

Skymicro Merlin05  
Version RC57

BREC – Batch Recorder Application for  
Dual Stream Recording and Decoding

Users Manual



The Sky is the Limit

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## 1. Overview

### 1.0 Introduction

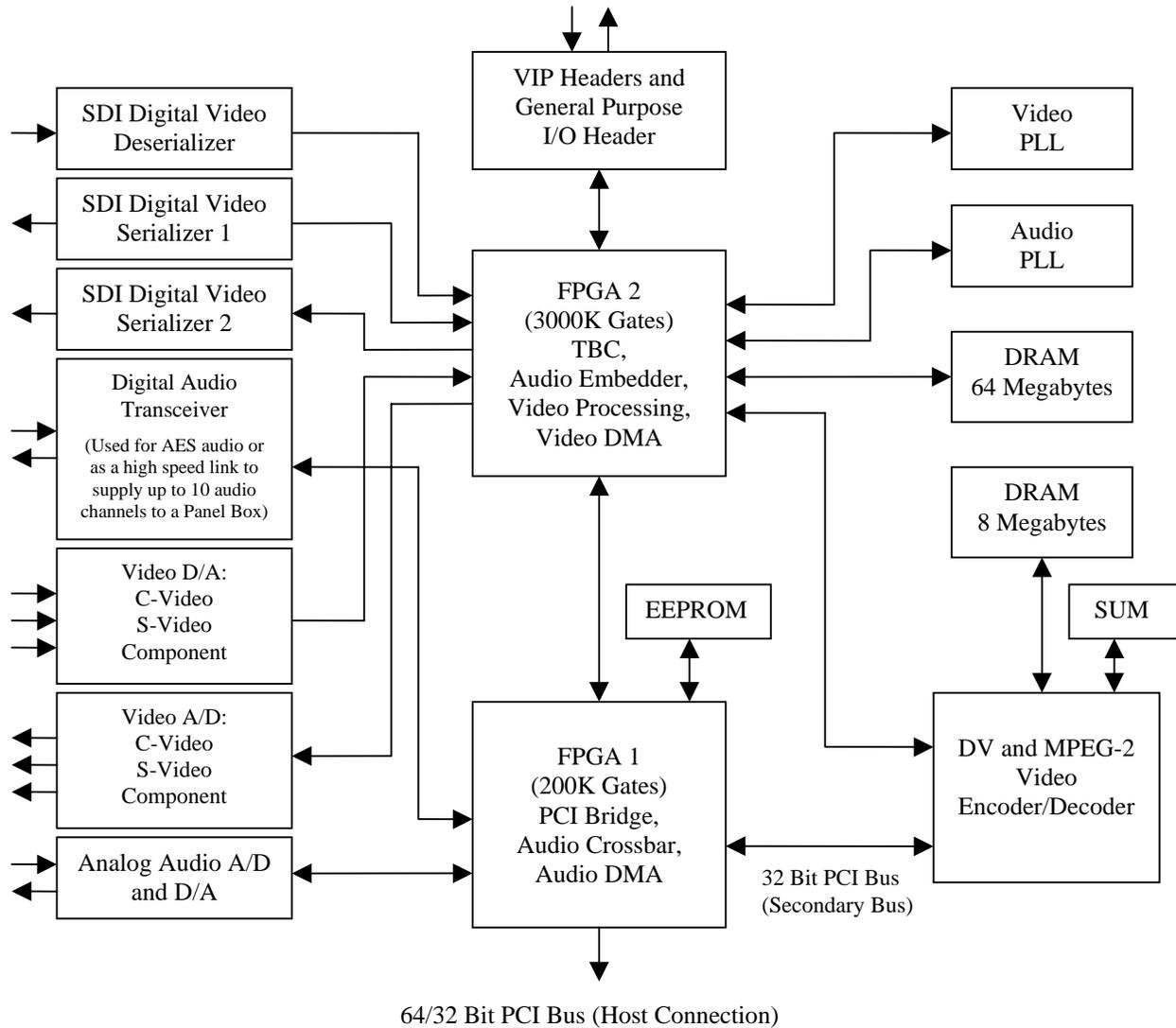
Skymicro's Merlin05 DV and MPEG-2 Recorder and Dual Stream Decoder board is a complete video capture and playback solution in a single half-sized PCI card. It is ideally suited for applications such as digital video broadcast, video distribution applications, authoring, and nonlinear editing.

The Merlin05 DV and MPEG-2 Recorder and Dual Stream Decoder includes all the software necessary to record, compress, process and play back audio and video clips in DV and MPEG-2 formats. The audio and video are treated separately so audio can be added to video at a later time or vice versa. The Merlin board can also play audio and video at variable speed. Merlin has many elaborate Non Linear Editing features; one of these is to allow you to play back two streams of video and then transition from one to the other using many selectable transition effects. By using a highly sophisticated processor all this can be done in Real Time. Moving from any frame to any other frame in a video clip is a snap with Merlin. All you need to do is enter a frame number or move a slide control and you are instantly at the desired frame. You can even give Merlin a play list to specify all the clips you wish to play, and all the transition effects you wish to occur between your clips with starting and ending frame numbers, and Merlin will do the rest. Merlin can even convert files to and from DV and MPEG-2.

### 1.1 Key Features

- Real Time DV and DVC-PRO50 Play and Record.
- Real Time MPEG-1, MPEG-2 and IMX Play and Record.
- Real Time 10 Bit Uncompressed Play and Record.
- MPEG-2 (4:2:0) and (4:2:2) Chroma sampling supported.
- DV (4:2:0), (4:1:1) and (4:2:2) Chroma sampling supported.
- Variable and fixed bitrates from below 1 Mbs to 50 Mbs supported.
- I - Frame only, IP, IBBP and IB GOP structures supported.
- Variable resolutions supported up to 720x512(NTSC), or 720x608(PAL) including the ability to capture lines in the blanking interval.
- Variable Video Play Speed at resolutions as low as 1% normal speed.
- Composite analog, S-video analog, Component (YCrCb and RGB), or SDI Serial Digital video selectable as video input or genlock source.
- Composite analog, S-video analog, Component (YCrCb and RGB), and SDI Serial Digital video simultaneous outputs.
- Supports 32K, 44.1K and 48K audio sample rates that can be locked to the video clock.
- Up to 3 AES3 digital audio connections supporting PCM, AC-3, DolbyE, etc. (1 AES3 max without Panel)
- Up to 8 channels of embedded audio per SDI video connection.
- Up to 4 channels of analog audio. (2 channels max without Panel)
- Analog video input is Time Base Corrected allowing Merlin to be used as a TBC when in pass through mode.
- SDI Serial Digital video input has jitter reduction allowing Merlin to be used as a SDI video Jitter reducer in pass through mode.
- Merlin can also be used as an Analog to SDI Serial Digital video converter and vice versa.
- Decodes two DV or MPEG-2 video streams with the ability to alpha blend the 2 video streams in Real Time for doing elaborate scene transitions such as fades, wipes, dissolves, etc.
- Two independent SDI video outputs that can play 2 separate video streams at the same time.
- Logo Inserter, Video Scalar and Video Color Space Converter built in.
- VITC and LTC reader and generator on each input and output. VITC reader and generator can even be used on pass through video.
- Simple Play List format for playing long sequences with many video clips and transitions.
- Runs on Windows™ 98/NT/2K/XP, Linux™, IRIX™, Solaris™, and Mac OS™.
- Support for multiple boards per system to allow simultaneous Record and Play, including support for video delay applications.
- Conversion to and from DV, MPEG-2 and uncompressed formats at rates faster than Real Time.
- Merlin can be used for DVD authoring.
- Includes all the software needed to Record, Play and Edit Video and Video Play Lists.
- Includes a Batch recording utility with VTR control.
- Includes a Software Development Kit and many source code examples for custom application developers.
- Includes a lot of field programmable logic that can be reconfigured via software allowing for easy feature request upgrades.
- Half sized PCI card that works in both 3.3V and 5 Volt PCI slots.
- 64 bit PCI interface that works in both 32 bit and 64 bit PCI slots.

## 1.2 Block Diagram



Merlin05 Block Diagram

## 2. Getting Started

### 2.0 System Requirements

Please make sure your system meets the following requirements before using the Merlin05 board.

- Pentium 600MHz CPU or a CPU with higher performance.
- Windows XP, Windows 2000, Windows NT 4.0, Windows 98, or Windows Me Operating System.
- One available Bus Mastering PCI slot (two slots if you are installing a two board configuration).
- At least 128 Megabytes of system DRAM.
- A high performance Disk Drive or Disk Array for storing Audio/Video files.
- At least 10 Megabytes of available Disk space for the Merlin Application Software.
- Approximately 10 to 100 Megabytes of Disk space for each minute of video you plan to store.
- An output monitor or overlay graphics card (such as the ATI All in Wonder) to view video output.

### 2.1 Package Contents

Please make sure your package includes the following items.

- One Merlin05 board.
- One 14 pin cable for Analog Input/Output Connections (Composite, S-VHS, Component, Audio).
- One 9 pin cable for Digital Input/Output Connections (D1 Serial Video, AES Audio).
- Installation Software.
- Documentation.

### 2.2 Preparing Your System

Before you install your Merlin05 Board there are a few guidelines that will help you achieve optimum video performance. It is important to make sure that there are no other programs running while recording and playing back video. You should check your system and make sure there are no screen savers, anti-virus programs or fax/modem utilities that can use up CPU and memory resources. It is also important to make sure your disk drives will run efficiently. The best way to do this is to defragment your disk drives frequently. If you do not own any defragmentation software, we recommend that you purchase Norton Utilities for Windows from Symantec. This software package includes a defragmentation program for the most Windows Operating System. Another way to optimize your disk performance is to have a dedicated partition for Audio and Video files. Here is a list of recommendations on how to optimize the performance of the Audio/Video (A/V) partition that you use:

- Try not to store anything other than Audio/Video files on your A/V partitions.
- Defragment your A/V partitions frequently.
- Try to use NTFS (WindowsNT, Windows 2000/XP File System) partitions for A/V files.
- Try to use dedicated drives to store your A/V files.
- If possible use a high performance storage system for your A/V files.

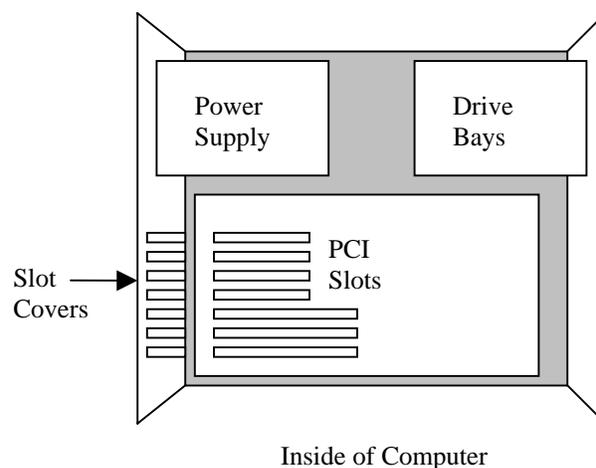
A high performance storage system can mean a variety of things. It can be as simple as using a single high quality IDE, SCSI or Fibre Channel disk drive to using a high performance Disk Array tuned for optimum video performance. There are lots of storage system options available and lots of companies to choose from. With MPEG-2 very high quality video can be achieved with a less than 15 megabit per second video stream. This is easily sustained on even the cheapest IDE drives available today. However, if it is desirable to play multiple video streams at fast forward play speeds that were recorded at 50 megabit per second record rate, you may want to consider looking into a higher performance storage system.

## 3. Installing the Hardware

### 3.0 Computer Installation

To install the Merlin05 Board in your computer follow the directions below:

1. Discharge any electrostatic charge that you may have accumulated by touching the metal case of your computer.
2. Switch off the computer and disconnect any cables attached to your computer, including the power cord.
3. Loosen any screws required to remove the computer cover and remove the cover.
4. Position the computer so that the PCI expansion slots are visible. It should look something like this:



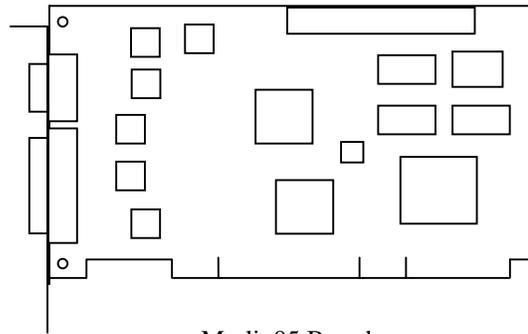
5. Select a Slot to install the Merlin board. It is best to space boards 2 apart at first and then fill the spaces as you use up the slots. This distributes the heat in your computer better.
6. Remove the Slot Cover corresponding to the slot you wish to use.

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## Merlin05 Batch Recorder (BREC) and Dual Stream Decoder

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7. Remove the Merlin05 board from its protective wrapper and orient the board as shown:



Merlin05 Board

8. Holding the board by the top two corners, carefully slide the board into the desired slot and press on the top edge of the board until it is firmly seated. If the board does not seat correctly, do not apply excessive force. If necessary pull the board out and try installing it again.
9. Tighten the screw over the slot cover to hold the Merlin board in place.
10. Replace the cover and tighten any screws needed to hold the cover in place.
11. Reconnect cables.
12. Connect the 15 pin and 9 pin cable that came in the box with the Merlin board.
13. Connect an Output monitor to one of the video output cable.
14. Connect an input video source to one of the video input cables.
15. Connect input and output audio to the Red and White audio cables.

