

ACCENT KEYER
USER GUIDE AND REMOTE SERIAL PROTOCOL
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1 INTRODUCTION

The Accent Keyer from Pro-Bel is a combined downstream keyer and AB mixer for component serial digital video (SDI). Housed in a compact 1U rack frame, the unit features full 10-bit operation for professional broadcast quality output.

In downstream keyer mode, the unit provides clip, gain and transparency controls as well as linear keying. Other features include a key invert facility and anti-aliased keying using key edge re-mapping. In the event of key or foreground input signal failure, the background signal is passed unchanged to maintain picture transmission.

In mixer mode, the unit operates as an AB mixer, and it can mix between two programme inputs, either manually or automatically by autotransition. Colour may be provided by internal colour field generators.

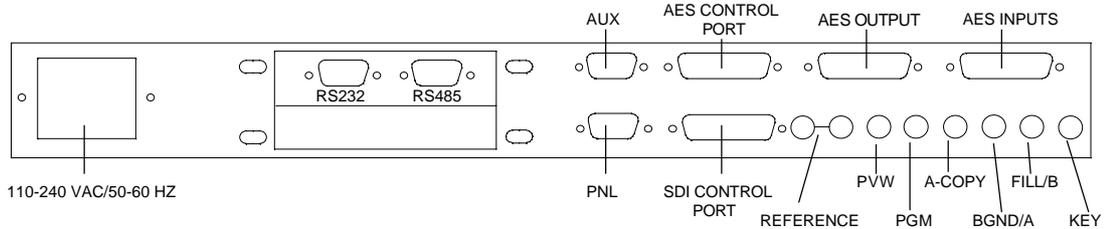
The Accent Keyer features 'Fade To Black', and has an optional preview output (SDI or analogue composite PAL/NTSC) to allow users to monitor a range of signals.

The unit is available with a range of remote control solutions, including operation by GPI and analogue fader inputs, as well as by RS422/RS485.

To simplify system installation, the unit has line synchronisers on all inputs and flexible output timing controls for easy synchronisation to the analogue reference or SDI background input. In the event of an input signal failure, the input will switch to its internal colour field generator, maintaining signal integrity. Finally, embedded audio within the background signal will be passed through unaffected.

2 INSTALLATION

The rear panel of Accent Keyer has all the necessary video, control and power connections, as shown below:



BNCs	Function
BGND/A	BACKGROUND OR 'A' SDI VIDEO INPUT
A-COPY	RE-CLOCKED AND RE-EQUALISED SDI COPY OF BGND/A INPUT
FILL/B	SDI VIDEO FILL INPUT OR 'B' SDI VIDEO INPUT
KEY	SDI VIDEO KEY INPUT
PGM	SDI PROGRAMME OUTPUT
PVW	SDI OR ANALOGUE PREVIEW OUTPUT
REFERENCE	ANALOGUE COMPOSITE REFERENCE INPUT ON LOOPING BNCs. THIS IS TYPICALLY 'BLACK AND BURST' BUT MAY CONTAIN PICTURE.

D-Types	Function
SDI CONTROL PORT	CONNECTION FOR GPIS AND ANALOGUE FADERS
PNL	CONNECTION FOR OPTIONAL REMOTE CONTROL PANEL
AES INPUTS	AES AUDIO INPUTS (AUDIO MIXER OPTION)
AES OUTPUTS	AES AUDIO OUTPUTS (AUDIO MIXER OPTION)
AES CONTROL PORT	CONNECTION FOR GPIS AND ANALOGUE FADERS (AUDIO MIXER OPTION)
AUX	NOT USED
PROCESSOR CARD LEFT	RS232 SERIAL PORT FOR REMOTE CONTROL
PROCESSOR CARD RIGHT	RS485 SERIAL PORT FOR REMOTE CONTROL

Power

IEC, universal input 110-240V a.c., < 50W, 50-60Hz mains.

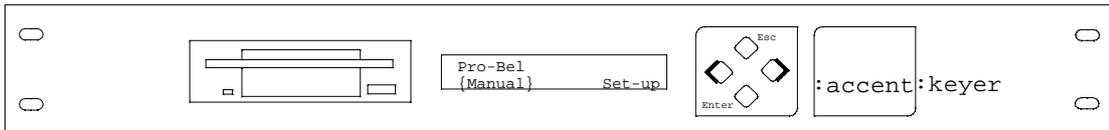
Ventilation

When installing the unit ensure that there is adequate side ventilation.

3 CONTROLS

The Accent Keyer can be operated from the front control panel as well as by remote control using the remote control unit, or by GPI and analogue fade inputs. The unit can also be controlled remotely by RS422 or RS485 links and over Ethernet.

The front control panel comprises a 3.5" floppy disk drive, four control buttons and a back-lit alpha-numeric LCD display, as shown below:



The keying and mixing functions are accessed by using the four control buttons to drive the operating system using a tree-type software menu structure (see diagram, Page 16). The status of the unit and the options available to the user are indicated on the LCD display.

Understanding the Front Panel LCD Display

The LCD display is divided into two areas. The upper row of characters indicates the function, and the lower row indicates the configuration or operation options.

The configuration and operation options are indicated in two different ways:

- When all the options can be displayed simultaneously on the lower row, the current option selected is shown by brackets, as shown below. To change the current selection, use the left and right cursor buttons on the front panel. The brackets will indicate the new selection.

```
Set Reference
{analogue} SDI-BGnd
```

- When all the options cannot be displayed simultaneously on the lower row, the current option selected is the only option displayed. Further options can be found to the left and/or right as indicated by arrows, as shown below. To change the current selection, use the left and right cursor buttons on the front panel.

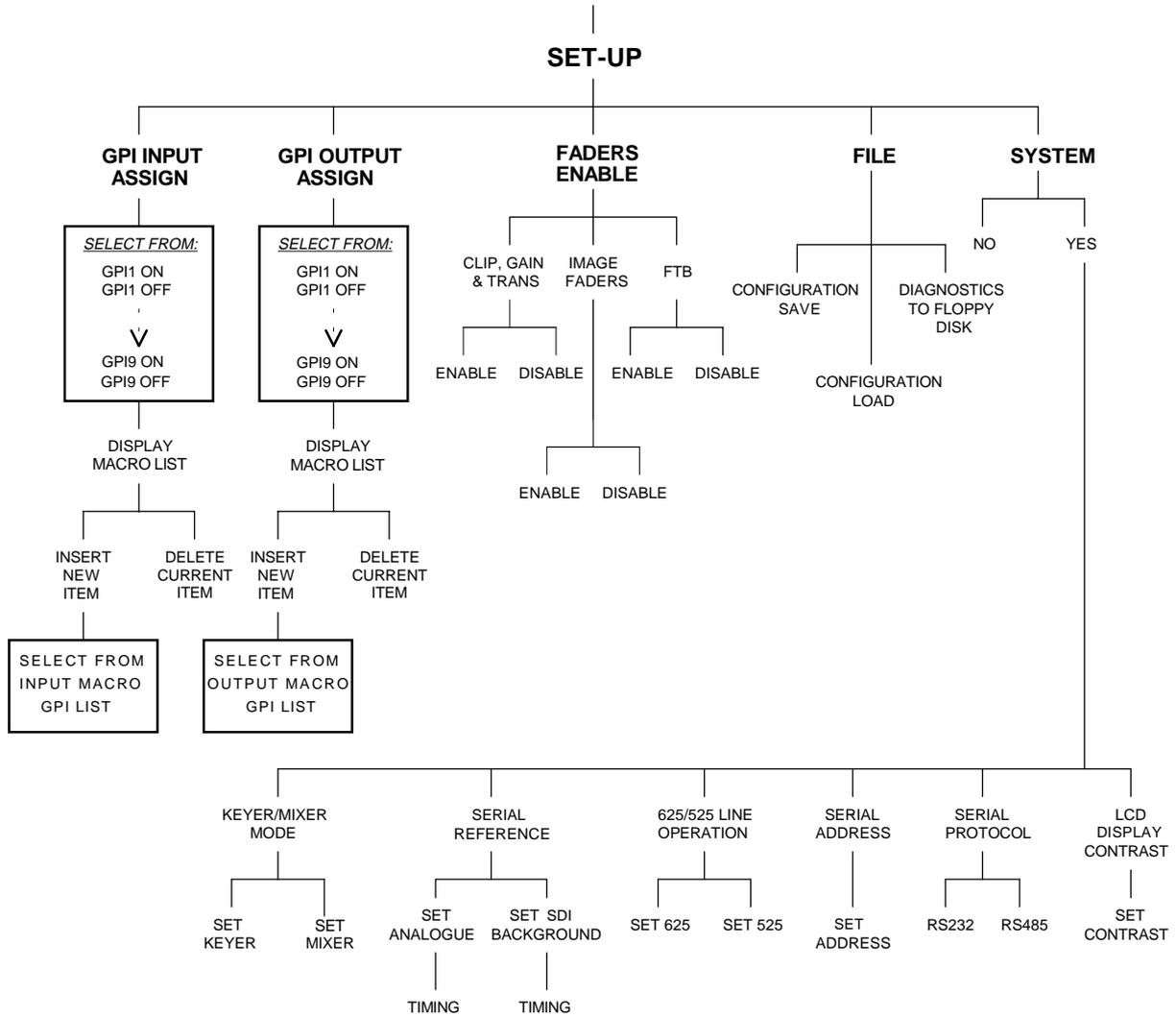
```
Set-up
<GPI outputs assign>
```

Once a new selection has been made, this can be confirmed by pressing the ENTER button. To revert to the original selection press the ESC (escape) button.

