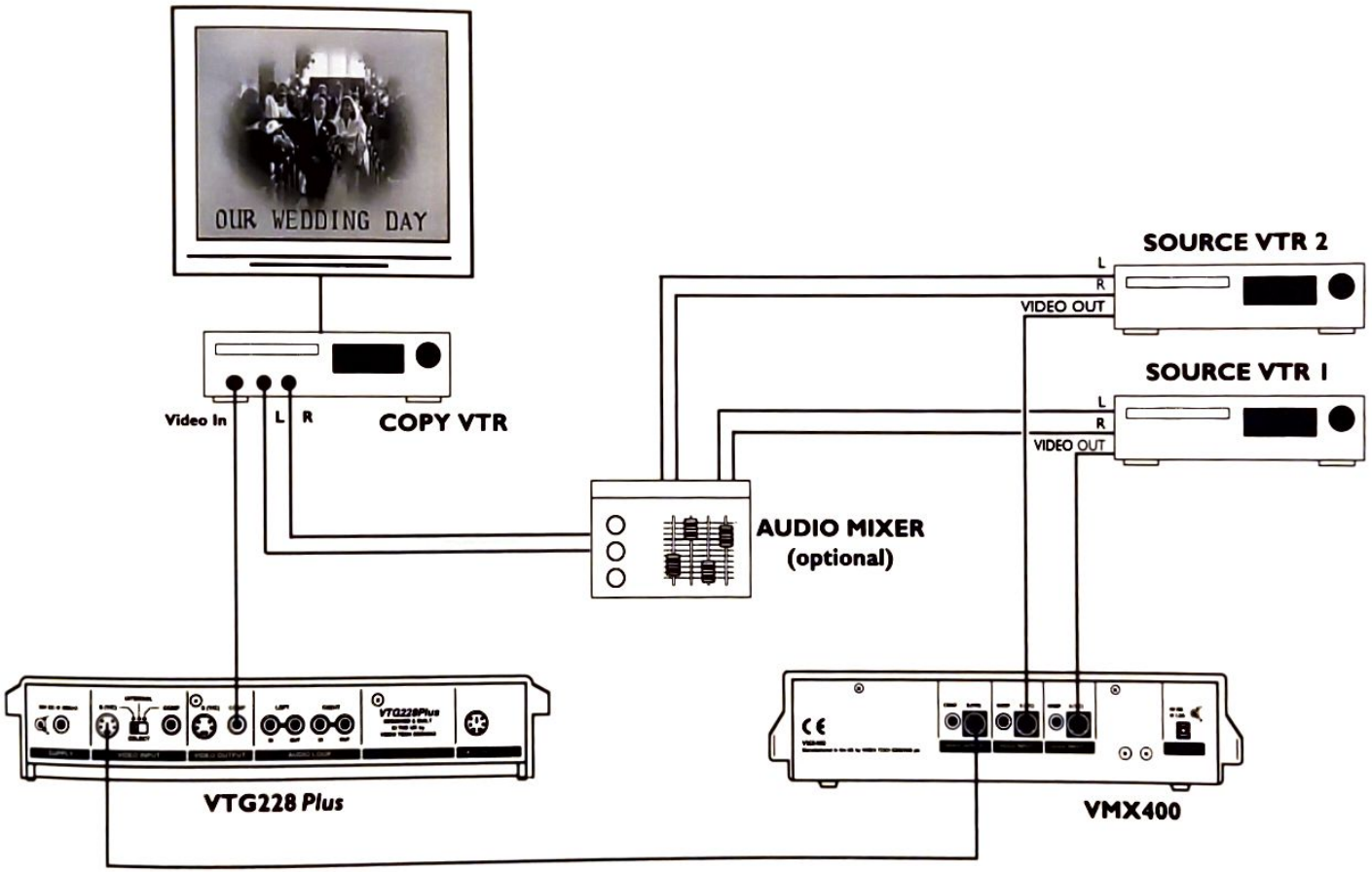
Colour rippling along edges of effects.

- If possible use S(Y/C) connections right through from source VTR to TV.
- Work with B&W effects and/or B&W pictures only.

Appendix 1 Using with a Video Titler

You can use the VMX400 with any good titler or computer genlock. The diagram below illustrates one way to connect the Video Tech Designs VTG228*Plus* in line with the output of the VMX400, so that titles can be superimposed over the mixed pictures.