## 4. Installing the Software

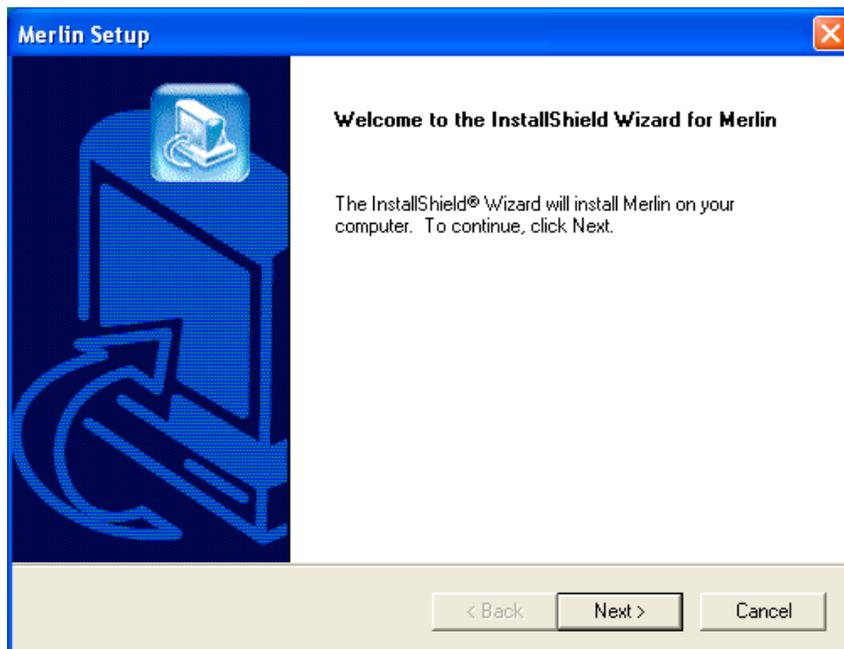
### 4.0 Driver Installation

The first time Windows loads after installing a Merlin board a New Hardware Found dialog box should appear. When asked for the location of the driver, browse to the location of the Merlin.inf file on the Merlin05 CD or on your hard drive if you downloaded the driver from the web. During the installation you will see a message saying the driver is unsigned by Microsoft. This is expected and you should continue the installation anyway. If for some reason the New Hardware Found dialog box does not appear you can run the hardware configuration wizard (Control Panel – Add/Remove Hardware). When running the wizard choose Multimedia device if you are given a choice. It will usually have a yellow icon next to it indicating it is hardware without a driver loaded. Be sure the CD is in the CD-ROM drive or the files are on your hard disk. The wizard usually searches the CD-ROM drive for drivers so if the CD is in the drive it will usually find it automatically.

### 4.1 Application Installation

To install the Merlin Board Application software follow the directions below:

1. Copy the file Mer2KXP.exe to a convenient location on your hard drive from the Skymicro Web Page or from the CD that came with your hardware. The software on the Skymicro Web Page will either be the same revision or newer than the version on the CD. If the version on the Web Page has a higher revision number than the one on your CD, it is better to use the one from the Web Page.
2. Execute the Mer2KXP.exe program. This will run an installation program that will present you with the dialog boxes shown below.

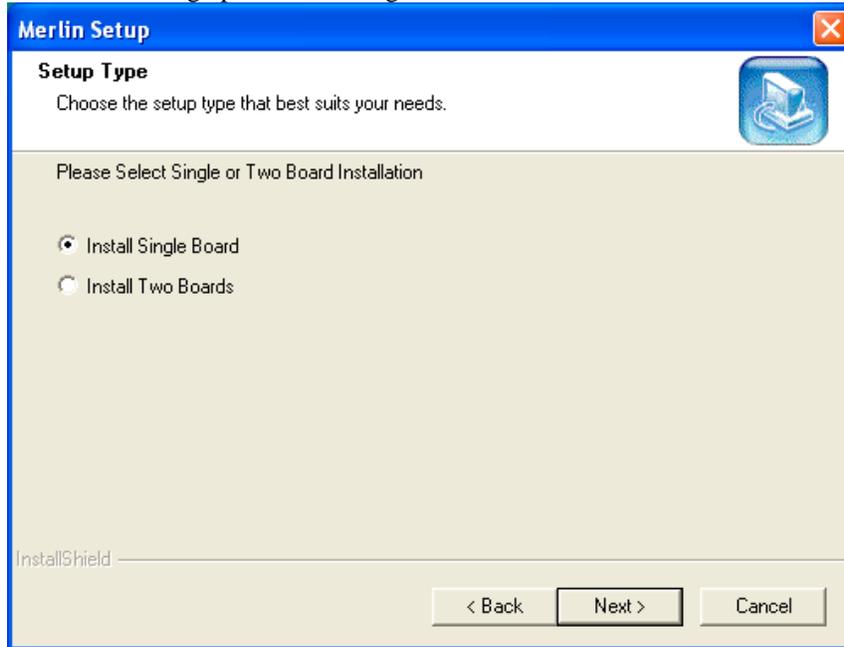


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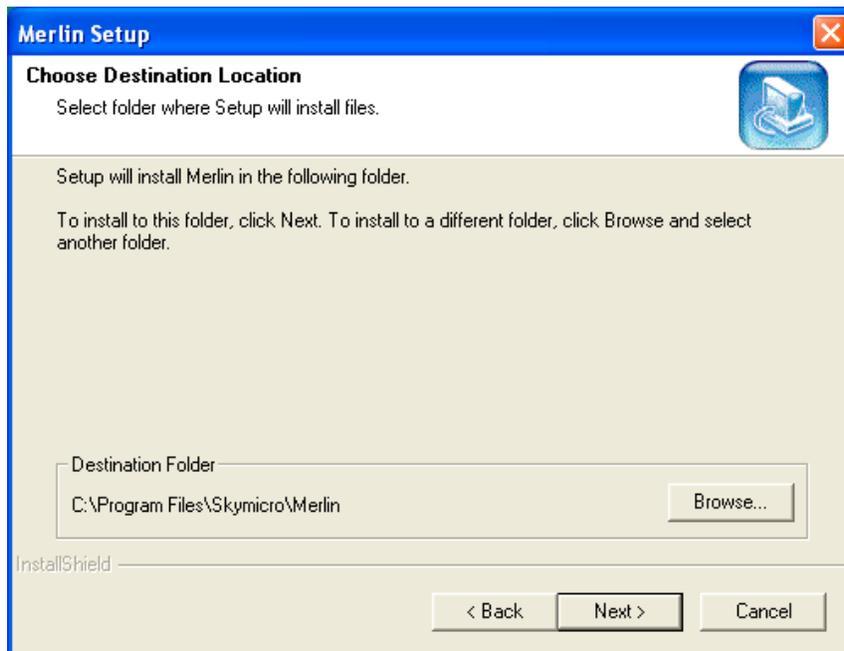
## Merlin05 Batch Recorder (BREC) and Dual Stream Decoder

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3. After reading the information in this dialog box and closing any other programs click on the “Next” button. This will bring up the next dialog box.



4. If you are installing a single board in your system you can click the next button now, or if you are installing two boards you should click the “Install Two Boards” radio button and then click the “Next” button. This will bring up the next dialog box.

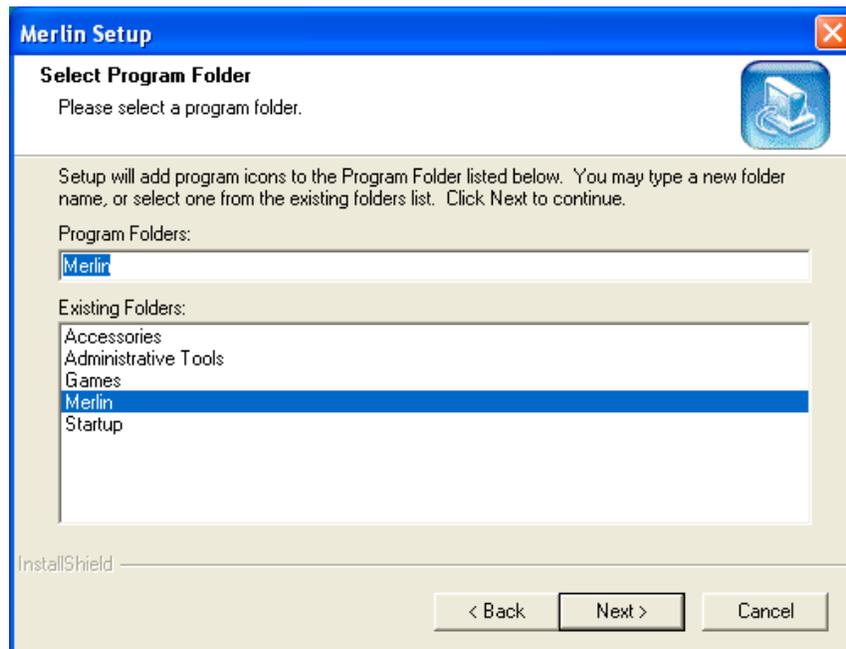


5. If you want to change the location where the software is installed click the “Browse” button and select a suitable location. If the default is acceptable click the “Next” button. This will bring up the next dialog box.

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## Merlin05 DV and MPEG-2 Recorder and Dual Stream Decoder

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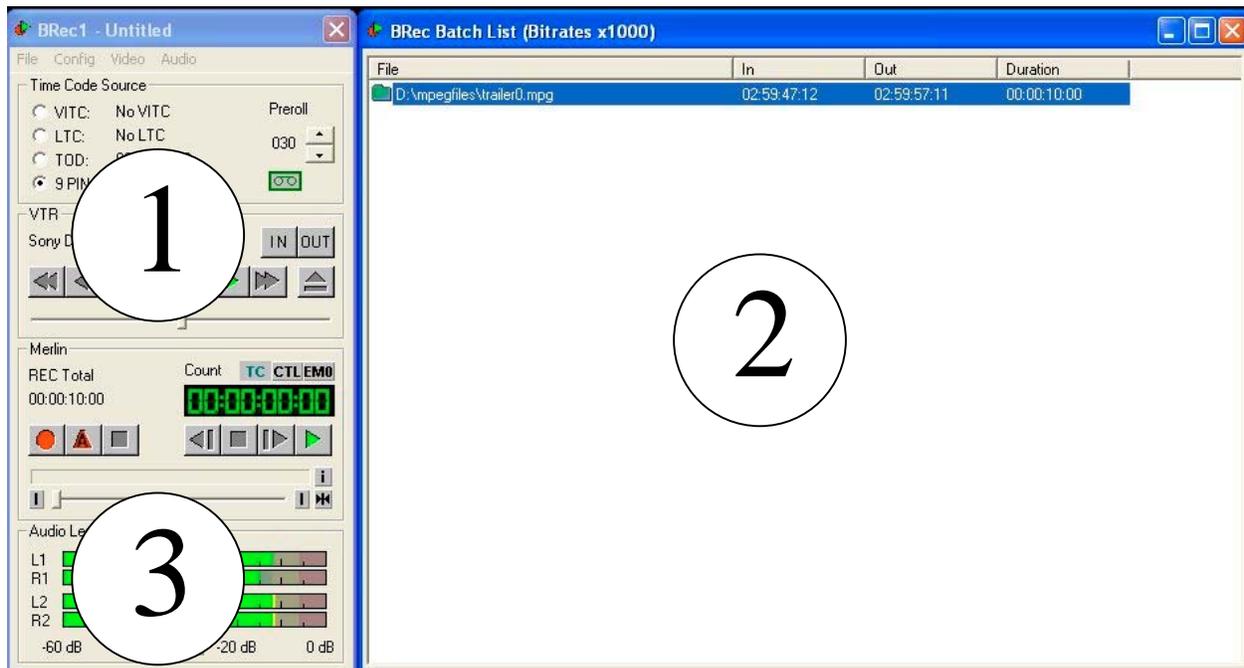
6. If you want to change the location where the program icons are installed select a different folder or if the default is acceptable click the "Next" button. This will bring up the next dialog box.



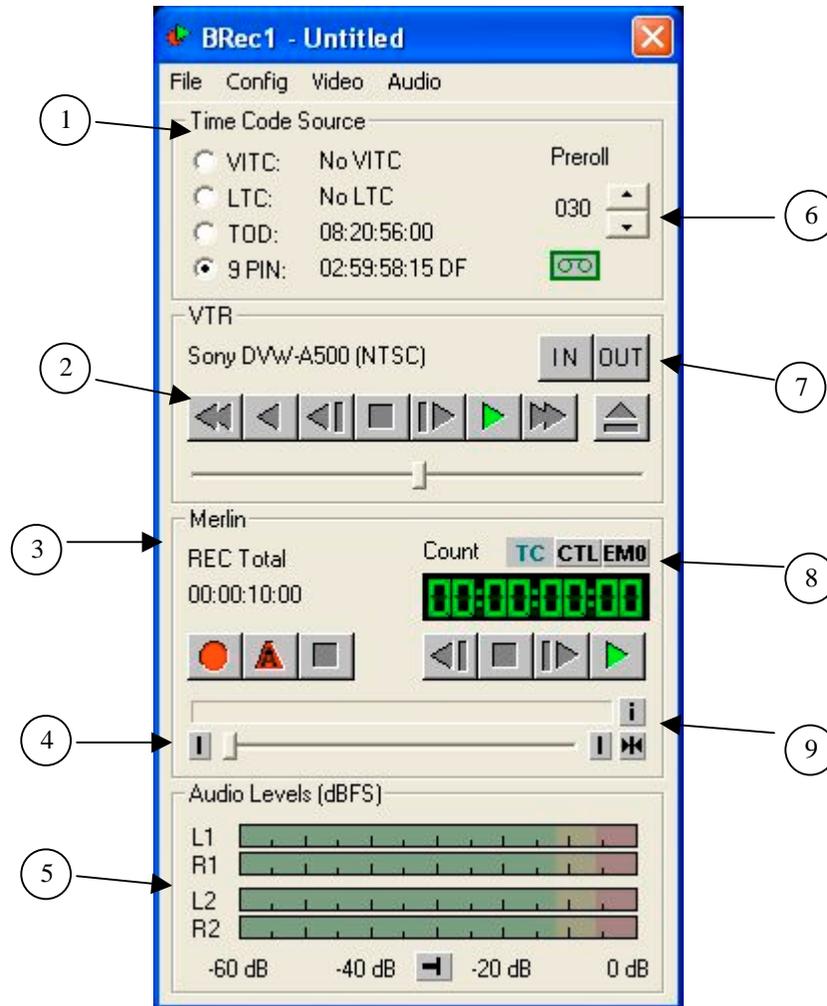
7. At this point the installation is complete. However some registry settings are only checked when the computer is restarted so it is best to restart the computer before you use the application. If you would like to restart click the "OK" button now.