The functions of the four control buttons on the front panel are summarised as follows:-

Button	Function
ESC	ESCAPES FROM CURRENT LEVEL OF SOFTWARE MENU TO THE PREVIOUS LEVEL
ENTER	ACCEPTS INDICATED SETTINGS ON SOFTWARE MENU
<	PERMITS THE USER TO CURSOR LEFT ALONG A DISPLAYED MENU BRANCH BRANCH TO SELECT A FUNCTION. THIS KEY ALSO USED TO REDUCE A DISPLAYED VALUE OR SELECT A VARIABLE PARAMETER
>	PERMITS THE USER TO CURSOR RIGHT ALONG A DISPLAYED MENU BRANCH TO SELECT A FUNCTION. THIS KEY IS ALSO USED TO INCREASE A DISPLAYED VALUE OR SELECT A VARIABLE PARAMETER

4 SET-UP



'SET-UP' FRONT PANEL SOFTWARE MENU

When the unit is powered-up, the system menu will automatically start at the top level of the tree. The LCD will display:-

```
Accent Keyer ver 1.1
{manual}          set-up
```

Use the right cursor key to select set-up. The display will now show:-

```
Accent Keyer ver 1.1
manual           {set-up}
```

Press ENTER and the unit will enter the set-up menu.

The set-up options are:-

- GPI Input Assign**
- GPI Output Assign**
- Faders Enable**
- File (System Information)**
- System Change**
- LCD Display**

Use the left and right cursor buttons to select the required set-up option.

GPI Inputs Assign

To assign the GPI inputs, select the option {GPI inputs assign}:-

```
Set-Up
GPI inputs assign >
```

Nine GPI inputs are available on the rear of the unit for external control. Each of these GPIs can be programmed with a user-definable macro. Separate macros are available for GPI 'on' and GPI 'off' actions.

To create or edit a macro enter 'GPI inputs assign' from the set-up menu, first select the required GPI number and on-off state. GPIs are arranged GPI 1 on, GPI 1 off, GPI 2 on, GPI 2 off, and so on from left to right. For example to edit GPI 2 on, select 'GPI 2 on' from the menu, use the cursor button to select the following display:-

```
GPI Inputs Assign
<GPI 2 on          >
```

This setting is confirmed by pressing the ENTER button which will then access the macro display level.

If a particular GPI macro is empty, the unit will indicate this in the display, as follows (in this case 'GPI 2 on'):-

```
GPI 2 on :Macro
NO ACTIONS SET
```

GPIs that already have a macro programmed will enter at the first programmed macro command, such as:-

```
GPI 2 on      :Macro
FTB on       >
```

The cursor buttons can be used to move backwards and forwards through a macro. At the end of the macro list the unit will indicate this with an 'END OF LIST' statement.

```
GPI 2 on      :Macro
< END OF LIST
```

Creating and Editing a GPI Macro

To start a new macro make sure that the 'NO ACTIONS SET' indication is shown. Press the ENTER button to access the macro editor which will offer both 'insert' and 'delete' commands.

```
Edit Macro
{insert}      delete
```

Select 'insert' and press ENTER to access the macro editor commands list. The display will then show the full range of macro options available for the GPI inputs (see following pages for a full list of GPI inputs).

```
Macro List Insert
cut up       >
```

To set the first macro command, use the cursor buttons to display your required command and press ENTER. The macro editor will add the command as the first entry to the current macro and jump back up one level to the macro display level. A number of macro commands require an additional step to accept a variable value.

```
Macro List Insert
fade rate=028 frames
```

For example, 'fade rate' above can be set from 000 to 300 frames. The value is set by using the left (-) and right (+) cursor buttons. Once the value is correct, press ENTER to accept the command and return to the macro display level.

Having created a macro the user can exit to the 'GPI Inputs Assign' level by pressing the ESC button.

Alternatively, it is possible to continue adding to and editing the macro.

Additional commands are added in exactly the same way as the first. Because many commands will need to be ordered correctly within the macro list it is important to note the following:-

Before entering the macro editor, the item which you wish to follow the new command should be displayed as the new macro command will be inserted in front of this. For this purpose the 'END OF LIST' statement should be treated as a command.

To delete a macro command, make sure that the unit is at the macro display level. The display should appear as follows:-

```
GPI 2 on   :Macro
FTB off   >
```

Use the cursor buttons to select the command that you wish to remove, then press ENTER to enter the macro editor.

```
Edit Macro
insert   {delete}
```

Select the delete again press ENTER. The unit will now remove the command from your macro and return to the macro display level.

Note: Any macro can contain up to 10 macro commands.

GPI Input Commands

Commands Available For Keyer Mode		
CUT UP	FTB RATE = nnn	DISABLE FADER
CUT DOWN	PVW: PGM PREVIEW	EN/DIS FADER
CUT UP/DOWN	PVW: PGM OUTPUT	ENABLE FTB FADER
FADE UP	PVW: BGND INPUT	DISABLE FTB FADER
FADE DOWN	PVW: FILL INPUT	EN/DIS FTB FADER
FADE UP/DOWN	PVW: PROCESSED KEY	ENABLE CGT FADER
FTB ON	KEY SENSE: NORMAL	DISABLE CGT FADER
FTB OFF	KEY SENSE: INVERT	EN/DIS CGT FADER
FTB ON/OFF	KEY SRCE: SEPARATE	GPIIn ON/HOLD
BGND: SDI	KEY SRCE: SELF	GPIIn OFF/RELEASE
BGND: COLOUR	KEY TYPE: FULL	GPIIn PULSE LOW
BFND: SDI/COLOUR	KEY TYPE: LINEAR	
FADE RATE = nnn	ENABLE FADER	

Commands Available For Mixer Mode		
CUT A	BGND: SDI	ENABLE FADER
CUT B	BGND: COLOUR	DISABLE FADER
CUT A/B	BGND: SDI/COLOUR	EN/DIS FADER
FADE A	FADE RATE = nnn	ENABLE FTB FADER
FADE B	FTB RATE = nnn	DISABLE FTB FADER
FADE A/B	PVW: PGM PREVIEW	EN/DIS FTB FADER
FTB ON	PVW: PGM OUTPUT	GPIIn ON/HOLD
FTB OFF	PVW: A INPUT	GPIIn OFF/RELEASE
FTB ON/OFF	PVW: B INPUT	GPIIn PULSE LOW

GPI Outputs Assign

To assign the GPI outputs, select the option {GPI outputs assign}

```
Set-up
GPI outputs assign >
```

The first seven of the nine rear panel GPIs can be used as outputs for triggering external equipment. Each of the GPI outputs can be programmed to be triggered by one event which is selected from the GPI outputs list (see following pages for a full list of GPI outputs). Separate macros are available for GPI 'on' events and GPI 'off' functions.

To change the trigger event for a GPI output, enter 'GPI outputs assign' from the set-up menu. Next select the required GPI number and on-off state. GPIs are arranged GPI 1 on, GPI 1 off, GPI 2 on, GPI 2 off, and so on from left to right. For example to edit GPI 2 on, select 'GPI 2 on' from the menu using the cursor buttons. The display should show:-

```
GPI Outputs Assign
<GPI 2 on >
```

This setting is confirmed by pressing the ENTER button which will then display the current trigger event selection.

If the particular GPI has no trigger event selected, then the unit will indicate this in the display, as follows:-

```
GPI 2 on :Event
<NOT DEFINED
```

The cursor buttons can now be used to move backwards and forwards through the list of possible trigger events, for example:-

```
GPI 2 on :Event
<loss of reference >
```

Once the desired trigger event is displayed, it can be stored by pressing the ENTER button. Alternatively, to leave without affecting the previous setting, press ESC.

GPI Output Commands

Commands Available For Keyer Mode		
LOSS OF BGND	KEYER AT OFF	KEYER FADER ENABLED
BGND RESTORED	KEYER AT ON	FTB FADER DISABLED
LOSS OF REFERENCE	FTB AT OFF	FTB FADER ENABLED
REF. RESTORED	FTB AT ON	
ANY GPI ON	KEYER FADER DISABLED	

Commands Available For Mixer Mode		
LOSS OF BGND	MIXER AT A	MIXER FADER ENABLED
BGND RESTORED	MIXER AT B	FTB FADER DISABLED
LOSS OF REFERENCE	FTB AT OFF	FTB FADER ENABLED
REF. RESTORED	FTB AT ON	
ANY GPI ON	MIXER FADER DISABLED	

Faders Enable

A number of external analogue faders can be used to operate the unit. These faders are divided into three groups:-

Clip, Gain and Transparency

Image Faders

Fade To Black (FTB)

Each of the groups can be independently 'enabled' to permit external fader control, or 'disabled' to prevent external fader control.

For example, to enable the clip, gain and transparency faders select 'faders enable' from the set-up menu, as shown below:-

```
Set-up
< faders enable >
```

Press ENTER to enter the 'faders enable' menu, as shown:-

```
Faders Enable
clip, gain & trans >
```

Press ENTER once more to select 'clip, gain and transparency'. The unit now offers the following menu:-

```
CG&T Faders
disabled {enabled}
```

Select 'enabled' and press ENTER. The fader group is now enabled and the unit will return to the 'faders enable' menu.

File (System Information)

Four different floppy disk drive (FDD) file facilities are available on the unit, namely:-

- **Configuration Save**

Saves the current configuration information to a floppy disk located in the front panel 3.5" FDD for use in other units or to be saved in a configuration library.

- **Configuration Load**

Loads new configuration information from a floppy disk located in the front panel 3.5" FDD.

- **Diagnostics To FDD**

Saves diagnostic information as printable ASCII text to a floppy disk located in the front panel 3.5" FDD. The file is called SYSTEM.LST.

- **Program Load**

Used to load Pro-Bel software up-grades supplied on 3.5" floppy disk.

To access the file facilities, select 'file' from the set-up menu, as shown below:-

```
Set-up
<      file      >
```

Press ENTER to enter the 'file' menu, as shown:-

```
File
configuration save >
```

Select the facility your require and press ENTER to action. Whilst the disk is being accessed the unit will confirm the operation on the front panel display:-

```
CONFIGURATION SAVE
saving
```

System Change

Three system parameters can be adjusted, these are:-

- **625/525 Line**
Changes between component 625 and component 525 line operation.
- **Keyer/Mixer Mode**
Changes between keyer and mixer modes of operation.
- **Select Reference**
Selects between an external analogue black and burst reference signal (present on the rear panel 'REFERENCE' input) and the SDI BGnd/A video input as the timing reference.