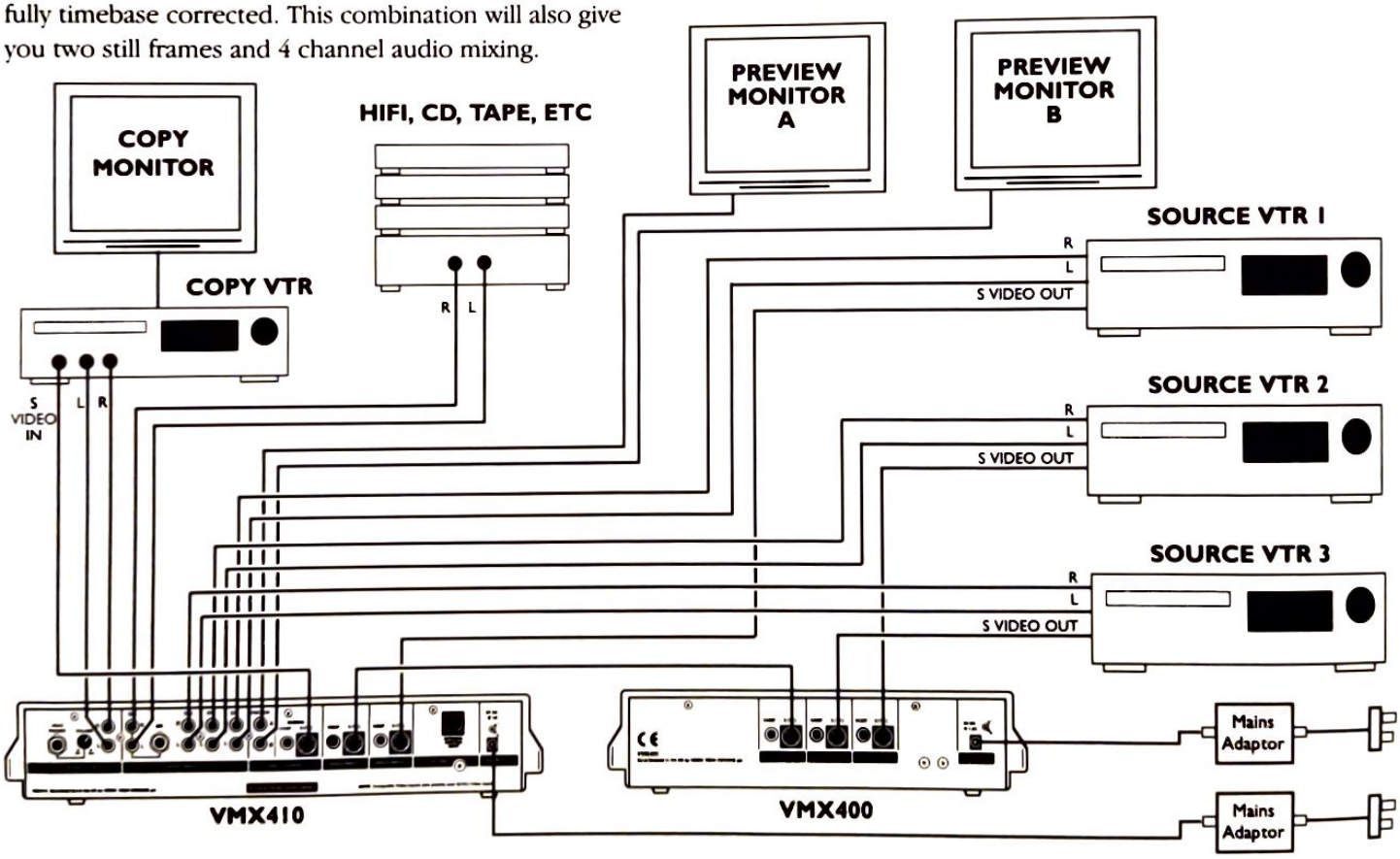
- **Note:** For minimum losses and best resolution, always use an 'S' video lead between the VMX400 and VTG228*Plus*, even if the output of the VTG228*Plus* is normal composite video.



Appendix 2 Using with the VMX410

By connecting a VMX400 and VMX410 together you will be able to create some really spectacular effects. Not only will you be able to mix three different video sources together, and have all three on the screen at the same time, but you will also be able to have two PIP's over a third picture.
If you just want to mix 2 pictures together then each source can be individually processed and the output will be fully timebase corrected. This combination will also give you two still frames and 4 channel audio mixing.

- **Notes:** The source VTRs could be replaced by cameras/camcorders for 'live' recording.
  The 'Preview Monitors' are very useful but could be ommitted for simpler set-ups.
  An alternative preview set-up would be to have a monitor connected to the aerial output of each source VTR.



Appendix 3 Technical Specifications

2 x S(Y/C) Video Inputs
Y = 1V p-p, C = 0.3V p-p. Term 75Ω. 4 pin S sockets.

2 x Composite Video Inputs
1V p-p. Term 75Ω. Phono sockets.

S(Y/C) Video Output
Y = 1V p-p, C = 0.3V p-p. Term 75Ω. 4 pin S sockets.

Composite Video Output
1V p-p. Term 75Ω. Phono socket.

System
UK PAL 625 lines 50Hz negative syncs.
Channel A Digital Conversion standard – CCIR601
13.5MHz, 4:2:2, 8 bit sampling.
Video frame store size 8Megabits
(Active picture area 720 pixels x 625 lines x 16 bits).

Overall Bandwidth/Resolution

Channel A	S to S	>5.5MHz/500lines
	S to COMP	>5.5MHz/500lines
	COMP to COMP	>3.2MHz/250lines
Channel B	S to S	>7.0MHz/600lines
	S to COMP	>7.0MHz/600lines
	COMP to COMP	>3.2MHz/250lines

E. & O.E. All details and specifications subject to change.

Special Effects
Automatic and Manual Picture Wipes, Mixes and Cuts.
60 Wipe and masking effects with hard or soft edges.
Automatic speeds adjustable from approx. 1/2 to 9 seconds in 10 steps.
Picture In Picture with 5 sizes of reduction.
Chroma-Key and Luma Key effects.
Still frame with either 'flicker free' or high resolution pictures.
Digital adjustment of picture Detail, Brightness, Contrast and Colour Saturation.
Positive/Negative switching.
Horizontal and Vertical colour re-registration.

Technology
Mixed Bipolar, HCMOS, FPGA, 2x double sided TPH PCBs.
Comprises 50 Integrated Circuits and 40 discrete semiconductors.

Power Supply
9V DC. Max ripple 1V p-p.
Power consumption 1.1A.
Fitted with 2,5mm DC power socket.
(NOTE: Each unit is supplied with a suitable adaptor for 220/240V 50Hz mains)

Overall size
322mm wide x 270mm deep x 75mm high (max).
Weight ≈ 2.5Kg.

VIDEO TECH DESIGNS PLC

Units 2 & 3, Kilnbridge Works
Lower Road, East Farleigh
MAIDSTONE, Kent ME15 0HD
Telephone: (01622) 729872