## 5. Brec Application

### 5.0 The Batch Recorder (BREC)



The Batch Recorder is divided into 3 components: 1) the Record Application, 2) The Project Window and 3) the Playback Application. The following will give an overview of each.



### 5.1 The Brec Interface

This is the Record application, the First component to Brec. This is where vtr and record controls are found. This also where decoder controls are found.

- 1) Time Code Source – This setting chooses which time code source to use for matching starting and ending times. All of the time coded sources are continually updated and displayed next to the radio button controls that let you select the time code source. A DF indicator will show by the time code to indicate whether the source is a Drop Frame (DF) or a Non Drop Frame source (NDF).
- 2) VTR Controls – These buttons directly control the VTR that is connected using RS422. The choices are fast rewind, unity speed rewind, single step reverse, stop, single step forward, unity speed play, fast forward and eject. There is also a software controller bar that allows control of the VTR remotely via RS422.
- 3) Merlin Record Controls – These buttons start and stop the batch record process. They also ARM the encoder for a Crash Record.
- 4) JumpTo & Slider Bar – After a clip is encoded you can Jump to the First or Last frame of the clip by clicking on the I button. You may also use the slider to go to a relative spot in the file.
- 5) Audio Meters – You can see up to 4 channels of audio when playing a tape or playing back a clip.

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## Merlin05 Batch Recorder (BREC) and Dual Stream Decoder

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- 6) Preroll & Tape Indicator – This setting sets the number of frames to cue a VTR before each the first frame to be captured. The Tape Indicator – Green  indicates a tape is present in the vtr. Red X  indicates there is no tape present.
- 7) In/Out Mark Buttons – When one of these buttons is pressed it transfers the current time code to the start or end time code of the selected entry in the batch list.
- 8) TC,CTL,EM0 Buttons – Toggle the TC/CTL button to see the files GOP time code or the relative zero time code counter. The EM0 button is a toggle based on Record/Play Monitor F8 Cycling settings. Pressing this will cycle the output audio through up to 8 audio channels. This is useful if you have more than 2 channels of audio in the file, but only 2 channel audio output to your sound system.
- 9) INFO button – The info button will show the video/audio attributes of a file that is highlighted in the batch window.

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## Merlin05 DV and MPEG-2 Recorder and Dual Stream Decoder

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### File Config Video Audio

This is the menu section of the recorder application.

- 1) File
  - A) New
  - B) Open
  - C) Save
  - D) Save As
  - E) Hide Columns
  - F) Hide Messages
  - G) Reload F2 on Startups
  - H) Unload F2 and Close.
  - I) Close
- 2) Config
  - A) Port
    - 1. NONE
    - 2. Com1
    - 3. Com2
    - 4. Com3
    - 5. Com4
  - B) VTR PB/EE
  - B) Drop Frame
  - C) Non Drop Frame
  - D) DF/NDF Stop on Errors
  - E) DF/NDF Ignore Errors
  - F) DF/NDF Auto Switch
  - G) GOP TC
    - 1. Start at Zero
    - 2. Start at IN TC
  - H) GOP TC Proxy
    - 1. Start at Zero
    - 2. Start at IN TC
  - I) New GOP on Scene Change
  - J) Overwrite Warning
  - K) Stop Warning
  - L) Extensions
  - M) Proxy Settings
  - N) Transport Stream Settings
  - O) Stop Default
    - 1. Analog Video EE F2
    - 2. SDI1 Video EE F3
    - 3. SDI2 Video EE F4
  - P) Record Default
    - 1. Analog Video EE F2
    - 2. SDI1 Video EE F3
    - 3. SDI2 Video EE F4
  - Q) Play Default
    - 1. Analog Video EE F2
    - 2. SDI1 Video EE F3
    - 3. SDI2 Video EE F4
  - R) Process Batch List Once
  - S) Process Batch List Forever
- 3) Video
  - A) Input Select – Selection for video input during recording.
    - 1. NTSC - C-Video
    - 2. NTSC - S-Video
    - 3. NTSC – Component
    - 4. NTSC - RGB
    - 5. NTSC – SDI

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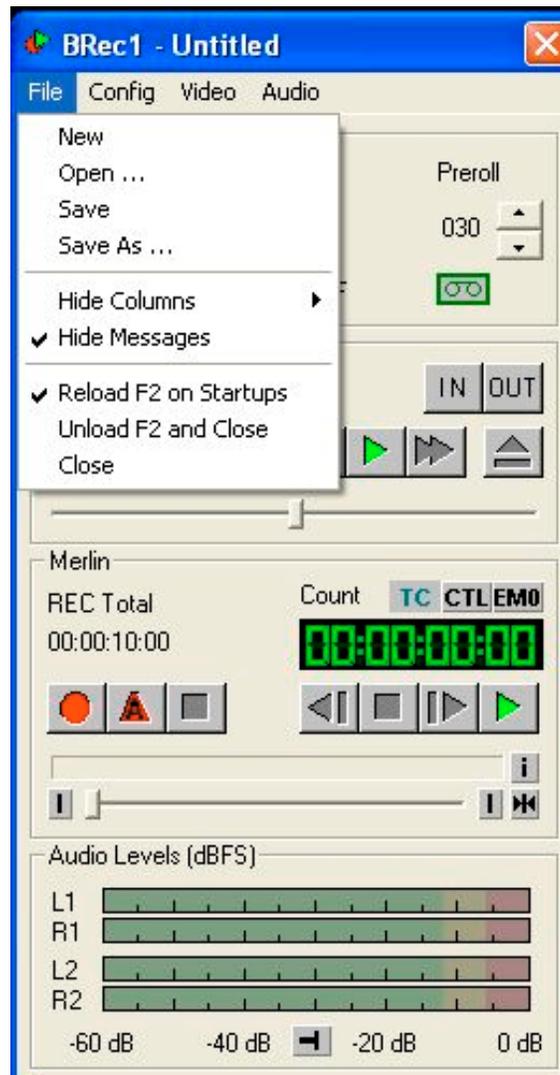
## Merlin05 Batch Recorder (BREC) and Dual Stream Decoder

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- 6. PAL – C-Video
- 7. PAL – S-Video
- 8. PAL – Component
- 9. PAL - RGB
- 10. PAL - SDI
- B) VITC Lines – VITC line selection. The default is 16 and 18.
- C) Video Settings – Analog input brightness, contrast, saturation and hue settings.
- D) Proxy Settings
- E) Graphic Overlay Fader
- F) Transport Stream Settings
- G) Confidence Output
  - 1. Analog F2
  - 2. SDI1 F3
  - 3. SDI2 F4
- H) Open Confidence Window
- I) Open Source Window
- 4) Audio
  - A) Audio Router
  - B) Audio Settings - Analog audio input gain and output volume settings.
  - C) AV Sync Adjust
  - D) Audio Mix Inputs 0dB
  - E) Audio Mix Inputs -6dB
  - F) Hide Meters
  - G) Show Meters
  - H) Record Monitor F8 Cycling
    - 1. Mute
    - 2. Embedded 0
    - 3. Embedded 1
    - 4. Embedded 2
    - 5. Embedded 3
    - 6. AnalogC
    - 7. AnalogP1
    - 8. AnalogP2
    - 9. AES0
    - 10. AES1
    - 11. AES2
  - I) Play Monitor F8 Cycling
    - 1. Mute
    - 2. DEC0
    - 3. DEC1
    - 4. DEC2
    - 5. DEC3

# Brec Menu Items

## FILE MENU



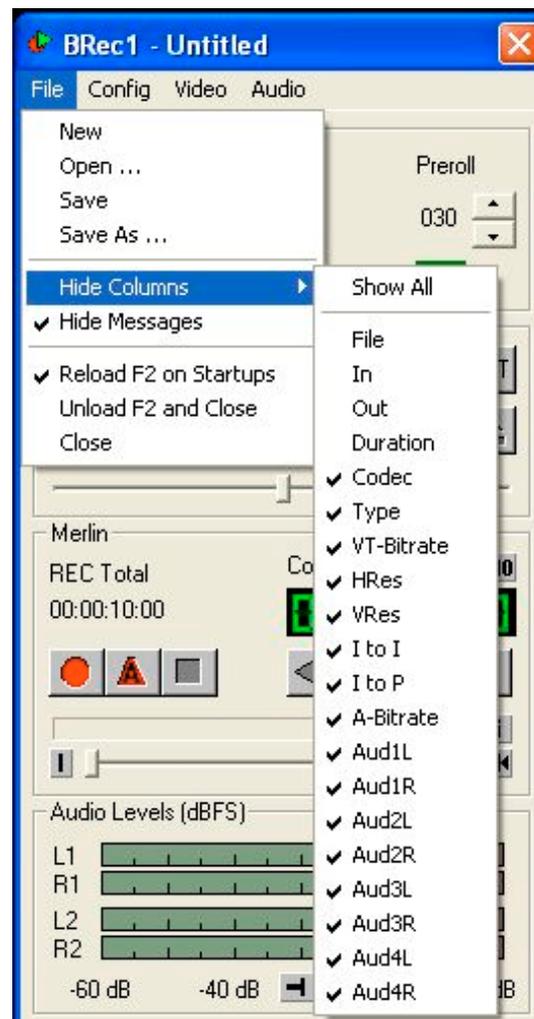
### FILE MENU –

1. NEW – Creates a NEW project. The Batch Project Window will become Blank ready for a new entry.
2. OPEN – Opens an existing project. Projects are referred to as EDL's.
3. SAVE – Saves the current Project as an .edl file.
4. SAVE AS – Saves the current Project with a new name.

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## Merlin05 Batch Recorder (BREC) and Dual Stream Decoder

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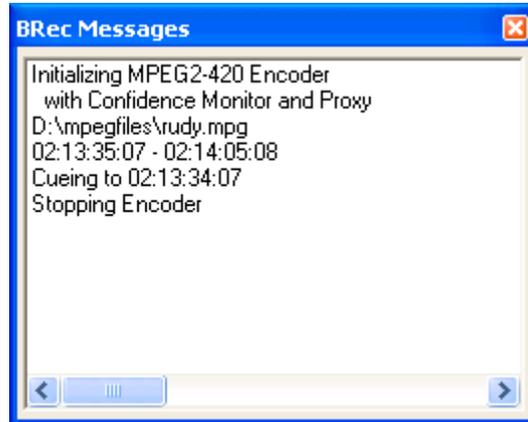


5. HIDE COLUMNS – Put a check by each parameter that you do not want displayed in the Batch window. When Show All is checked then all parameters will be seen in the Batch window.

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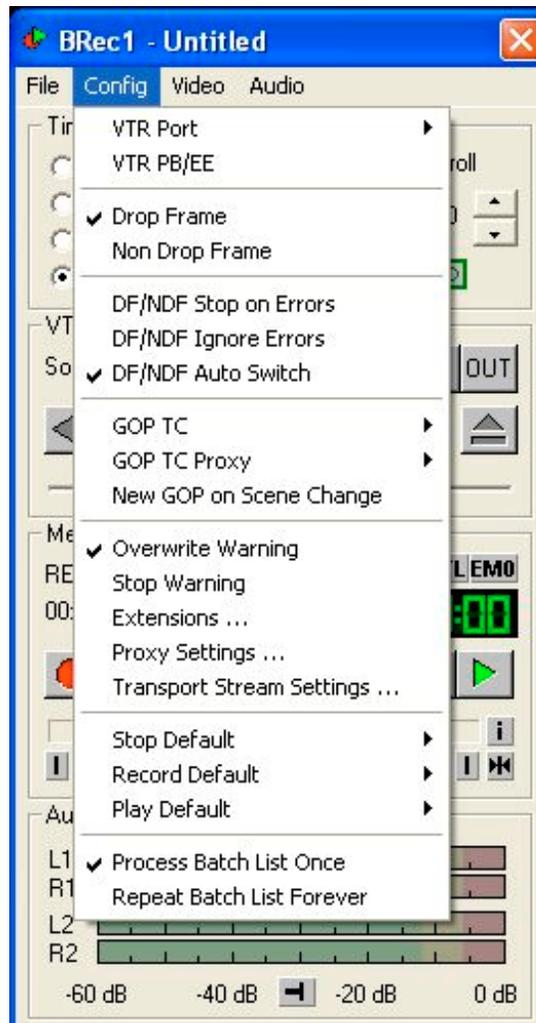
## Merlin05 DV and MPEG-2 Recorder and Dual Stream Decoder

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6. HIDE MESSAGES – When checked, turns off the encoder message window. You may want to do this if extra screen real estate is needed.
7. RELOAD F2 ON STARTUPS – When checked the encoder card will reset itself every time it is launched. This accounts for a slightly longer startup of the application.
8. UNLOAD F2 and CLOSE – By selecting this option, the card is reset and the application closes. This can be useful if there is a new firmware update.
9. CLOSE – Closes the application.