In view of the importance of the system parameters, an additional access level is incorporated to prevent accidental changes. To change any of the system parameters, select 'system change' from the set-up menu, as shown below:-

```
Set-up  
< system change >
```

Press ENTER to enter the 'system change' menu, as shown:-

```
System Change!  
NO {YES}
```

Select YES and press ENTER once more to gain full access to system parameter adjustments, as shown:-

```
System Set-up!  
< select reference
```

Select the system parameter to be changed and press ENTER to confirm. For example, to change the reference source, choose 'select reference' from the menu and press ENTER. The unit will display the following:-

```
Reference Input  
{analogue} SDI-BGnd
```

Select the reference input required and press ENTER to confirm.

```
SDI out WRT BGnd  
0 lines +2.590uS
```

Select the timing of the SDI output relative to the chosen reference and press ENTER to confirm.

The SDI input FIFO registers have a delay adjustment of 2.590us to approximately one television line. (Minimum delay is 12us if the optional audio mixer is fitted). If SDI-BGnd is chosen as the reference, setting the output timing to $\pm 1/2$ line relative to the input allows a spread or variation in input timing of $\pm 1/2$ line with no change in output timing. If the spread and stability is closer than this, the fixed delay can be decreased.

The analogue reference has a much larger adjustment range (± 8 lines). This is to compensate for differences between the SDI inputs and the reference. The range of video path delay adjustment is identical to the SDI reference case. If the user attempts to go outside this range the picture will not be positioned in the correct vertical position on the raster.

LCD Brightness and Contrast

The front panel LCD's brightness and contrast can be adjusted by entering the 'LCD display' option.

5 INPUT SIGNAL SELECTION

Each of the three SDI inputs can be set to external SDI video or to its internal colour field generator (CFG). The CFG for each of the inputs is totally independent and all three CFGs can be set to different colours. The CFG can be useful if, for example, a user wants to key a page of text over a coloured background but does not have a suitable background available externally.

To set an input source, starting at the top level of the menu, select 'manual' as shown:-

```
Accent Keyer ver 1.1
{manual}      set-up
```

Then select 'set i/ps':-

```
Manual Override
operate {set i/ps}
```

Choose the input that you intend to change:-

```
Input Signal Set
{A/BGnd} B/Fill Key
```

Select the input source:-

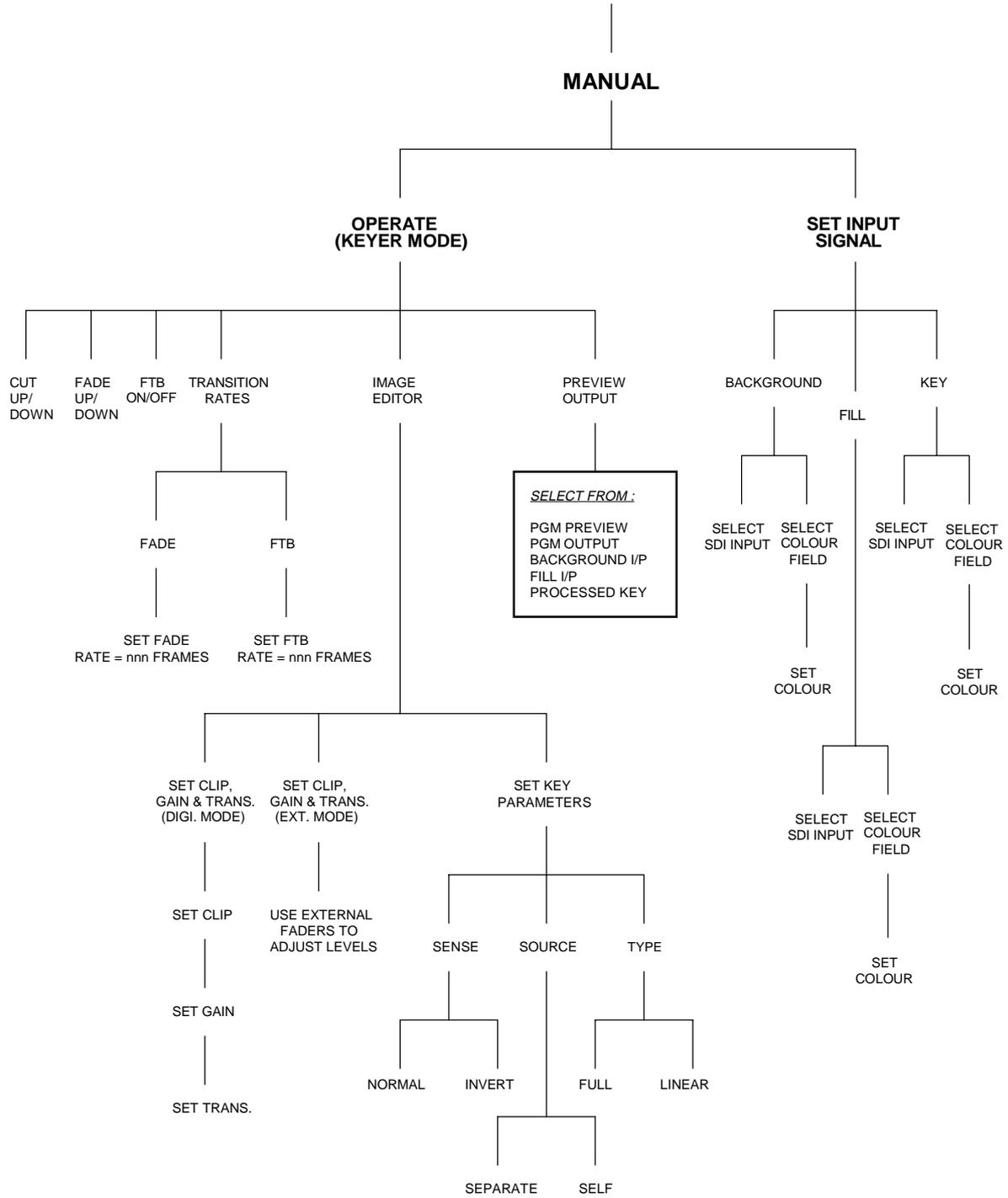
```
A/BGnd Input Set
SDI video {colour}
```

Selecting 'SDI video' will take the user back to the 'Input Signal Set' menu. If 'colour' is selected the user will be invited to adjust each of the red, green and blue component levels in turn, such as:-

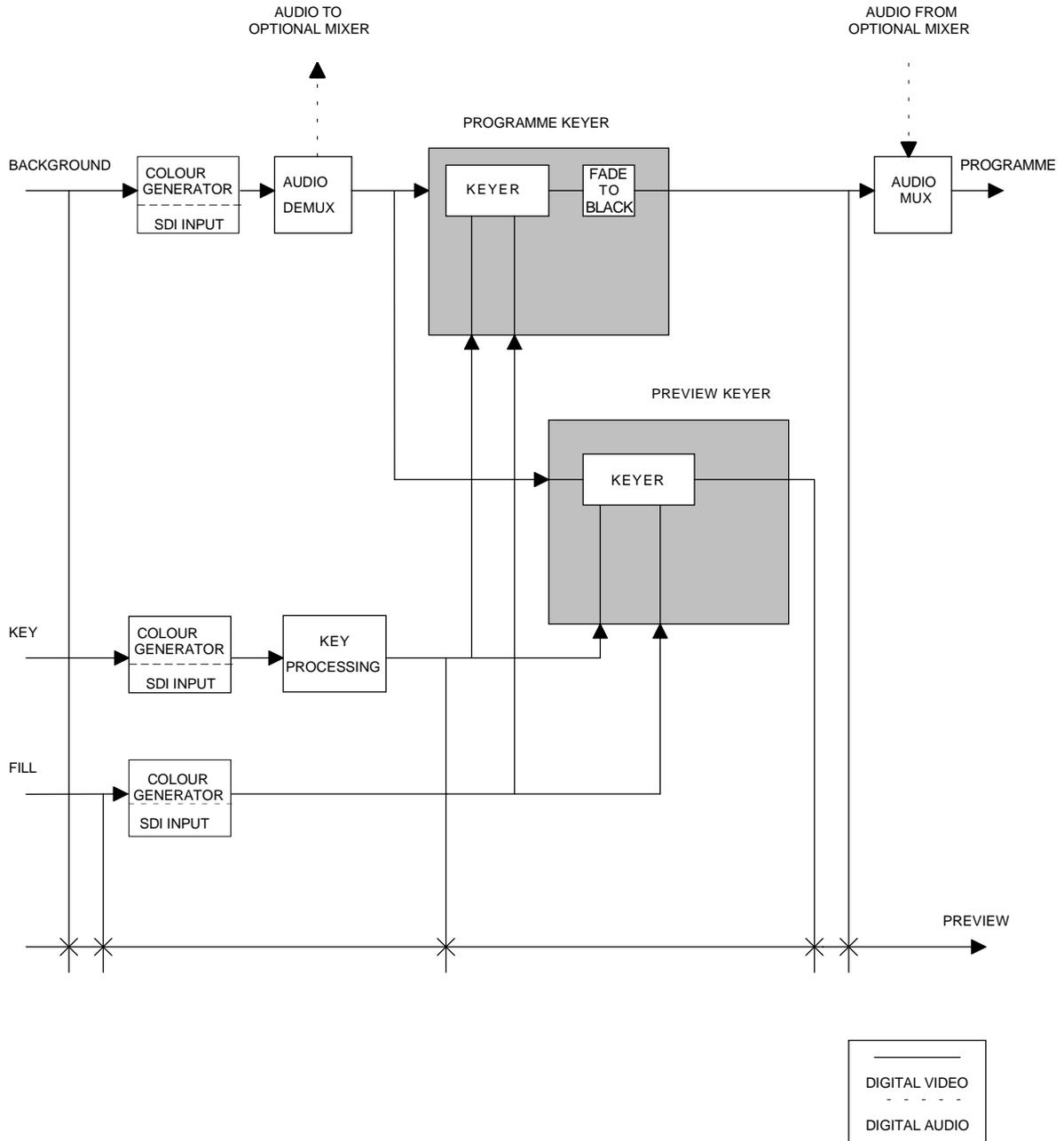
```
Colour Field: Red
0 <- 77% -> 100
```

To adjust each of the three colour levels, use the cursor buttons. Press ENTER to confirm a change in level, or press ESC to leave unchanged. The unit will then present the level of the next colour, until all three have been shown.