### CONFIG MENU



#### CONFIG Menu –

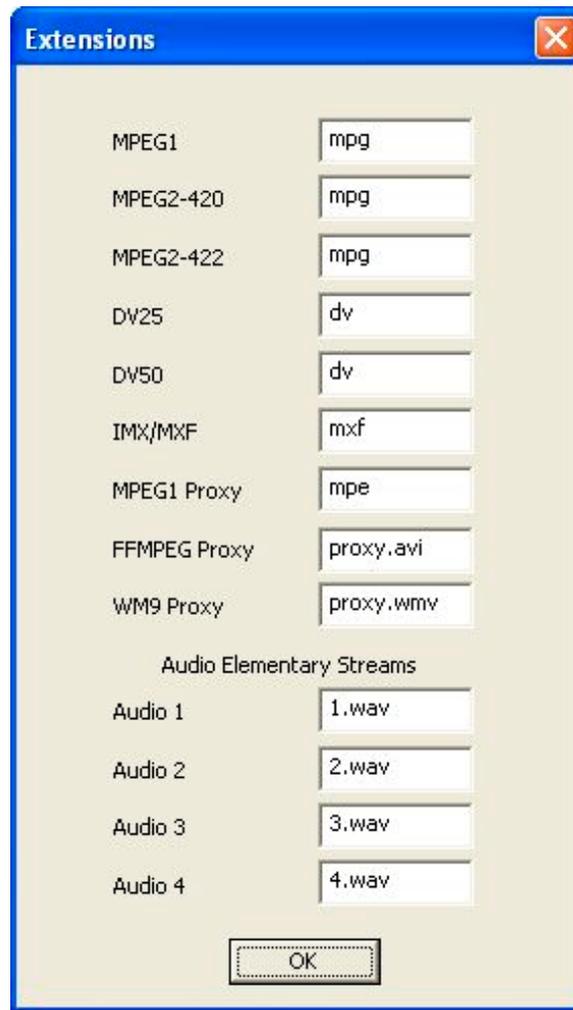
1. VTR PORT – There are 4 serial ports that can be chosen when using an RS422 cable with a 232 convertor. If you do not need RS422 VTR control, then you can select NONE and use another TIMECODE SOURCE such as Time of Day or LTC.
2. VTR PB/EE – Toggles the VTR's PB/EE PB button. NOTE: This may only be available on broadcast vtrs.
3. DROP FRAME – Sets up the session to expect Drop Frame sourced Tapes
4. NON DROP FRAME – Sets up the Session to expect Non Drop Frame sourced Tapes
5. DF/NDF STOP ON ERRORS – This setting is used when it is critical that the end user be warned when the tapes time code format does not match the projects time code format that was set above. You must either change the tape or change the project to reflect the specific time code format.
6. DF/NDF IGNORE ERRORS – This setting is used to warn the user that a time code format change has taken place, but does not change the overall project. So, if the tape was NDF and the project was DF, the encoded file would appear to be DF to match the project.

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## Merlin05 DV and MPEG-2 Recorder and Dual Stream Decoder

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7. DF/NDF AUTO SWITCH – This setting is used when the user knows that every tape may have a different time code format and Brec should accommodate and move on. Only a message in the Message window will indicate the change, but no workflow will be impacted. So if the Project was NDF and tape was DF, the project would switch to DF and the file would reflect that it is DF as well.
8. GOP TC – The time code value from the vtr may be stamped into the GOP of the encoded file. To do this you must select Start at IN TC. By default the GOP will stamp Zero when Start at Zero is checked.
9. GOP TC PROXY - The time code value from the vtr may be stamped into the GOP of the encoded proxy mpeg1 file. To do this you must select Start at IN TC. By default the GOP will stamp Zero when Start at Zero is checked.
10. NEW GOP ON SCENE CHANGE – By checking this, the encoder will look for changes in the video content and apply I frames at those points. This can be useful for a more efficient encoding, however, this can cause potential problems if played back on a device that does not support scene detection. Default should be off.
11. OVERWRITE WARNING – By selecting this, you will be notified with a dialog box whenever a file in the project is being attempted to be overwritten. Otherwise with it unselected, there will be NO warning for overwriting a file.
12. STOP WARNING – When doing a crash recording, if checked, you will get a confirmation window after pressing the stop button ARE YOU SURE YOU WANT TO STOP RECORDING? This can be used as a safe guard to accidentally ending a crash record prematurely.



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## Merlin05 Batch Recorder (BREC) and Dual Stream Decoder

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13. EXTENSIONS – User Defined Extensions can be set to apply to each encode file type. When Brec encodes it will automatically add the Global extension that is defined here in the extensions menu.

**Proxy Settings**

MPEG1 Video 352 x 240

Video Bitrate x1000: 576

Video GOP Size: 15

Audio Bitrate x1000: 192

FFMPEG Video 352 x 240

FFMPEG command line (Use for MPEG4, DivX or other codecs)

```
-vcodec mpeg4 -vtag DIVX -r 30000/1001 -s 352x240 -b 800 -g
```

WMV Video 360 x 240

Bitrate and Profile are set in Merlin.prx

Overlay Timecode

Horizontal Offset: 72

Vertical Offset: 350

OK

14. PROXY SETTINGS – If Proxy is selected in the CODEC column, then you can adjust the mpeg1 video/audio bitrate as well as the GOP setting. Also,
- FFMPEG and WMV – Brec can create 3<sup>rd</sup> party files via FFMPEG and Windows Media
  - Overlay Timecode - will burn a timecode window over the proxy video referencing 00:00:00;00.
  - Horizontal Offset – positions the burnin from the horizontal position.
  - Vertical Offset – positions the burnin from the vertical position.

Transport Stream Settings

Video PID	512
Audio PID 1	640
AudioPID 2	641
Audio PID 3	642
Audio PID 4	643
PMT PID	16
Program #	2
PAT Rate	100
PMT Rate	100

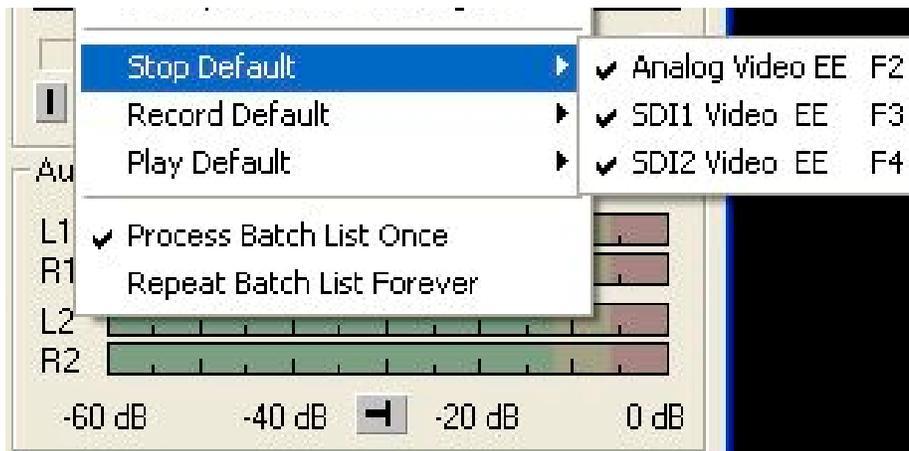
OK

15. TRANSPORT STREAM SETTINGS – Adjustments when using the Transport Stream Codec.
- Video PID – Numerical value that can be set to id the specific video PID.
  - Audio PID1 through PID4 – Numerical value that can be set to id the specific audio PID.
  - PMT PID – Program Map Table PID. The PMT PID is the PID number that BRec will use for PMT packets. This number will be defined in the PAT to map PMT packets to the appropriate Program number
  - Program # - Program Number – The Program Number is the number that BRec will use to map the Program number in the PAT to its' matching PMT. This number will be used in both the PAT and PMT.
  - PAT Rate – Program Map Table Rate - The rate of insertion of PMT Transport Stream packets. The PMT packets hold the mappings of all the stream numbers in a transport stream program and their corresponding PIDs. PMT packets have their PID value defined in the PAT. A value of 100 means that a PMT frame will be inserted every hundredth transport stream packet.
  - PMT Rate – Program Association Table Rate – The rate of insertion of PAT Transport Stream packets. The PAT packets hold the mappings of all the program numbers in a transport streams and the matching Program IDs (PIDs) of the corresponding Program Map Tables. PAT packets always have a PID value of zero. A value of 100 means that a PAT frame will be inserted every hundredth transport stream packet.

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## Merlin05 Batch Recorder (BREC) and Dual Stream Decoder

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16. STOP/RECORD/PLAY DEFAULT – The encoder has Smart Switching capabilities, therefore it is not necessary to have a separate Video monitor and audio monitor for the vtr and the encoder, saving money and real estate space.

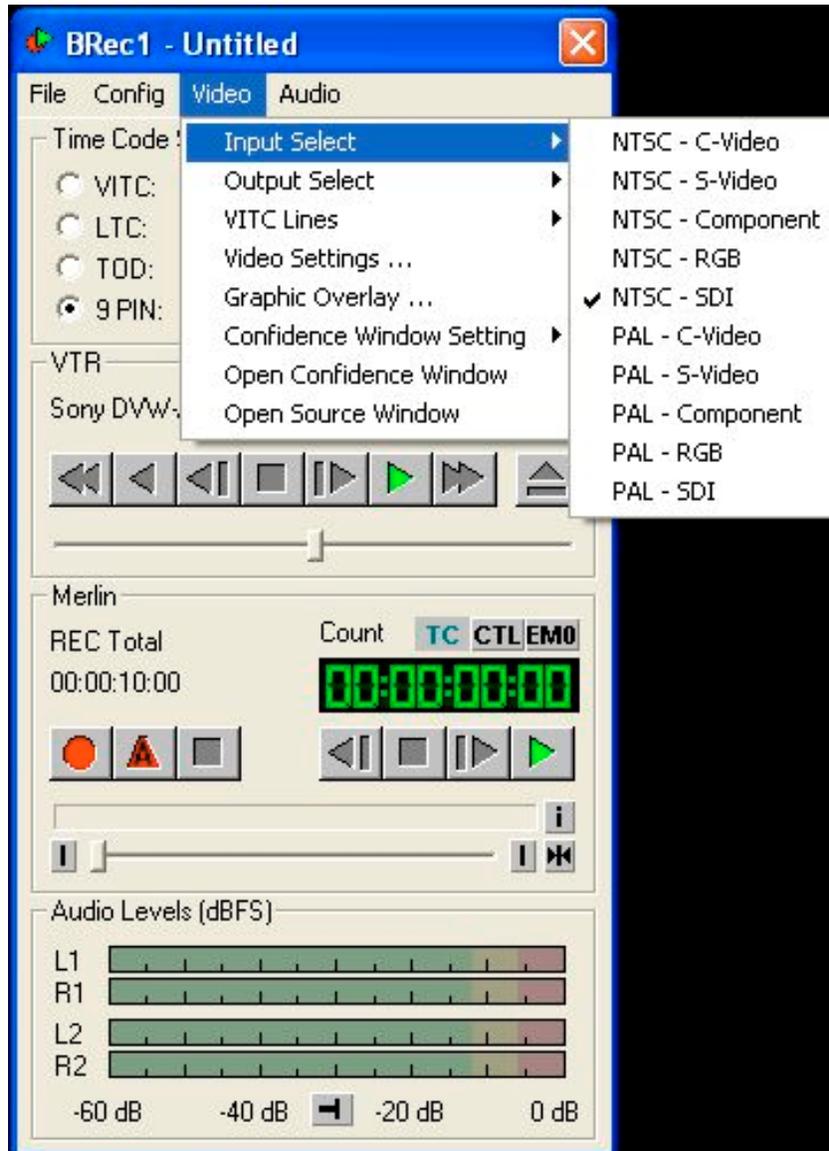
The three defaults cause the Merlin to switch it's audio and video outputs based on what's checked. For instance, if you are monitoring through the analog (meaning you have a composite video output and two channel analog audio output), you could put a check by ANALOG VIDEO EE under the STOP DEFAULT and leave both RECORD and PLAY DEFAULT unchecked. As a result, when you play a tape source, you will see and hear the VTR. When you Record, you will see and hear the decoder output. When you Play, you will see and hear the decoders output. Anytime the recording or clip playback is stopped, you will again see/hear the VTR's output.

Similarly, if you wanted to see/hear via one of the two SDI connectors, then you could put a check by the SDI connector you are using. (NOTE: SDI1 is the GREEN connector and SDI2 is the RED connector on the Merlin Pigtail cable. Please see the appendix for a complete list of cable inputs and outputs).



17. PROCESS BATCH LIST ONCE/FOREVER – When process batch list once is checked Brec will record what is in the Batch window only once, then stop. If Process Batch List Forever is checked, then the Brec will continuously overwrite the list until the user stops it. (This is useful for recording an entire days worth of content and then having this repeat on a daily basis. Primarily for broadcast).