6 DOWNSTREAM KEYS OPERATION



'KEYER OPERATE' FRONT PANEL SOFTWARE MENU



'DOWNSTREAM KEYS' MODE BLOCK DIAGRAM

The following downstream keyer operations are available:-

- Cut Up/Down**
- Fade Up/Down**
- Fade To Black On/Off**
- Transition Rates**
- Image Editor**
- Preview Output**

To operate any of the above functions, start at the top level of the menu, select 'manual' as shown:-

```
Accent Keyer ver 1.1
{manual}          set-up
```

Then select 'operate':-

```
Manual Override
operate {set i/ps}
```

Use the left and right cursor buttons to select the required keying operation.

Cut Up/Down

To action a keyer cut up or down, ensure that you have 'cut up/down' selected from the 'Keyer Operate menu', as below:-

```
Keyer Operate
cut up/down >
```

Press ENTER and the operation will take place immediately. The display will not change and the unit will be ready to perform further cut up/down operations using the ENTER button.

Fade Up/Down

To action a keyer fade up or down, ensure that you have 'fade up/down' selected from the 'Keyer Operate' menu, as below:-

```
Keyer Operate
< fade up/down >
```

Press ENTER and the operation will take place immediately. The display will not change and the unit will be ready to perform further fade up/down operations using the ENTER button.

Fade To Black On/Off

To action a 'Fade To Black on/off' ensure that you have 'FTB on/off' selected from the 'Keyer Operate' menu as below:-

```
Keyer Operate
< FTB on/off >
```

Press ENTER and the operation will take place immediately. The display will not change and the unit will be ready to perform further 'Fade To Black on/off' operations using the ENTER button.

Transition Rates

'Keyer fade' and 'Fade To Black' transition rates can be adjusted. To adjust a transition rate, ensure that you have 'transition rates' selected from the 'Keyer Operate' menu, as below:-

```
Keyer Operate
< transition rates >
```

Press ENTER, and select the transition rate that you intend to change, as shown:-

```
Adjust Rates
{fade} FTB
```

Press ENTER once more and the unit will display the current transition rate:-

```
Fade Rate
rate = 028 frames
```

Use the cursor buttons to adjust the transition rate and press ENTER to confirm. To leave unadjusted, press ESC and the unit will return to the 'Adjust Rates' menu.

Image Editor

The image editor enables an operator to adjust a number of parameters, all of which affect the visual appearance of the keyed image.

Two groups of image editor parameters can be changed:-

Clip, Gain and Transparency Key Parameters

To change any of the parameters covered by these two groups, select 'image editor' from the 'Keyer Operate' menu, as below:-

```
Keyer Operate
< image editor >
```

Press ENTER and select between 'clip, gain & trans' and 'key type'.

Clip, Gain and Transparency

To alter clip, gain and transparency levels, ensure that you have 'clip, gain & trans' selected from the 'Image Editor' menu, as below:-

```
Image Editor
clip, gain & trans >
```

Press ENTER once more and the unit will display the current clip level:-

```
Adjust Clip Level
0 <- 0001 -> 1023
```

Use the cursor buttons to adjust the clip level and press ENTER to confirm. To leave unadjusted, press ESC. The unit will then cycle through gain and transparency adjustments before returning to the 'Image Editor' menu.

If the external faders for clip, gain and transparency are enabled then the unit will not offer front panel level setting, and will instruct the user to use the faders.

Key Parameters

Three key signal parameters can be set:-

- **Sense**
Allows the key signal to be used normal or inverted. In normal mode a high level key signal selects fill input, whilst in inverted mode a high level key signal selects the background input.
- **Source**
Selects between an external (separate) key signal provided on the rear panel SDI 'Key' input and an internal key signal derived from the 'Fill' input.
- **Type**
Selects between 'full' or 'linear' keying modes.

'Full key' sums the background (with the key signal area removed) to the fill. The fill is only passed where the key signal is present. This mode is used when the background area of the fill input is not black.

'Linear key' sums the background (with the key signal area removed) to the fill. The fill is not affected by the key. This mode is used with, for example, character generators which provide anti-aliased characters over a black background.

To alter any of the above key parameters, ensure that you have 'key parameters' selected from the 'Image Editor' menu, as below:-

```
Image Editor
< key parameters
```

Press ENTER and the key parameters will be displayed as shown below:-

```
Set Key Parameters
{sense} source type
```

Select the parameter that you wish to change and press ENTER to show the current setting. For example, key sense parameters are shown below:-

```
Key Sense
normal    {invert}
```

Choose the required setting and press ENTER to confirm. To leave unadjusted, press ESC. The unit will then return to the 'Set Key Parameters' menu.

Preview Output

The signal sent to the rear panel 'PVW' preview output can be selected from a number of sources, these are:-

Programme Preview
Programme Output
Background Input
Fill Input
Processed Key

To select a new source for the preview output, ensure that you have 'preview output set' selected from the 'Keyer Operate' menu, as below:-

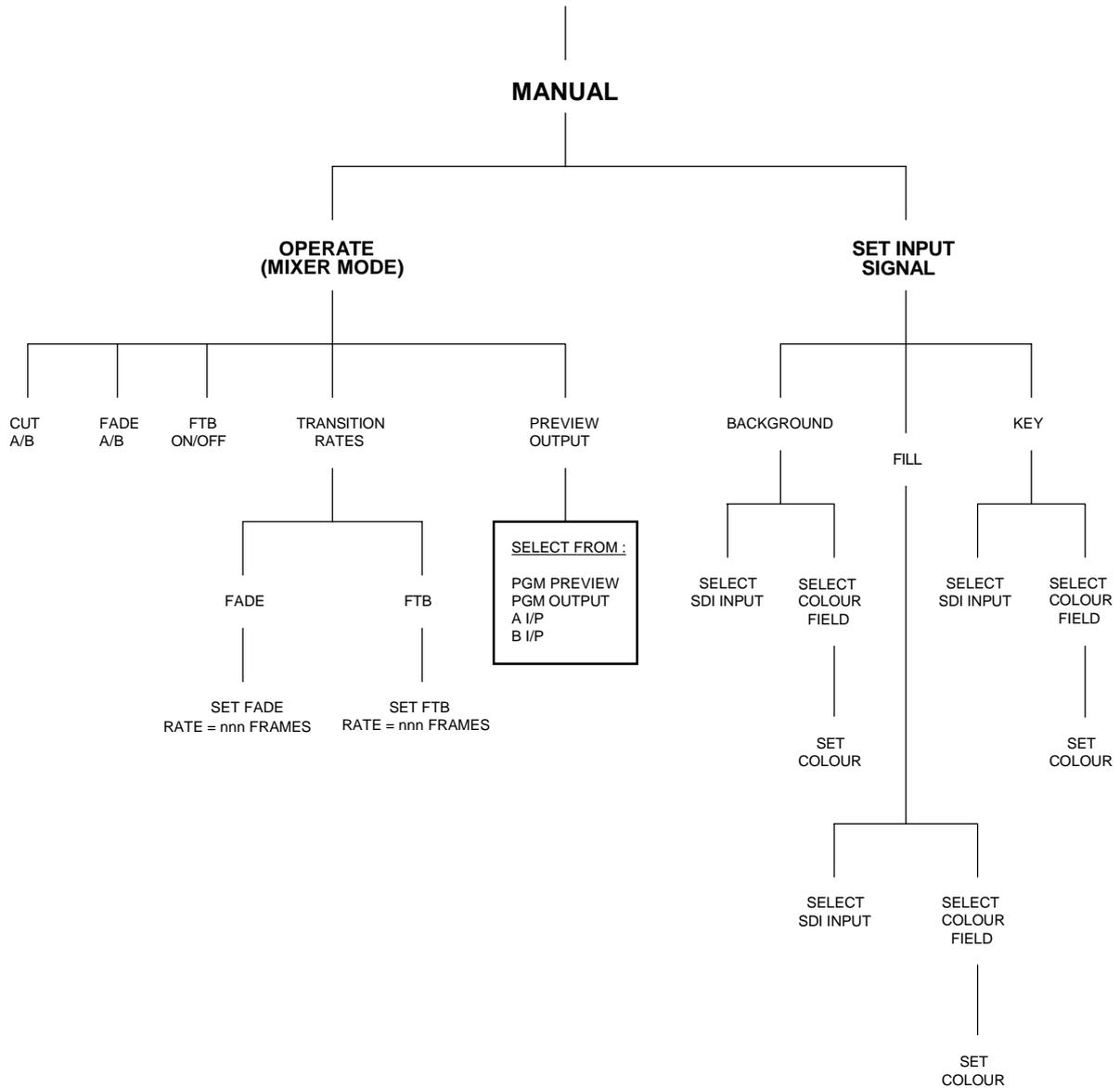
```
Keyer Operate
<preview output set
```

Press ENTER and select the required source from the 'Preview Output Set' menu. For example, programme preview is shown ready for selection in the display below:-