## VIDEO MENU



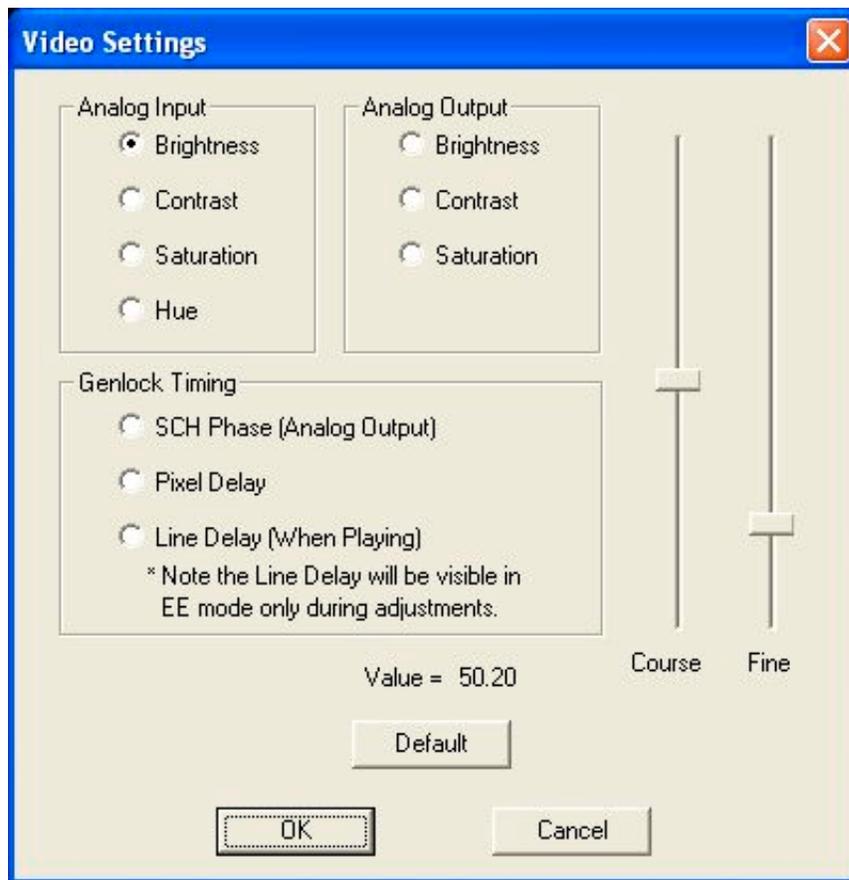
### VIDEO –

18. Input Select – Select the appropriate incoming Video Source. NTSC/PAL Composite, Svideo, Component or SDI video. NOTE: You need an optional Breakout panel when using Component Video Input.
19. Output Select – Select the appropriate output Video. Composite or Component.
20. VITC LINES –

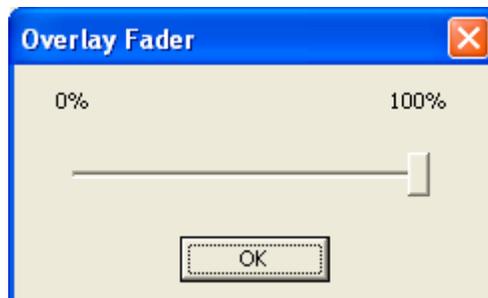
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## Merlin05 Batch Recorder (BREC) and Dual Stream Decoder

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21. Video Settings – Gives control over the ANALOG Video INPUT and OUTPUT. This will not affect the SDI video levels. Genlock Timing gives control over SCH Phase, Pixel Delay and Line Delay **NOTE: these are advanced adjustments and should only be adjusted by a qualified technician.**



22. GRAPHIC OVERLAY FADER – increases or decreases the amount of opacity for the given graphic file.

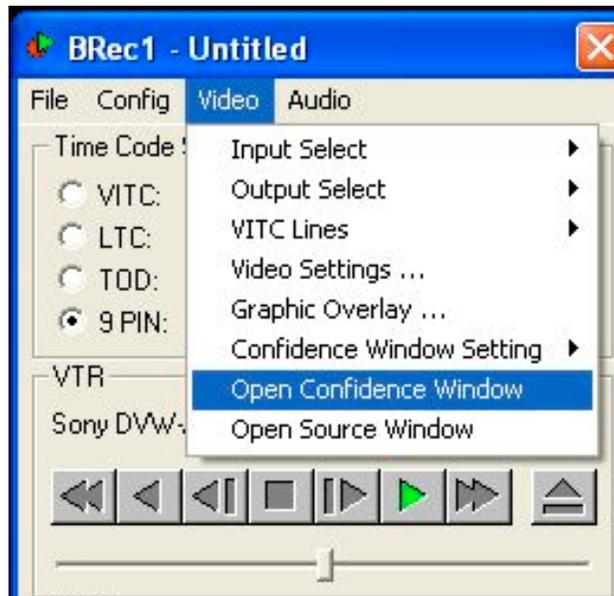
---

## Merlin05 DV and MPEG-2 Recorder and Dual Stream Decoder

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23. CONFIDENCE WINDOW SETTING – There are two options when using the confidence monitor on your desktop. They are as follows:
- Use DirectDraw – This is the default
  - Use DX3D – Depending on the Graphics card you may need to select this.



24. OPEN CONFIDENCE WINDOW – This will open up a VGA window display of the decode video.



25. OPEN SOURCE WINDOW – This will open up a VGA window display of the source video.

**AUDIO MENU**

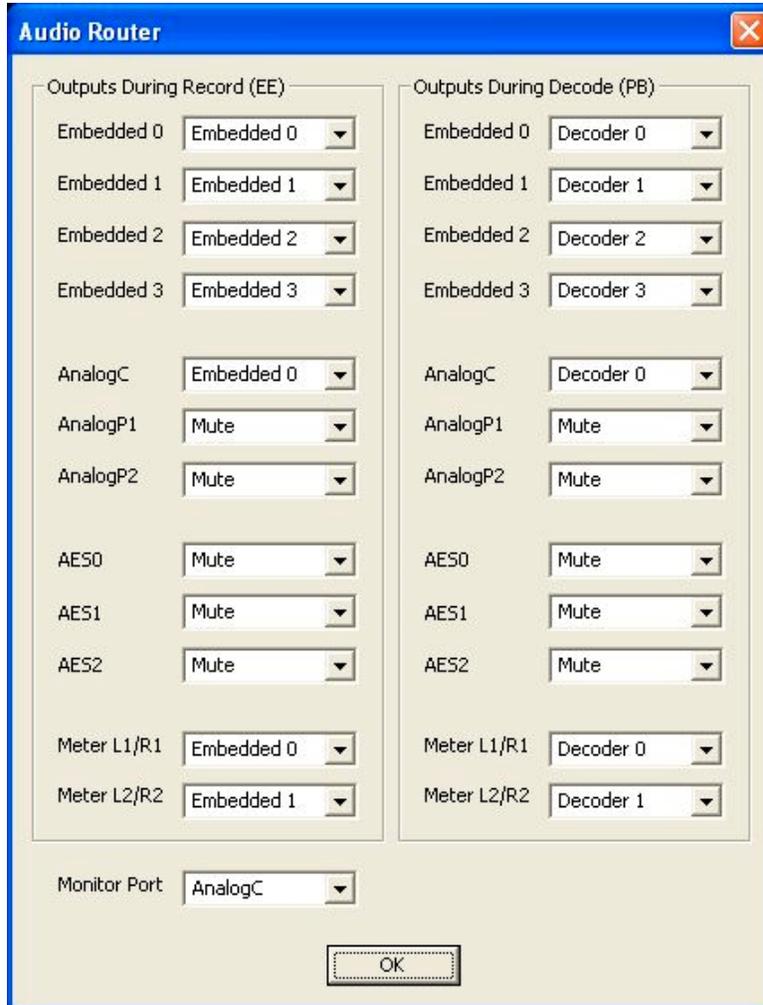
## Merlin05 Batch Recorder (BREC) and Dual Stream Decoder



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## Merlin05 DV and MPEG-2 Recorder and Dual Stream Decoder

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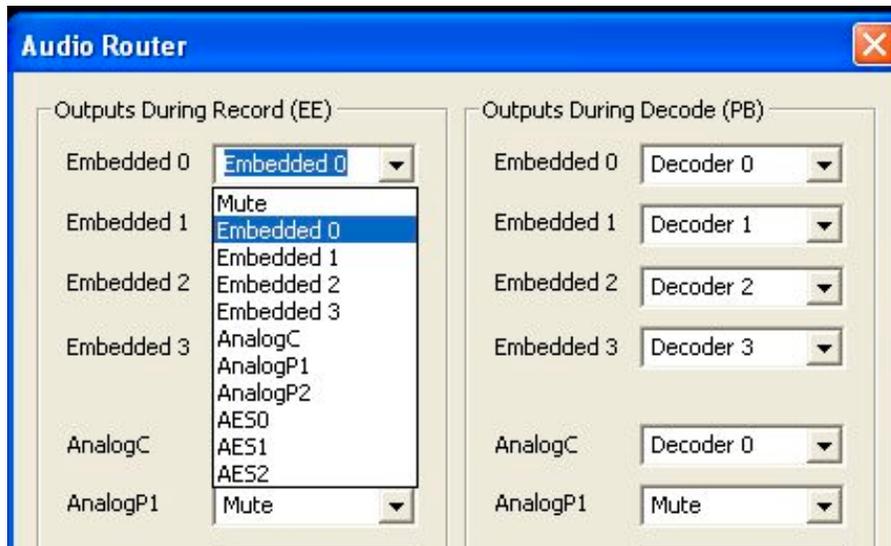


1. AUDIO ROUTER – This is where audio mapping of the Record and Playback outputs occur.

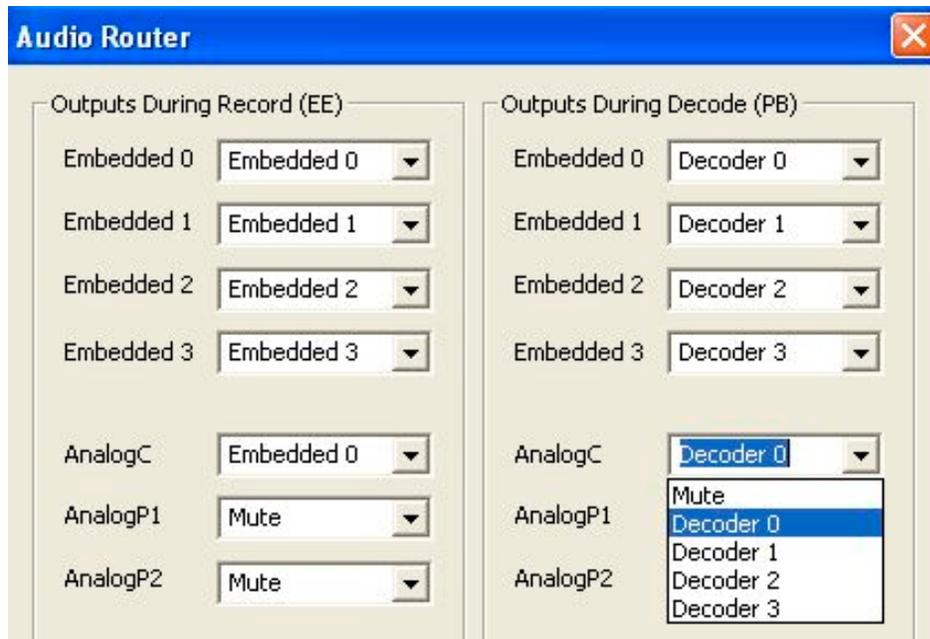
---

## Merlin05 Batch Recorder (BREC) and Dual Stream Decoder

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- A) Outputs During Record (EE) – On the left you see Embedded 0,1,2,3 AnalogC, P1, P2 and AES0,1,2. These represent the OUTPUT connector of the Merlin card or of the optional breakout panels. So for instance, All merlin cards come with SDI outputs with embedded audio, so that represents Embedded 0,1,2, and 3 which add up to 8 audio channels. The pull down menu next to each of these are the audio sources (what do you want to hear through this output while in the Record mode). If you are using SDI outputs then you may want to default them to the respective Embedded channels.



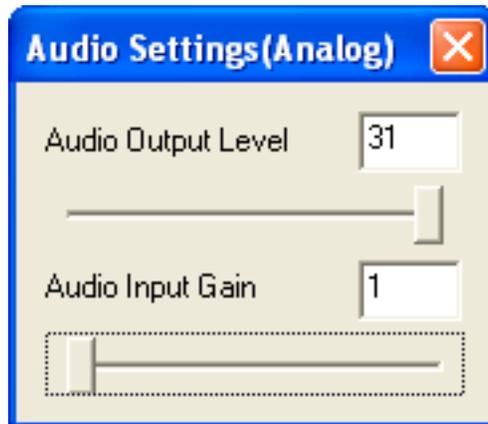
- B) The same is true for the OUTPUTS DURING DECODE (PB) Playback. Only on the Playback side you refer to audio as Decoders 0,1,2 and 3. Again there is 8 channels of audio, but they are split into pairs: Pair 0, Pair1, Pair2 and Pair3. So, here you can map what audio you want to hear through each pair. If you are using SDI, then you may want to leave a default to the respective Decoder channels.

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## Merlin05 DV and MPEG-2 Recorder and Dual Stream Decoder

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- C) If you are using SDI sources but analog monitoring, then you can select ANALOG C and route Embedded 0 to it for instance, to monitor the embedded audio that is feed from the SDI source.
- D) Meter L1/R1, L2/R2 – Here you can route the audio pair to the meters for monitoring. Likewise you may select the Decoder pair that you want to monitor as well when playing back a clip.
- E) Monitor Port – The monitor port is the port that will be affected by the F8 key or by pressing the button next to TC,CTL above the timecode display. So if you select AnalogC then when you hit F8 it will cycle through your monitor selections on the AnalogC output. If you were to change the monitor port to AES0, for example, then the audio cycling would only happen on AES0 output.



- 2. AUDIO SETTINGS – You may adjust the ANALOG audio INPUT and OUTPUT levels. No adjustments can be made to the AES or Embedded audio levels however.