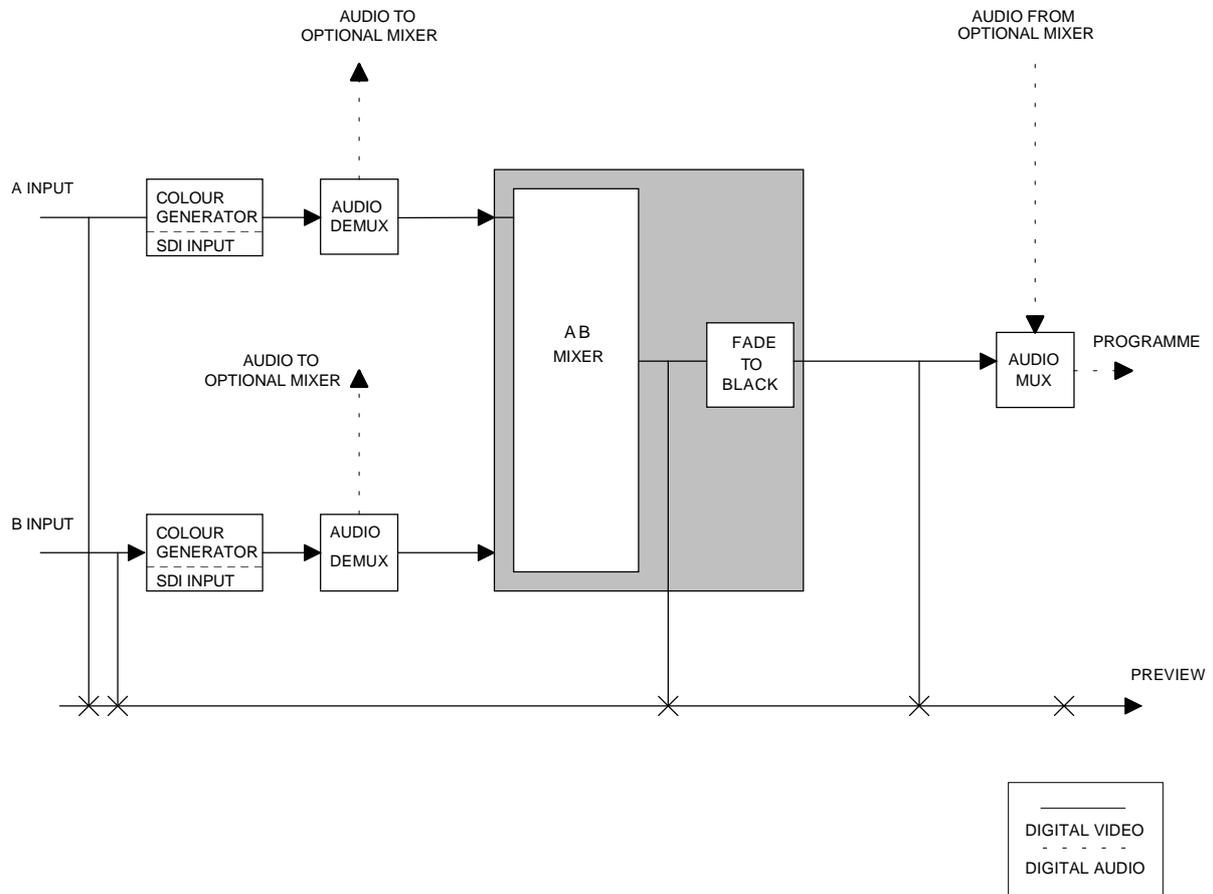
```
Preview Output Set
  programme PVW >
```

Press ENTER to confirm selection, or to leave unadjusted, press ESC. The unit will then return to the 'Keyer Operate' menu.

7 AB MIXER OPERATION



'MIXER OPERATE' FRONT PANEL SOFTWARE MENU



'AB MIXER' MODE BLOCK DIAGRAM

The following mixer operations are available:-

- Cut A/B**
- Fade A/B**
- Fade To Black On/Off**
- Transistion Rates**
- Preview Output**

To operate any of the above mixing functions, start at the top of the menu, select 'manual' as shown:-

```
Accent Keyer ver 1.1
{manual}          set-up
```

Then select 'operate':-

```
Manual Override
{operate}       set i/ps
```

Use the left and right cursor buttons to select required mixing operation.

Cut A/B

To action a mixer cut up or down, ensure that you have 'cut A/B' selected from the 'Mixer Operate' menu, as below:-

```
Mixer Operate
cut  A/B      >
```

Press ENTER and the operation will take place immediately. The display will not change and the unit will be ready to perform further cut A/B operations using the ENTER button.

Fade A/B

To action a mixer fade A or B, ensure that you have 'fade A/B' selected from the 'Mixer Operate' menu, as below:-

```
Mixer Operate
<  fade A/B  >
```

Press enter and the operation will take place immediately. The display will not change and the unit will be ready to perform further fade A/B operations using the ENTER button.

Fade To Black On/Off

To action a 'Fade To Black on/off' ensure that you have 'FTB on/off' selected from the ' Mixer Operate' menu, as below:-

```
Mixer Operate
< FTB on/off >
```

Press ENTER and the operation will take place immediately. The display will not change and the unit will be ready to perform further 'Fade To Black on/off' operations using the ENTER button.

Transition Rates

'Mixer fade' and 'Fade To Black' transition rates can be adjusted. To adjust a transition rate, ensure that you have 'transition rates' selected from the 'Mixer Operate' menu, as below:-

```
Mixer Operate
< transition rates >
```

Press ENTER, and select the transition rate that you intend to change as shown:-

```
Adjust Rates
{fade} FTB
```

Press ENTER once more and the unit will display the current transition rate:-

```
Fade Rate
rate = 028 frames
```

Use the cursor buttons to adjust the transition rate and press ENTER to confirm. To leave unadjusted press ESC and the unit will return to the 'Adjust Rates' menu.

Preview Output

The signal sent the rear panel 'PVW' preview output can be selected from a number of sources, these are:-

- Programme Preview**
- Programme Output**
- A Input**
- B Input**

To select a new source for the preview output, ensure that you have 'preview output set' selected from the 'Mixer Operate' menu, as below:-

```
Mixer Operate
<preview output set
```

Press ENTER and select the required source from the 'Preview Output Set' menu. For example, A input is shown ready for selection in the display below:-

```
Preview Output Set
  A i/p          >
```

Press ENTER and to confirm selection or to leave unadjusted, press ESC. The unit will then return to the 'Mixer Operate' menu.

8 HARDWARE INTERFACE

Control Ports (Faders and GPI)

Two control ports exist, the SDI CONTROL PORT and the AES CONTROL PORT. The AES port is only for units with the digital audio mixer option fitted. The SDI port connects faders and GPIs to the unit. The control port is a 25 way female 'D' connector and is pinned as follows:-

Pin	Function
1	RESERVED
2	RESERVED
3	ANALOGUE FADER - SPARE
4	ANALOGUE FADER - SPARE
5	ANALOGUE FADER - SPARE
6	ANALOGUE FADER - MAIN FTB
7	ANALOGUE FADER V+ OUT
8	GPI +12V OUT
9	GPI 8
10	GPI 6
11	GPI 4
12	GPI 2
13	GPI GROUND
14	RESERVED
15	ANALOGUE FADER GROUND
16	ANALOGUE FADER - TRANSPARENCY
17	ANALOGUE FADER - GAIN
18	ANALOGUE FADER - CLIP
19	ANALOGUE FADER - MAIN FADE
20	N/C
21	GPI 9
22	GPI 7
23	GPI 5
24	GPI 3
25	GPI 1

Analogue faders are used to control a number of system variables. In order to use the fader input pots should be connected between the ANALOGUE FADER V+ and ANALOGUE FADER ground. Pots should be greater than 20KΩ and screened cable should be used. The screen should be connected to the ANALOGUE FADER GROUND at the Keyer end of the cable and nowhere else. Analogue fader signals must be wired such that extraneous signals are less than 1mV. Ground loops should be avoided.

GPI signals GPI 1 to GPI 7 can be inputs or outputs whilst, GPI 8 and GPI 9 are inputs only. When used as inputs, the GPIs are activated by pulling to GPI ground. When used as outputs the signals are internally pulled to ground with a darlington transistor (0.7V saturation voltage).

Lamps or relays may be driven from the GPI +12V supply from which a total of 500mA may be drawn. Where relays are driven, reverse diodes should be connected across the relay to catch switch off transients.

PNL (Control Panel)

The PNL connection is used to connect Pro-Bel remote control panels. This is a 9 way female 'D' type. The pinouts are as follows:-

Pin	Function
1	GND
2	DATA A-
3	DATA B+
4	0V OUT
5	GND
6	GND
7	DATA A+
8	DATA B-
9	+12V OUT

RS232

RS232 signals are taken from the control card. These conform to the pinouts expected from an IBM PC 9 way male 'D' type serial port. These are as follows:-

Pin	Function
1	DCD
2	RX
3	TX
4	DTR
5	GND
6	DSR
7	RTS
8	CTS
9	RI

RS422/485

RS422/485 signals are taken from the control card. These are carried on a 9 way male 'D' type and are pinned as follows:-

Pin	Function
1	TX-
2	TX+
3	RX+
4	RX-
5	GROUND
6	RTS-
7	RTS+
8	CTS+
9	CTS-

9 SPECIFICATION

Serial Inputs	Type:	Component SDI 270MHz, 75 unbalanced NRZI coded serial data (BNC)
	Return loss:	>15dB 5MHz to 270MHz
	Equaliser:	Adaptive automatic for cable up to 300m (typical). Belden 8281 type or equivalent coaxial cable
Serial Outputs	Type:	Component SDI 270MHz, 75Ω unbalanced NRZI coded serial data (BNC)
	Return loss:	>15dB 5MHz to 270MHz
	Amplitude:	800mV ±10%
	Risetime:	CCIR: between 0.75ns and 1.5ns
	Copy feed:	Fully equalised and regenerated
Analogue Reference Video Input	Signal:	PAL, NTSC or component analogue video with syncs (high impedance looping BNC)
Power	Type:	110-240V a.c. <50 watts, 50-60Hz mains supply
	Fuse:	2 amp, slow blow HRC (20mm)
Mechanical	Height:	44mm (1.75")
	Width:	482mm (19.0") 442mm (17.5") excluding mounting ears
	Depth:	442mm (17.5") 423mm (16.75") excluding rear connectors
	Weight:	6.5Kg (7.5 Kg boxed)

10 APPLICABILITY

This protocol applies to the current version of the Accent Keyer range. Audio commands require the fitting of the audio processing board.

11 INTRODUCTION

This section describes the protocol used to control the Accent Keyer and Logo Inserter. These products are based on the same control platform so the term Accent Keyer will be used to describe them both.

This section is in two parts. The first, the semantics, describes the types and meanings of messages which can be sent to an Accent Keyer. The second part, the syntax, describes the way in which the messages may be sent.

The wide variety of control mechanisms, RS485 multi-drop, RS422 point-to-point, ES-BUS, GVG100, RS232 and Ethernet make adopting a single transport layer excessively restrictive. These commands can be carried on any mechanism capable of two-way transmission of ASCII characters.

12 COMMAND SEMANTICS

Commands are composed of groups of printable ASCII characters. Commands are of two sorts, actions and enquiries. Actions set values whilst enquiries cause a value to be returned.