- 3. AV SYNC ADJUST – This should default to zero, but can be adjusted for AV sync delay with separate adjustments for recording and playback.
- 4. AUDIO MIX INPUTS 0dB – This should be DEFAULT when recording.
- 5. AUDIO MIX INPUTS -6dB – This is optional setting that adjusts the audio level when mapping L+R MIXED in the Audio channels Column of the Brec. (NOTE: You may need to SHOW ALL COLUMNS under the FILE menu when changing to the L+R MIXED mode).
- 6. HIDE METERS – You choose to Hide the audio meters to save computer desktop space.
- 7. SHOW METERS – This is checked to make visible the audio meters.
- 8. RECORD MONITOR F8 CYCLING – Brec supplies a unique feature where you can choose to hear any of the 8 channels of audio, even if you only have a two channel playout connection. Simply put checks by the

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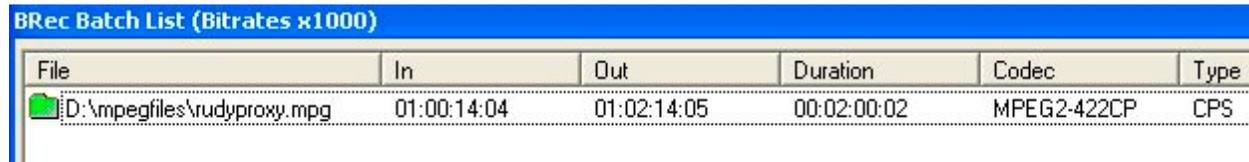
## **Merlin05 Batch Recorder (BREC) and Dual Stream Decoder**

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audio pairs that you would like to be able to listen to while recording, then press the F8 to toggle between your selections. (NOTE: You will see on the Brec GUI on the COUNT line, the Record audio pair that is currently active. This will change as you toggle the F8 Key).

9. **PLAY MONITOR F8 CYCLING** – Like Record Monitor above, when Brec is playing back a clip, you may set what audio pairs in the file you want to listen to. Then when Brec plays the clip, you may toggle the F8 key and hear the audio pairs that you have checked. (NOTE: You will see on the Brec GUI on the COUNT line, the decoder pair that is currently active. This will change as you toggle the F8 Key).

## Merlin05 DV and MPEG-2 Recorder and Dual Stream Decoder



File	In	Out	Duration	Codec	Type
D:\mpegfiles\rudyproxy.mpg	01:00:14:04	01:02:14:05	00:02:00:02	MPEG2-422CP	CPS

This is the Second component of Brec. This window shows the list of batch jobs that will be recorded. Each job specifies a Filename, In time, Out time, Duration, File format (Codec to use for record), Type (Transport or Program / VBR or CBR), Video Bitrate, Horizontal and Vertical resolution, GOP structure, Audio Bitrate, and which audio input to capture. Any of the fields can be changed by double clicking or right clicking on them.

**TIP:** New jobs can be added by right clicking on an empty section of the window or pressing the **INSERT** key. All Fields can be edited by either Right clicking or by Double clicking.



File	In	Out	Duration
D:\mpegfiles\rudyproxy.mpg	01:00:14:04	01:02:14:05	00:02:00:02

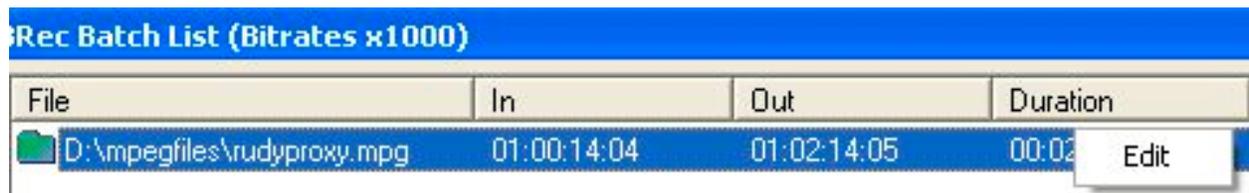
- Change Filename
- Delete Job
- Save Settings as Defaults

**CHANGE FILENAME** – The filename can be changed by either double clicking or right-clicking in the FILE Field and selecting Change Filename. Navigate to the folder where you want to save and type in the filename of choice.

**TIP:** You do not need to add an extension to the end of a filename. The extension will be added from the File>Extensions menu.

**DELETE JOB** – Highlight the entry that you want to delete.

**SAVE SETTINGS AS DEFAULTS** – You can choose a default for a project and have it applied to all entries in the session by clicking this. Every time you create a new project, the settings that you have saved as default will be applied.



File	In	Out	Duration
D:\mpegfiles\rudyproxy.mpg	01:00:14:04	01:02:14:05	00:02:00:02

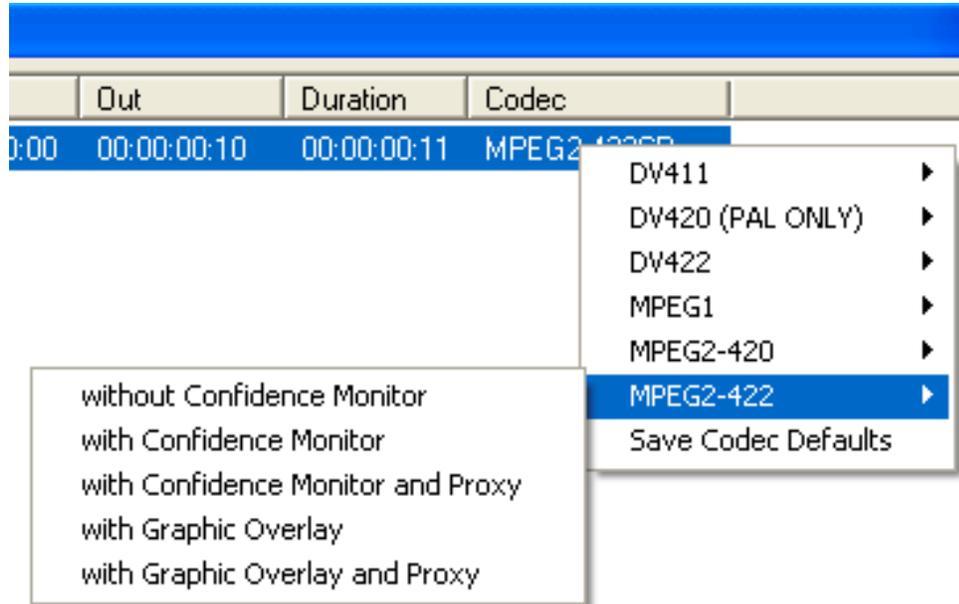
Edit

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## Merlin05 Batch Recorder (BREC) and Dual Stream Decoder

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EDIT – You may Type in an IN, OUT or DURATION by Double Clicking or by Right Clicking and choosing EDIT under the appropriate field.



CODEC – The codec is where you choose the type of encoding that you want. You may encode DV & MPEG.

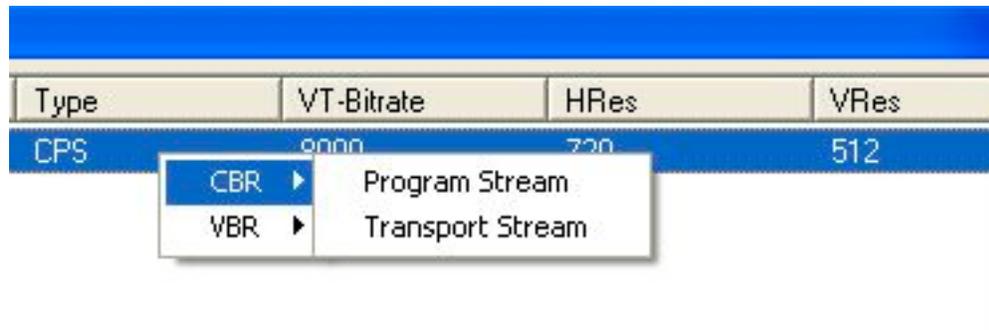
- A) without Confidence Monitor – This selects the MPEG2 422 codec, but disables the Confidence Monitor.
- B) With Confidence Monitor – This selects the MPEG2 422 codec, and enables the Confidence Monitor.
- C) With Confidence Monitor and Proxy – This selects the MPEG2 422 codec, and enables the Confidence Monitor and creates an mpeg1 proxy stream.
- D) With Graphic Overlay – This selects the MPEG2 422 codec, and also enables the Graphic Overlay capability.
- E) With Graphic Overlay and Proxy - This selects the MPEG2 422 codec, and also enables the Graphic Overlay capability while creating an mpeg1 proxy stream.

**TIP:** You may also save a default setting for **each** codec by selecting SAVE CODEC DEFAULTS. Then, each time you select the codec, the specific parameters will be applied.

---

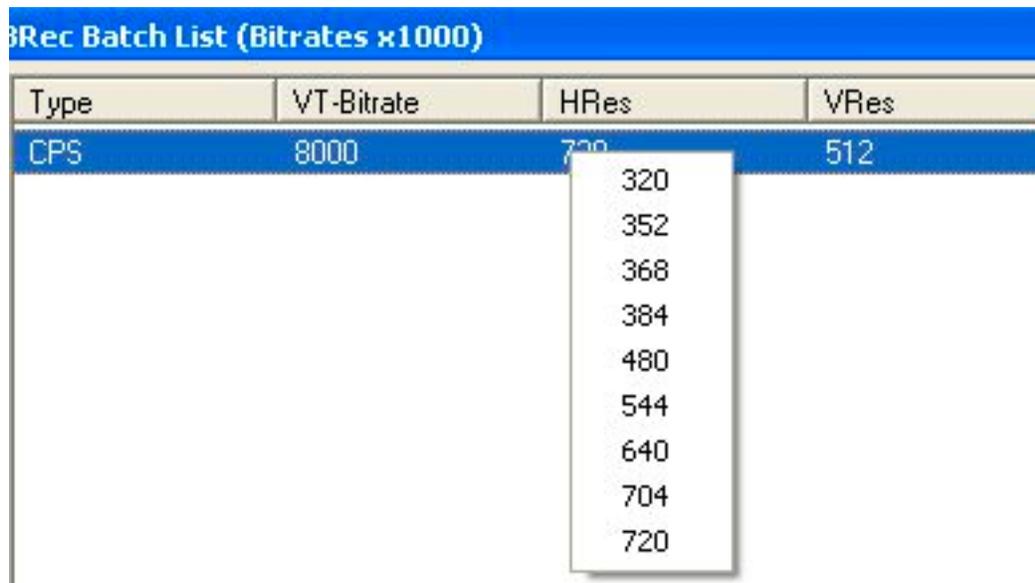
## Merlin05 DV and MPEG-2 Recorder and Dual Stream Decoder

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TYPE – The Type refers to the MPEG Stream Type. The options are as follows:

- A) CBR/Program Stream – This creates an MPEG2 Constant Bitrate Program Stream.
- B) CBR/Transport Stream – This creates an MPEG2 Transport Stream in conjunction with the Transport Stream Settings under the VIDEO Menu in the BRec Gui.
- C) VBR/Program Stream – This creates an MPEG2 Variable Bitrate Program Stream.
- D) VBR/Transport Stream – This creates an MPEG2 Variable Bitrate Transport Stream in conjunction with the Transport Stream Settings under the VIDEO Menu in the BRec Gui.



VT-BITRATE – Type in a value here for the target video bitrate for Program Streams or the target MUX bitrate for Transport streams.

HRES – Refers to the Horizontal Frame Resolution of the MPEG file. Typically for MPEG2 this would be either 704 for Half D1 or 720 for Full D1.

VRES – Refers to the Vertical Frame Resolution of the MPEG file. Typically 480 would be selected if the codec is 420. 512 would be selected if the codec is 422.

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## Merlin05 Batch Recorder (BREC) and Dual Stream Decoder

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VRes	I to I	I to P	A-Bitrate	Aud1L
512	15	2	192	EMBOL

1

2

3

4

5

6

7

8

9

10

11

12

13

14

15

I to I – This sets the distance between the I-Frames within the GOP structure. Short GOP would equate to choosing a lesser value such as 1 or 2. Long GOP would equate to choosing a larger value such as 14 or 15.

I to I	I to P	A-Bitrate
15	2	192

1

2

3

I to P – Refers to the number of B-Frames between an I and a P frame. The Larger the number , the more compression that is applied to the video.

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## Merlin05 DV and MPEG-2 Recorder and Dual Stream Decoder

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I to P	A-Bitrate	Aud1L
2	192	EMBOL

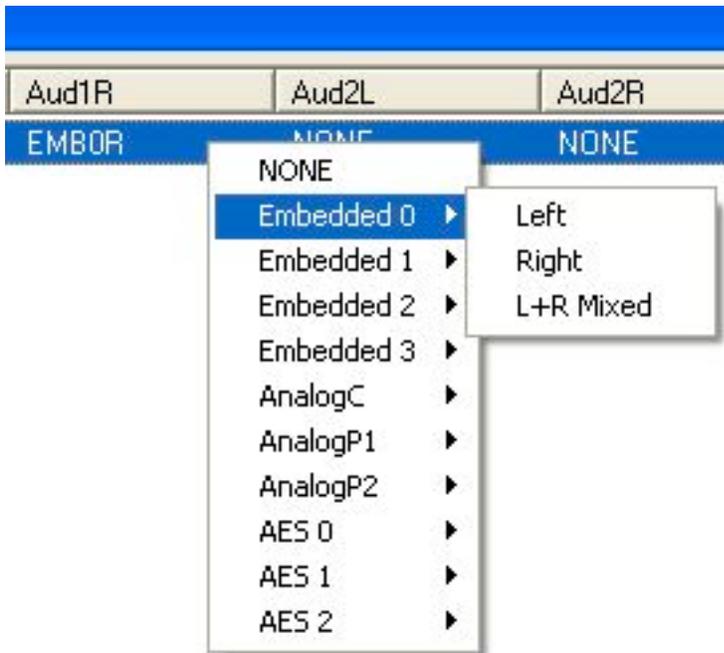
32  
48  
56  
64  
80  
96  
112  
128  
160  
192  
224  
256  
320  
384

A-BITRATE – Refers to the audio bitrate of the MPEG stream. This value is in Kilobits.

---

## Merlin05 Batch Recorder (BREC) and Dual Stream Decoder

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AUDIO COLUMNS – (AUD1L, AUD1R, AUD2L, AUD2R etc). – These columns are unique in that you can assign the incoming audio to various channels within the MPEG file. A normal scenario would be to have AUD1L assigned the corresponding LEFT channel. The AUD1R would have the corresponding RIGHT channel assigned etc. However, there may be times when you want the Audio from one channel to be assigned to the more than one channel. For instance, if there was mono Spanish on channel 3 and mono English on channel 4, you could reroute the mono Spanish on to channel 4 overwriting the mono English. You can also select NONE which would blank out the audio from the selected channel.

# Brec Message Window



The Message Window is the third component of Brec. This window will print messages that pertain to jobs as they are recorded. If an error occurs for any reason the message will display in this window. This window will also display the vtr and decoder status during an encode session. This message window may be useful if troubleshooting is needed.

**TIP:** The message window can be turned off by selecting Hide Messages from the File Menu. The window will still record the messages however.

## Brec Version Information

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## Merlin05 Batch Recorder (BREC) and Dual Stream Decoder

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You may find out the version of Brec you are running by clicking on the Brec Icon in the uppermost left hand corner and selecting **About BRec...** Beside the version number you will also find the License Code of the board, the Firmware revisions and Driver revision numbers.



## Appendix A

## Brec Warning Messages



**Warning Message "A"**



**Warning Message "B"**

Brec will warn you if you have a mismatch between the Tape Source Time Code and the projects Time Code that is set under FILE > NON DROP FRAME.

If you have a Non Drop Frame Tape and the NON DROP FRAME setting is not checked you will get the warning message "A".

If you have a Drop Frame Tape and the NON DROP FRAME setting is checked, then you will get the warning message "B".

## Appendix B

## Video Play List Files

### B.0 Video Play List File Format

The format of a Video Play List File is as follows:

---

```
<Video File> <Starting Frame #> <Ending Frame #> <Repeat Count> <Alpha File> <Start Alpha @ Frame #>
<Video File> <Starting Frame #> <Ending Frame #> <Repeat Count> <Alpha File> <Start Alpha @ Frame #>
<Video File> <Starting Frame #> <Ending Frame #> <Repeat Count> <Alpha File> <Start Alpha @ Frame #>
<Video File> <Starting Frame #> <Ending Frame #> <Repeat Count> <Alpha File> <Start Alpha @ Frame #>
.
.
.
<Video File> <Starting Frame #> <Ending Frame #> <Repeat Count> <Alpha File> <Start Alpha @ Frame #>
```

---

Any line that starts with a semicolon (“;”) or any line that has no arguments on it is ignored. Alpha files are optional. So a line may contain either four or six arguments. The “Alpha File” specifies what transition file should be used when starting the “Video File” specified on the next line. If there is no “Alpha File” the next “Video File” will start immediately after the last Field of the previous “Video File”. If an “Alpha File” is specified then the next file will start at “Start Alpha @ Frame #” of the current video file.

Here is an example of a Video Play List File:

```
;Video File          Start    End      Repeat Alpha File          Alpha Frame Start
;=====            =====  ===      =====  =====
<d:\mpeg\clip1.mpg> <50>    <500>   <0>     <d:\mpeg\alpha\crossfade50.alp> <450>
<d:\mpeg\black1.mpg> <0>     <250>   <250>   <d:\mpeg\alpha\rwipe50.alp>    <200>
<d:\mpeg\clip2.mpg> <1000>  <1500>  <0>     <d:\mpeg\alpha\dissolve80.alp> <520>
<d:\mpeg\clip3.mpg> <100>   <600>   <0>     <d:\mpeg\alpha\dissolve80.alp> <520>
```

In this example “clip1.mpg” start at field 50 of that file. At field 450 of that file “black1.mpg” starts and a crossfade transition is applied for 50 fields. If the fields in a file are less than the “end – start” the file is repeated. In this example “black1.mpg” is actually a single frame of black video. Therefore it is repeated 250 times. The Repeat count is ignored by the player application but it is used by the playlist editing application. At field 200 of black1.mpg (after it has repeated 200 times) “clip2.mpg” starts and a rwipe transition is applied for 50 fields. This file will start at offset 1000 fields into this clip and play for 500 fields. Since no alpha file was specified here “clip3.mpg” starts as soon as “clip2.mpg” ends at an offset of 100 fields into that clip. When the Play List file ends, it starts again from the beginning. Therefore at field 520 of “clip3.mpg”, “clip1.mpg” will start again at an offset of 50 fields and a dissolve transition will be applied for 80 fields.

## Appendix C

### Audio Play List Files

#### C.0 Audio Play List File Format

The format of an Audio Play List File is as follows:

---

```
<Audio File> <Starting Frame #> <Ending Frame #> <Repeat Count>
<Audio File> <Starting Frame #> <Ending Frame #> <Repeat Count>
<Audio File> <Starting Frame #> <Ending Frame #> <Repeat Count>
<Audio File> <Starting Frame #> <Ending Frame #> <Repeat Count>
.
.
.
<Audio File> <Starting Frame #> <Ending Frame #> <Repeat Count>
```

---

Any line that starts with a semicolon (“;”) or any line that has no arguments on it is ignored. Each line that has arguments always contains four arguments. Each “Audio File” will start immediately after the last Field of the previous “Audio File”.

Here is an example of a Video Play List File:

```
;Video File          Start   End     Repeat
;=====            =====  ===     =====
<d:\mpeg\clip1.wav> <50>   <500>  <0>
<d:\mpeg\clip2.wav> <1000> <1500> <0>
<d:\mpeg\clip3.wav> <100>  <600>  <0>
```

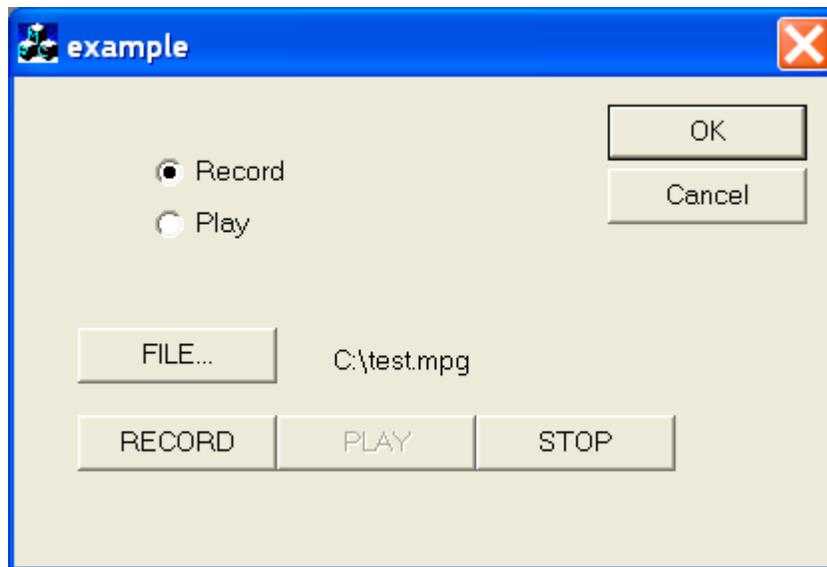
In this example “clip1.wav” start at field 50 of that file. At field 500 of that file “clip2.wav“ starts. If the fields in a file are less than the “end – start” the file is repeated. The Repeat count is ignored by the player application but it is used by the playlist editing application. At field 1500 of “clip2.wav”, “clip3.wav” starts. When “clip3.wav reaches field number 600 “clip1.wav” will start again at an offset of 50 fields and the whole process will repeat.

## Appendix D

## Writing your own Applications

There are 2 Methods of interfacing to the Merlin05 hardware. The first is through a high level interface that handles all file I/O and buffer management. The second method is through a lower level interface. The higher level interface is good for simple play and capture applications that only need to create files in elementary formats. The Merlin application was written using this interface. The lower level interface does not handle file I/O or buffer management but allows for much more control of the data going to and from the Merlin05 hardware. This is good for applications that require handling the data as it becomes available from the hardware. The Batch recorder was written using this interface because it required more control of the data that is stored to files. Another example of an application that may require the lower level interface are network applications that may not want the data stored to a file. Example source code using both interfaces will be demonstrated. Source code examples using the high level interface are in the SDK directory on the install CD under a directory called Windows\ExampleIF1. Source code examples using the low level interface as well as the source code to the BRec application are under a directory called Windows\ExampleIF2.

### D.0 Example Source Code using Method 1



The first example is a simple MFC 6.0 dialog application with minimal code added. The application has only four push buttons that selects a video filename, play a file, record to a file, and stop playing or recording a file. There is also a pair of radio buttons for switching between play and record mode. The starting application was generated by running the MFC App Wizard in MFC 6.0 and selecting a simple dialog application. Only five subroutines have been added to the application, and a few lines have been added to the OnInitDialog(); subroutine. The five subroutines are:

- 1) InitMerlinr(); - Initializes the Merlin hardware for record mode. This routine is called when the Record radio button is pressed.
- 2) InitMerlinp(); - Initializes the Merlin hardware for play mode. This routine is called when the play radio button is pressed.

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## Merlin05 DV and MPEG-2 Recorder and Dual Stream Decoder

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- 3) OnFile(); - Opens a file dialog box so you can select a video file. This routine is called when the File button is pressed.
- 4) OnRecord(); - Starts recording video. This subroutine is called when the Record button is pressed.
- 5) OnPlay(); - Starts playing video. This subroutine is called when the Play button is pressed.
- 6) OnStop(); - Stops playing or Recording video. This subroutine is called when the Stop button is pressed.

---

To build this application you must have “tools.cpp” and “tools.h” in the application build directory and you must have “mercmd.lib”, “merddi.lib”, “mercmd.dll”, and “merddi.dll” in the application build directory or in the library search path. “mercmd.lib” and “merddi.lib” must be added to the link settings in the project settings dialog box. In this example all the code mentioned was added to the file “exampleDlg.cpp”. There are also several lines that were added to the “exampleDlg.h” file. Refer to the source file to see what lines were added. For information on Merlin command strings refer to the cmdline.txt document.

### D.1 Command Line Examples using Method 1

The higher level interface can also be tested easily using a command line interface from a DOS shell window. The SDK directory on the CD includes many examples of batch programs that can control the Merlin05 hardware using this method. These example files can be found under the SDK\Windows\cmdlin directory on the install CD.

### D.2 Simpleplay application using Method 2

The Simpleplay and Simprelec programs are examples of applications that use the lower level interface. These programs are simple command line utilities that play and record audio and video. The Simpleplay utility is less than 200 lines of code. To build this application you must have “tools.cpp” and “tools.h” in the application build directory. No other libraries or DLL are required. The only routines that are needed from tools.ccp are:

- 1) m2ddWrInt32(); - Writes one of the registers on the Merlin05 board.
- 2) m2ddRdInt32(); - Reads one of the registers on the Merlin05 board.
- 3) loadf2(); - Loads the second FPGA on the Merlin05 board.
- 4) i2cinit(); - Initializes I2C devices on the Merlin05 board.
- 5) SetVideoInput(); - Selects the video input source for record or the genlock source for play.
- 6) mld(); - Loads a microcode file into the Video processor on the Merlin05 board.
- 7) Mercmd(); - Queues a command to the Video processor on the Merlin05 board.
- 8) Send(); - Transfers the commands in the command queue to the Video processor on the Merlin05 board.

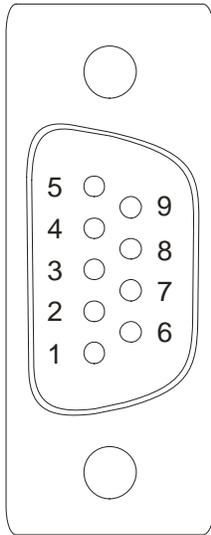
Using these 8 routines anything that is possible on a Merlin05 can be achieved.