13 VIDEO COMMANDS

Product	Description	Type	ID	Parameter 1	Parameter 2	Parameter 3	Parameter 4
MKL	FADE TO/FROM BLACK	ACT	0		1=TO BLACK		
MKL	FADE A/B OR KEY UP/DOWN	ACT	1	FIXED (1)	1=UP		
MKL	CUT TO/FROM BLACK	ACT	2	FIXED (1)	1=TO BLACK		
MKL	CUT A/B OR KEY UP/DOWN	ACT	3	FIXED (1)	1=UP		
L	LOAD DISPLAY FROM FILE NUMBER <n>	ACT	8	FIXED (1)	n		
L	STORE DISPLAY IN FILE NUMBER <n>	ACT	9	FIXED (1)	n		
L	ERASE STORE	ACT	A	FIXED (1)			
MKL	SET TRANSITION RATE	ACT	B	FIXED (1)	TYPE	RATE	
KL	SET SELF/SEPARATE KEY	ACT	C	FIXED (1)	1=SELF		
KL	SET LINEAR/FULL KEY	ACT	D	FIXED (1)	1=LINEAR		
KL	SET KEY NORMAL/INVERT	ACT	E	FIXED (1)	1=INVERT		
KL	SET CLIP, GAIN & TRANS	ACT	F	FIXED (1)	CLIP	GAIN	TRANS
L	SET IMAGE POSITION	ACT	G	FIXED (1)	HORIZ	VERT	
L	GRAB FILL/B+KEY AS VIDEO+KEY	ACT	J	FIXED (1)			
MKL	PASS SDI	ACT	K	INPUT			
MKL	FORCE COLOUR FIELD	ACT	L	INPUT	r	g	b
MKL	INQUIRE SYSTEM STATUS	ENQ	M				
	REPLY		M	SYSTEM STATUS BLOCK			
MKL	INQUIRE VIDEO STATUS	ENQ	N	FIXED (1)			
	REPLY		N	VIDEO STATUS BLOCK			
MKL	INQUIRE IMAGE STATUS	ENQ	O	FIXED (1)			
	REPLY		O	IMAGE STATUS BLOCK			
L	INQUIRE FILE STATUS	ENQ	P	N			
	REPLY		P	FILE STATUS BLOCK			
L	FILE ERASE	ACT	Q	N			

The column containing the letters M, K & L indicates which command is applicable to which product in which mode.

Command	Product	Mode
M	ACCENT KEYER	OPERATING AS A MIXER
K	ACCENT KEYER	OPERATING AS A KEYER
L	ACCENT LOGO	

Commands begin with a single identifying character which defines the nature of the command. This is followed by parameters the nature of which is dependent on the command.

The first parameter byte is typically unused and set to 1.

In Accent Keyer's mixer mode, the actions described as fading, or cutting the Keyer up will have the same effect as fading or cutting to the B input. Conversely, fading or cutting down will have the effect of selecting the A input.

Fade To Black/Fade From Black (ID 0)

These commands cause the total output to be faded to or from black. Repeated commands of the same sort have no effect. If the command is not finished when a reverse instruction is received, the fade will reverse direction and continue at the same rate.

Fade Keyer Up/Fade Keyer Down (ID 1)

These commands cause the keyer layer to be faded up or down. When the key is faded down, the background is passed unchanged. Repeated commands of the same sort have no effect. If the command is not finished when a reverse instruction is received, the fade will reverse direction and continue at the same rate.

Cut To Black/Cut From Black (ID 2)

These commands are identical to an instant fade to black.

Cut Fader Up/Cut Fader Down (ID 3)

These commands are identical to an instant fade.

Load Display From Image Library (Logo) (ID 8)

This reads an image into the store. Images are numbered from 1 to 10.

Save Display To Image Library (Logo) (ID 9)

This saves an image in the store to the internal library. Images are numbered from 1 to 10.

Erase Store (Logo) (ID A)

This empties a store and its associated key store. Both picture and key stores are filled with colour black.

Set Transition Duration (ID B)

This sets the duration for the selected transaction. The value provided sets the number of frames to complete the action. This value may range from 0 to 300. Type is a single digit defining which transition is to be controlled.

Type	Action
0	FTB
1	FADE

Set Self Key or Separate Key (ID C)

'Self key' sets the key input to be the Y component of the fill signal. The value will remain with the image as it is stored or recalled.

'Separate key' sets the key input to be taken from a separate key signal. The value will remain with the image as it is stored or recalled.

Set Key Linear or Full (Key Affects Fill) (ID D)

'Linear key' type sums the background (with the key signal area removed) to the foreground. The foreground is not affected by the key.

'Full key' type sums the background (with the key signal area removed) to the foreground. The foreground is only passed where the key signal is present. This mode is used with self-luma keys.

Set Key Normal or Invert (ID E)

'Normal key' implies that increasing brightness on the key signal will introduce more of the key fill signal.

'Key invert' implies that increasing signal will introduce less fill.

Set Clip, Gain and Transparency (ID F)

These commands set the clip, gain and transparency values. The parameter values are hexadecimal representations of unsigned 10-bit luminance values.

The 'clip value' is the lowest value of key signal which will cause the fill signal to contribute to the output.

The 'gain value' sets the level of key signal above which 100% of the fill signal is used.

The 'transparency value' (range 0 to 512) adjusts the transparency of the keyed foreground. 512 is totally opaque.

Set Image Position (Logo) (ID G)

This sets the position of the image relative to the viewing screen. The origin is the upper left hand corner with positive increments moving the picture downwards and to the right. The units are 'Y' pixels horizontally and 'lines on glass' vertically. The range horizontally is ± 768 and vertically ± 625 in 625 component (or 525 in 525 component systems). The horizontal resolution is two pixels and the vertical resolution is one line. Pictures may be placed off screen in all four directions. The values are in hexadecimal.

Grab Fill/B+Key To The Store (Logo) (ID J)

This causes a single frame of the fill and key signals present on inputs Fill/B and KEY to be written into the store. The signal on Fill/B is taken as the YUV 4:2:2 signal. The Y component of the signal on KEY is taken as the key signal. The Keyer should be cut or faded down for this operation.

Pass SDI (ID K)

This allows the selected input channel to pass the SDI if present. If no SDI is present then the colour field will be automatically substituted.

Force Colour Field (ID L)

This causes the selected input channel to produce a colour field. The R, G & B values are given as parameters. The values are hexadecimal representations percentages of saturated colour, for example 32 32 32 is 50% red, green and blue.

Input 0 is the background, 1 is the grab port fill input, and 2 is the grab port key input. These signals are labelled BGnd/A, Fill/B and KEY respectively on the rear of the equipment.

Inquire System Status (ID M)

This returns information about the total system:-

- The software version
- The transition rates

Inquire Video Status (ID N)

This returns a status block about the fader settings. The information returned is:-

- Fader settings
- Fade to black settings

Inquire Loaded Image Status (Logo) (ID O)

This returns a status block about the image loaded onto the store. The information returned is:-

- Position x,y
- Key modes
- Image file number
- Clip, gain and trans
- Masking

This data is returned in one block. For exact details of the specification see the program example.

Inquire File Status (ID P)

This returns a status block about the file slot selected. In particular it determines if the file slot is in use.

Erase File (ID Q)

This erases the file slot selected.

14 AUDIO COMMANDS

Audio commands are applicable to systems which have the audio mixer layer fitted. The audio system is viewed as a matrix with variable gain crosspoints. The mixes output from the matrix are then patched to physical outputs each of which has a master gain (fade to silence) control. Each of the mix matrix inputs is also available at the patch layer to allow pre-mix monitoring.

The inputs into the matrix may be selected from embedded audio or from physical AES inputs. The outputs from the patcher stage are available as AES and optionally as analogue audio. These outputs may be embedded into the program SDI output.

In practice there are physical constraints which limit the maximum number of logical outputs, the maximum number of physical outputs and the maximum number of inputs which may simultaneously contribute to any given logical output. This depends on the hardware purchased.

Inputs may be treated as mono or stereo. Inputs may be phase inverted or silenced. Pan control is available to control the sending of signals into the mix.

Mixer outputs are controlled by sending tuples of gain, input and time for each input fader to be changed. Mix matrix outputs can be specified as Left, Right or stereo.

Audio Commands Table

This table shows the commands used to control the audio layer. Each entry P1,P2,P3... in the table shows a parameter to be put in the command string. These parameters are not separated by spaces as they are all of fixed length. The values for each parameter are of set types which are listed in the table and explained later in the document.

	Type	ID	P1	P2	P3
MATRIX INPUT PRE-SELECT	ACT	a	MATRIX INPUT	PRE SELECT SOURCE	
			path_no	phys_io	
SET INPUT MODE	ACT	b	MATRIX INPUT	INPUT MODE	
			path_no	io_mode	
SET INPUT PAN	ACT	c	MATRIX OUTPUT	PAN VALUE	
			path_no	pan_val	
SET MIX	ACT	d	MATRIX INPUT	INPUT LEVEL BLOCK	
			path_no	mix_blk	
SET MIX MODE	ACT	e	MATRIX OUTPUT	OUTPUT MODE	
			path_no	io_mode	
SET OUTPUT PATCH	ACT	f	PATCH OUTPUT	PATCH INPUT	SELECT MATRIX INPUT OR OUTPUT
			path_no	path_no	patch_source
SET OUTPUT GAIN	ACT	g	PATCH OUTPUT	GAIN	DURATION
			path_no	gain_val	duration
SET EMBEDDED OUTPUT	ACT	h	PATCH OUTPUT	EMBEDDED CHANNEL	

Matrix Input Pre-Select (ID a)

This command selects which physical input is pre-selected to the matrix input. The parameters are the matrix input and the pre-select input.

Set Input Mode (ID b)

This sets the input to the matrix to be either mono or stereo and also sets the input to carry either the input unmodified, the input replaced by silence or the input phase inverted. This takes two parameters the matrix input and the input mode. When an input is set to stereo the command will affect both channels. When set to mono it will only affect the indicated channel. Setting the mode to stereo or mono affects the other channel in the channel pair.

Set Input Pan (ID c)

This sets the proportion of each input passed in a stereo input or the position of a mono input into a stereo mix. This takes an input and a pan value.

Set Mix (ID d)

This command sets one or more contributions to a given mix. All inputs which are not explicitly mentioned in the command are unchanged. At least one `mix_block` must follow the matrix output value.

Set Mix Mode (ID e)

This command sets the mode of a mix matrix output to either mono or stereo. The parameters are the output and the mode.

Set Output Patch (ID f)

This selects which signal is patched to a given patch panel output. One source may feed many outputs. A separate parameter is used to say if the value is an input to the matrix or an output from it.

Set Output Gain (ID g)

This sets the fade to silence fader associated with a patch panel output. The duration value sets the number of frames over which the action is to take place.

Set Embedded Output (ID h)

This sets which groups the audio outputs are embedded into. The AES output is always available and need not be set explicitly as it must be when setting the mode of an input.

Parameter Ranges and Meanings

This section explains the format of the fields in the commands above.

phys_io

This is used to pre-select the source taken into a matrix input or the destination to which an output is sent. Values can be selected from embedded channel pairs or from separate physical AES streams. Value 0x21 selects embedded channel pair 1. 0x28 selects channel pair 8. 0x29 selects the associated AES stream.

path_no

This is the number of the input or output as though it was a mono mixer (or the input may be thought of as the stereo input number followed by a one bit left/right identifier). Left is lower than Right.

The value is computed as 0x20 + path number. Thus:-

0 0 1 0 0 0 0 0

nnnnn = STEREO input number
 p = 0 Left

For example:-

```

. . .
0x22    ->    path 1    pair 1    LEFT
0x23    ->    path 2    pair 1    RIGHT
0x24    ->    path 3    pair 2    LEFT
0x25    ->    path 4    pair 2    RIGHT
0x26    ->    path 5    pair 3    LEFT
0x27    ->    path 6    pair 3    RIGHT
    
```

io_mode

I/O mode defines the way that commands for inputs and outputs are interpreted. For inputs this controls whether the input is a separate mono input or is treated as part of a stereo pair. It also controls whether the signal is phase inverted or replaced by silence. For outputs only the mono/stereo bit is significant.

0 0 1 0 0 a a x

x	=	0	STEREO
x	=	1	MONO
aa	=	01	Silence
aa	=	10	Normal
aa	=	10	Inverted

Setting either part of a pair to mono or stereo forces the other part to follow suit.

pan_val

The pan value is used to 'pan' an input across the stereo image. This value is two bytes long comprising two hex digits forming a signed byte. 0x30 0x30 (00) represents a value of 0 and is a central image. Characters 0x37 0x66 (7f) represents a value of +127 is fully right and characters 0x37 0x30 (80) represent a value of -128 and is fully left.

gain_val

Gain is specified in 1/2 dB steps with 1 meaning -99.5dB. 0 is a special case and means infinite attenuation. The maximum gain which may be specified is +28dB. This value is two bytes long comprising two hex digits forming an unsigned byte. Thus, 00 implies infinite attenuation, 01 -99.5dB and FF implies +28dB.

duration

A duration is used to set the number of frames over which a gain change will take place. It is coded as one hex value of two bytes width.

For example:-

0x30 0x20 -> 32 -> take 32 video frames

mix_blk

A `mix_blk` is used to set one input component of a mix. It consists of a tuple of three values contained in 5 bytes. The first value is one byte wide and is a `path_no`. The remaining 4 bytes are coded as two hex values each of two bytes width.

The first value selects the contributing input, the second value is the required gain and the third value is the duration, in video frames, over which the transition is to take place.

For example:-

```

0x23  0x39  0x36  0x30  0x20
      0x23          -> path 3 if MONO, 3 and 4 if STEREO
0x39 0x36          -> 96 -> (96/2) -99.5 = -51.5dB

```

patch_source

This value is set for 0x20 if the patcher is to monitor the matrix inputs and it is set to 0x21 to monitor the matrix outputs.

Hardware Limitations: HW Vn. 2.0, FW Vn. 2.0

The current version of the audio system has the following constraints:-

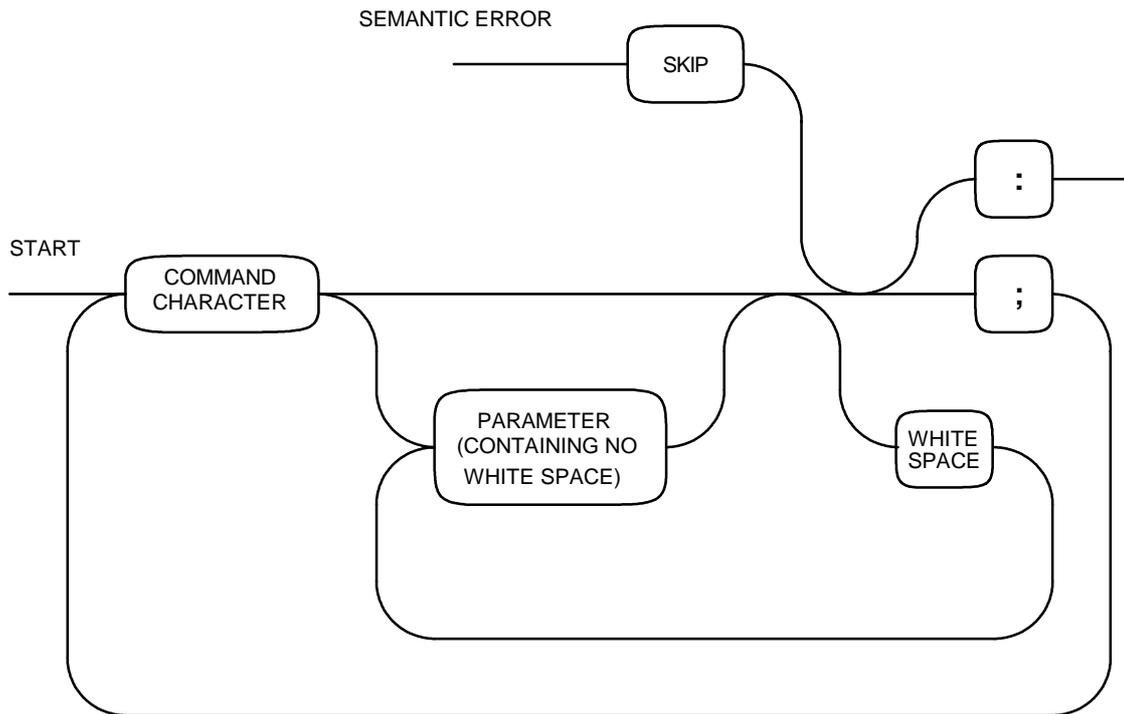
- The matrix has 6 (12mono) inputs.
- The matrix output can produce 4 (8mono) mixes.
- There are 6 physical outputs each an AES channel pair. Each of which can select a signal from the rest of the system.
- Matrix input 1 may be selected from either AES input 1 or one channel pair from the audio embedded in the background SDI. Matrix input 2 is then automatically set to the other channel pair in the same input group. Values for the input selector range from 1 to 8 (where 1 or 2 select group 1, and where 3 or 4 select group 2 and so on). This redundant numbering will maintain compatibility with possible future hardware revisions.
- Matrix input 2 may be selected from either AES input 2 or one channel pair from the audio embedded in the fill SDI. Matrix input 3 is then automatically set to the other channel pair in the same input group. Values for the input selector range from 1 to 8 (where 1 or 2 select group 1, and where 3 or 4 select group 2 and so on). This redundant numbering will maintain compatibility with possible future hardware revisions.
- Only channel pair outputs 0 and 1 may be embedded on the SDI program output. These must be embedded in the same audio group.

15 MESSAGE SYNTAX

Lists of commands as described above are made into messages to be transmitted. This is shown in the syntax diagram below. The commands in the command list are executed when the entire list has been received.

Command lists may then be encapsulated in any one of a number of different mechanisms.

Command List



Note: All data are ASCII characters \geq 0x20.

RS232/RS422 Encapsulation

For transmission over point to point links the command list is encapsulated as described below. All communications take place at 19k2 BPS with 8 bits of data, 1 stop bit and no parity.

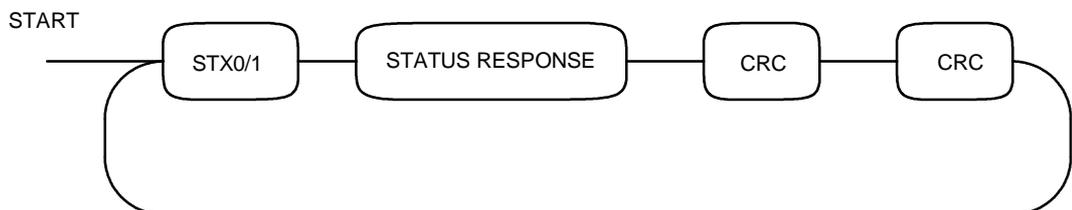


STX alternates between STX0 and STX1. Good messages are responded to by ACK0 or ACK1 the ACK matching the STX. If no ACK is received the message must be sent with the same flavour of STX. By this means lost ACKs do not cause message duplication.

If message transmission fails in that all retries either receive NAK or time-out, then the next attempt to send a message must use the opposite type or STX. This is important as a system reset could cause the Keyer to be waiting for the wrong STX.

If the Keyer receives a message it cannot understand it will respond with a NAK.

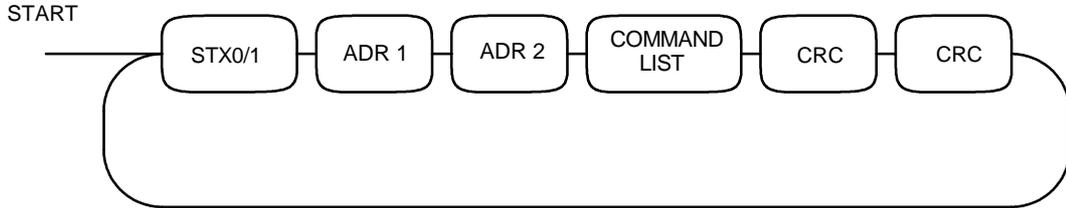
Status requests cause the following message to be returned:-



Status messages are not acknowledged or re-transmitted. The STX follows the STX of the received command. If the host fails to receive a status message it must re-request the status. This is appropriate as the host may have more important uses for the link and would otherwise be forced to wait for a re-transmission. Also as these messages are datagrams of state requesting the latest status is, in general, more useful than the data which may have been lost.

RS485 Encapsulation

For transmission over multi-drop links the command list is encapsulated as described below. All communications take place at 19k2 bps with 8 bits of data, 1 stop bit and no parity.



STX alternates between STX0 and STX1. Good Messages are responded to by ACK0 or ACK1 the ack matching the STX. If no ACK is received the message must be sent with the same flavour of STX. By this means lost ACKs do not cause message duplication.

If message transmission fails in that all retries time-out, then the next attempt to send a message must use the opposite type of STX. This is important as a system reset could cause the Keyer to be waiting for the wrong STX.

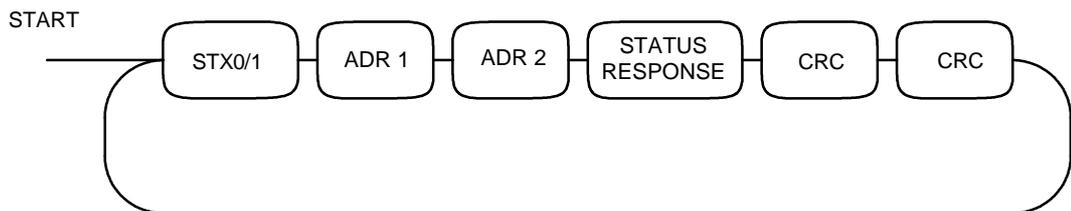
The slave addresses of Keyers are transmitted with each character added to 0x20 (This places a limit on the range of addresses available as neither the MS or LS parts may exceed 0xDF. It still leaves around 50,000 addresses).

The MS part of the address is transmitted first.

The CRC is accumulated over all characters after the STX and will equal 0 after both CRCs have been received.

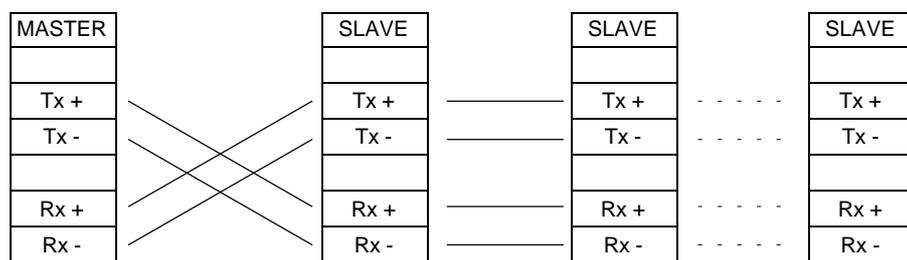
The Keyer will not drive the return data line unless it is correctly addressed in particular it will not send a NAK.

Status requests cause the following message to be returned:-



Status messages are not acknowledged or re-transmitted. The STX follows the STX of the received command. If the host fails to receive a status message it must re-request the status. This is appropriate as the host may have more important uses for the link and would otherwise be forced to wait for a re-transmission. Also as these messages are datagrams of state requesting the latest status is, in general, more useful than the data which may have been lost.

RS485 Connections



Software Details

The following software examples show a fast way to calculate the CRC and a SW interface driver. The latter code shows how to decode the contents of the status blocks.

Disk copies of the latest version of this program are available on request.

```

/*****

```

```

TITLE   :           Software Examples      © Oxtel Ltd
FILE    :           EG.CPP
VERSION :
AUTHOR  :           RMS
MOD. RECORD :
DESCRIPTION :

```

Example code for Accent Keyer interface

User must provide:-

```

get_data      reads a char from the serial port
get_data_timed reads a char and times out if none received
data_ready    returns true if a character waiting
send_char     sends a char to the serial port

```

```

*****/

```

```

int rem_address[ MAX_CHANS ];          /* array of addresses */
int this_stx[ MAX_CHANS ];

#define STX0    0x02
#define STX1    0x03

#define ACK0    0x04
#define ACK1    0x05
#define NAK     0x07

unsigned rem_crc;                      /* place to build CRC */

/*****
  things which must be done first */

void init()
{
  int i;

  for( i = 0 ; i < MAX_CHANS ; i++ )
    this_stx[ i ] = STX0;              /* say which STX to start with */

  rem_address[ 0 ] = 0x1234;          /* example addresses */
  rem_address[ 1 ] = 0x2234;
}

/*****
  utility routine to generate 16 bit CCITT CRC */

const unsigned int lstab[] =
{
  0x0000,
  0xc0c1,
  0xc181,
  0x0140,
  0xc301,
  0x03c0,
  0x0280,
  0xc241,
  0xc601,
  0x06c0,
  0x0780,
  0xc741,
  0x0500,
  0xc5c1,

```

```

    0xc481,
    0x0440
};

const unsigned int mstab[] =
{
    0x0000,
    0xcc01,
    0xd801,
    0x1400,
    0xf001,
    0x3c00,
    0x2800,
    0xe401,
    0xa001,
    0x6c00,
    0x7800,
    0xb401,
    0x5000,
    0x9c01,
    0x8801,
    0x4400
};

void do_crc( char ch, unsigned int * crcptr )
{
    unsigned int tmp;

    tmp = *crcptr ^ ch;
    *crcptr = mstab[ (tmp>>4) & 0xf ] ^ lstab[ tmp&0xf ] ^ ( *crcptr ) >> 8 );
}

/*****
    this waits for the status block from the Accent Keyer
*****/

int get_response( int chan )
{
    char ch;
    int rx_data_index;

    rx_data_index = 0;
    unsigned int rem_crc = 0;

    if( MULTY_DROP )
    {
        /* if using 485 multy drop */
        /* get the addresses and check if good */
        if( ! get_data_timed( ch, DATA_WAIT_TIMEOUT ) )
            return FALSE;

        if(( rem_address[ chan ] >> 8 ) != ( ch - 0x20 ))
            return FALSE;

        do_crc( ch, &rem_crc );

        if( ! get_data_timed( &ch, DATA_WAIT_TIMEOUT ) )
            return FALSE;

        if(( rem_address[ chan ] & 0xff ) != ( ch - 0x20 ))
            return FALSE;

        do_crc( ch, &rem_crc );
    }
}

```

```

for(;;)
{
    /* building command list */
    if( ! get_data_timed( &ch, DATA_WAIT_TIMEOUT ) )
    {
        rx_buff[ rx_data_index++ ]=0; /* timeout: terminate string & return */
        return FALSE;
    }

    rx_buff[ rx_data_index++ ] = ch & 0x7f;
    do_crc( ch, &rem_crc );

    if( rx_data_index > MAX_STRING )
    {
        rx_buff[ rx_data_index++ ]=0; /* o-flow: terminate string & return */
        return FALSE;
    }

    if( ch == ':' )
        break;
}

rx_buff[ rx_data_index++ ] = 0;

if( get_data_timed( &ch, DATA_WAIT_TIMEOUT ) )
    return FALSE;
do_crc( ch , &rem_crc );

if( get_data_timed( &ch, DATA_WAIT_TIMEOUT ) )
    return FALSE;
do_crc( &ch , &rem_crc );

return( rem_crc == 0 );
}

/*****
send a message to a remote Accent Keyer.
the chan variable is an index into the array of remote addresses. */

void remote_send( char * message, int chan )
{
    int retries;
    int ch;
    char * data;
    int expected_ack;

    response_waiting = FALSE;

    for( retries = 0 ; retries < MAX_RETRIES ; retries++)
    {
        data = message; /* doing re-tries */
        /* make a copy so we can re-send */

        rem_crc = 0;
        expected_ack = ( this_stx[ chan ] == STX0 ? ACK0 : ACK1 );
        send_char( REMOTE_SERIAL_PORT, this_stx[ chan ] );

        if( MULTY_DROP )
        {
            ch = ( rem_address[ chan ] >> 8 ) + 0x20; /* send the address */
            send_char( REMOTE_SERIAL_PORT, ch );
            do_crc( ch, &rem_crc );

            ch = ( rem_address[ chan ] & 0xff ) + 0x20 ;
            send_char( REMOTE_SERIAL_PORT, ch );
            do_crc( ch, &rem_crc );
        }

        while( ( ch = *data++ ) != 0 ) /* send the data */
        {

```

```
        &gain,  
        &opac,  
        &transparency,  
        &h_position,  
        &v_position,  
        &h_size,  
        &v_size,  
        &top_mask,  
        &bottom_mask,  
        &left_mask,  
        &right_mask,  
        &file_slot,  
        &tmp_char );  
  
    key_self    = tmp_char & 0x1;  
    key_linear  = tmp_char & 0x2;  
    key_invert  = tmp_char & 0x4;  
} }  
}
```

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16. WARRANTY PERIOD

Hardware Products

Hardware Products are warranted for a period of two years from the date of shipment. During this period Pro-Bel, at its discretion, will repair or exchange products proved to be defective providing that the products are returned to Pro-Bel, carriage pre-paid. The Company will use its best efforts to ensure that returned items are repaired and despatched within ten working days of receipt. Third party items, including PC hardware or any outsourced equipment is limited to the original manufacturers warranty, typically one year.

Software Products

Software Products are warranted for a period of ninety days from the date of shipment. During this period Pro-Bel undertakes to rectify products proved not to conform to the published specification provided with the product, when used in accordance with PC hardware and operating systems approved by Pro-Bel.

Loans

Within the warranty period, the Company will, at its discretion and subject to availability, provide loan units pending the repair of returned items. Loans are offered on a no charge basis providing that the loan units are returned to Pro-Bel within a period of twenty one days following the date of despatch of the repaired items. In the event that the loan units are not returned within this period, the loan units will be subject to a monthly overdue charge, details of which are available on request. Carriage charges apply to all loans.

NON WARRANTY PERIOD

Outside the stated warranty period, the Company will use it's best endeavours to rectify equipment failures through the provision of spare parts or in house repair services.

Loan units may also be provided subject to availability. All services and carriage costs are subject to a scale of charges, details of which are available on request.