## **Appendix E Cable Pinouts**

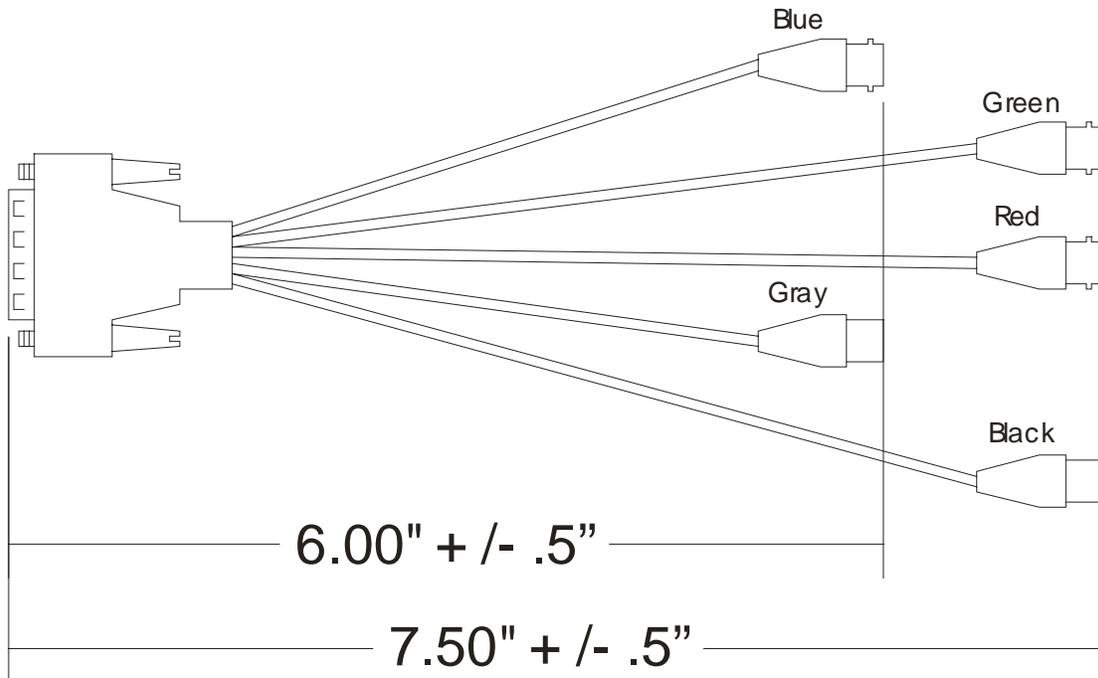
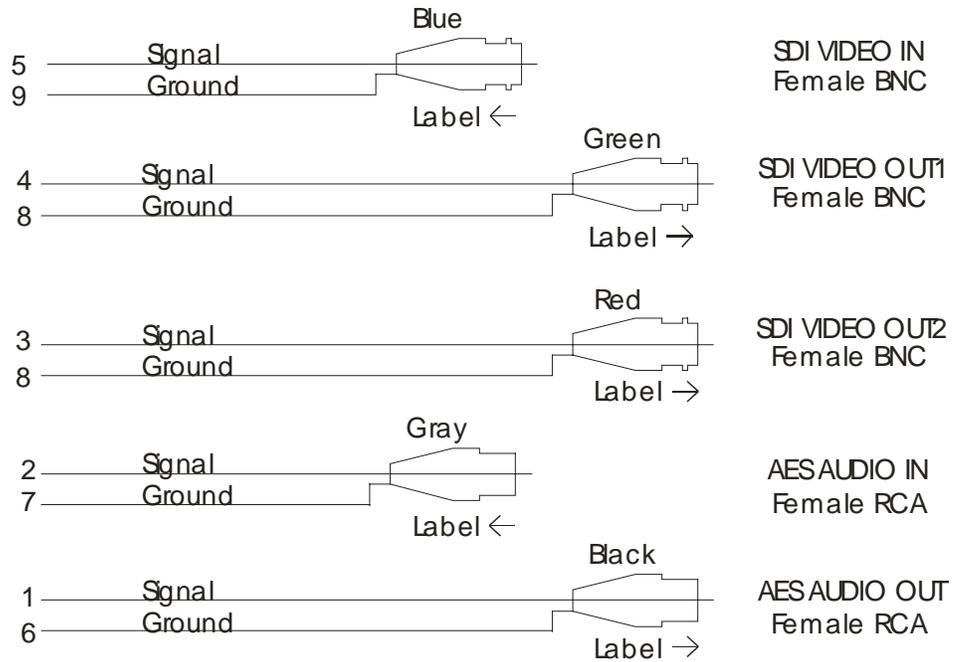
### **E.0 Cables**

- 1) Digital Cable
- 2) Analog Cable
- 3) RS422 Control Cable

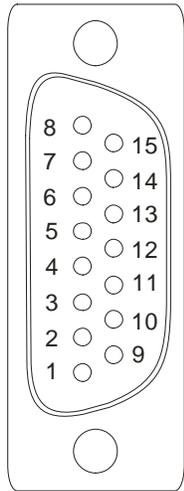
## Merlin 2003 Digital Cable



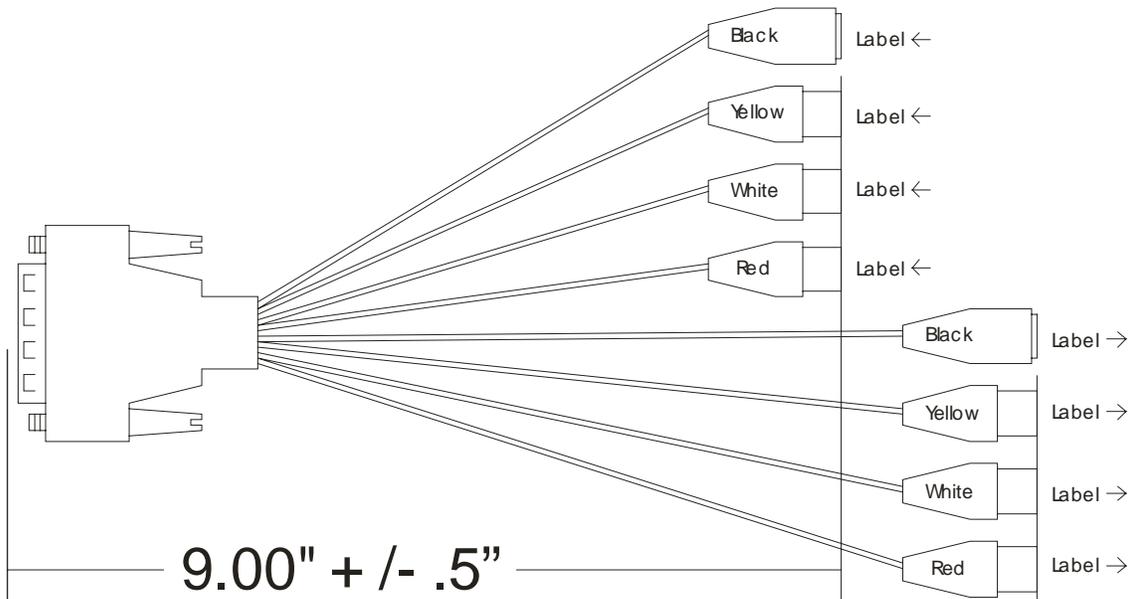
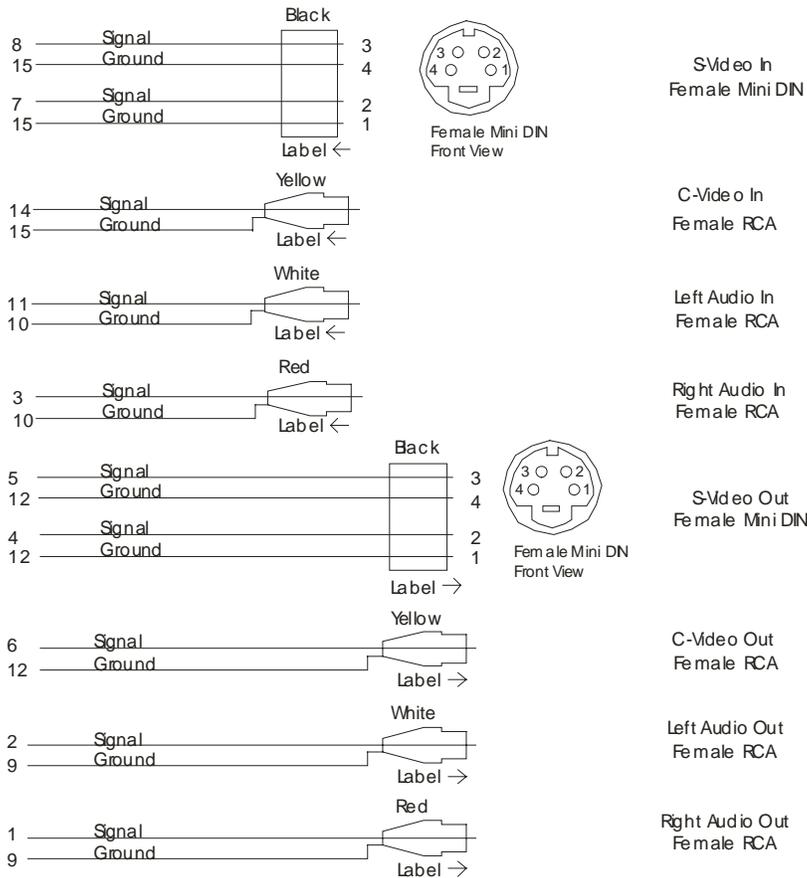
Male DB9  
Front View



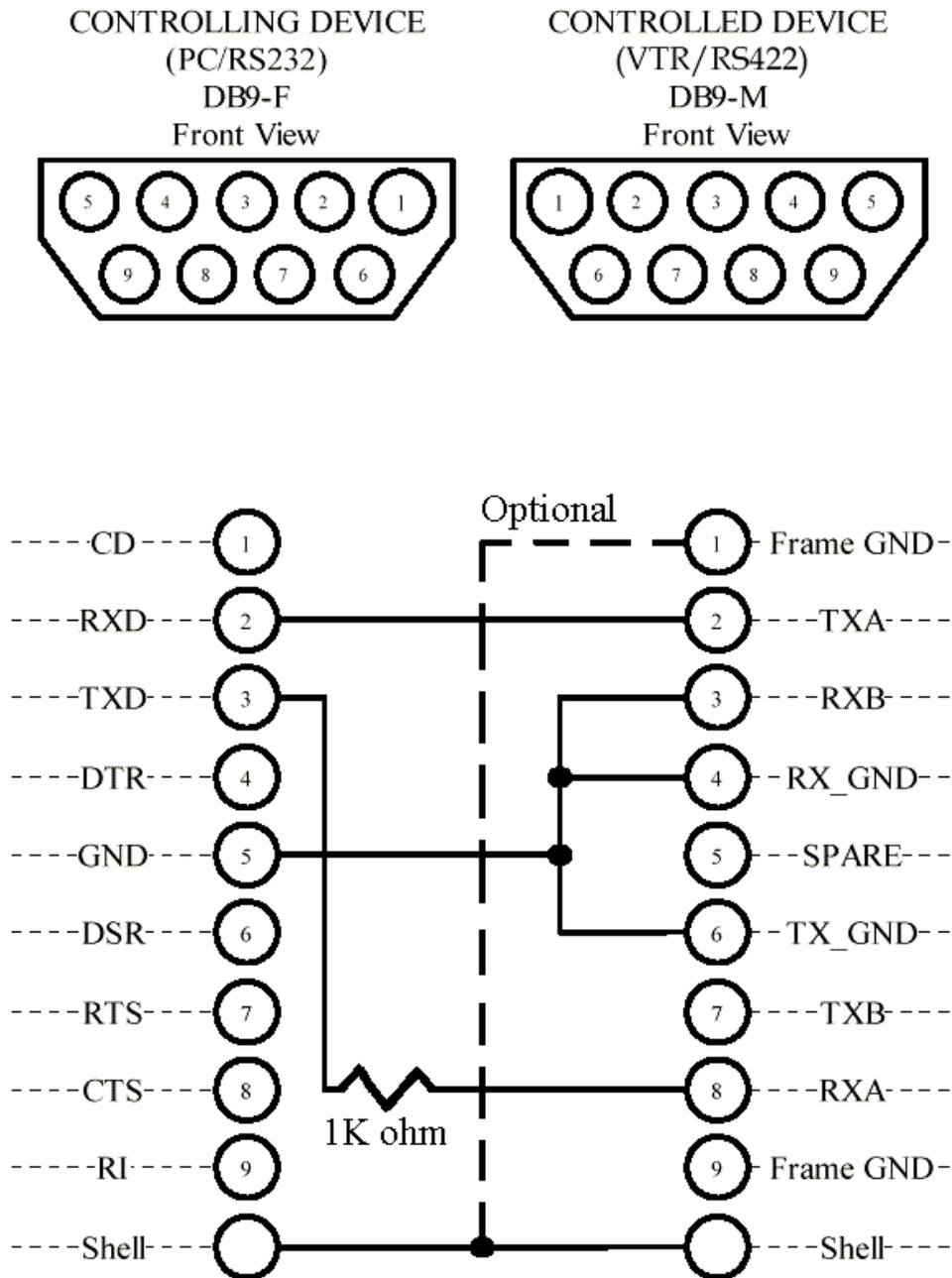
# Merlin 2003 Analog Cable



Male DB15 Front View



## Batch Recorder Serial Cable



## Appendix F

### Batch Recorder Optional Panels



#### **Panel2005A LITE Rack Mountable Panel Box for the Merlin Capture/Codec**

The Panel2005A LITE is a Panel Box that connects to 1 Merlin card. This should be purchased when you need broadcast INPUTS and OUTPUTS or when you exceed a cable run or more than 50 feet.

The Panel2005A LITE has the following inputs and outputs included:

- Serial Digital Video in (SDI) in
- Serial Digital Video (SDI) thru
- Serial Digital Video (SDI) Out 1
- Serial Digital Video (SDI) Out 2
- Composite/Genlock In
- Composite/Genlock Thru
- Composite Out
- AES/EBU Digital Audio In 1
- AES/EBU Digital Audio In 2
- AES/EDU Digital Audio In 3
- AES/EDU Digital Audio Out 1
- AES/EDU Digital Audio Out 2
- AES/EDU Digital Audio Out 3
- Analog Audio In 1
- Analog Audio In / LTC
- Analog Audio Out 1
- Analog Audio Out LTC

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## Merlin05 DV and MPEG-2 Recorder and Dual Stream Decoder

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### **Panel2003A Rack Mountable Panel Box for the Merlin Capture/Codec**

The Panel2003A is a Panel Box that has 2 identical halves that connect to 2 Merlins. The circuitry in the Panel2003A regenerates the signals from a Merlin and demultiplexes audio data to multiple audio connectors. This should be purchased when you need broadcast INPUTS and OUTPUTS or when you exceed a cable run or more than 50 feet.

Each half of the Panel2003A has the following inputs and outputs included:

- Serial Digital Video in (SDI) in
- Serial Digital Video (SDI) thru
- Serial Digital Video (SDI) Out 1
- Serial Digital Video (SDI) Out 2
- Composite/Genlock In
- Composite/Genlock Thru
- Composite Out
- AES/EBU Digital Audio In 1
- AES/EBU Digital Audio In 2
- AES/EDU Digital Audio In 3
- AES/EDU Digital Audio Out 1
- AES/EDU Digital Audio Out 2
- AES/EDU Digital Audio Out 3
- Analog Audio In 1
- Analog Audio In / LTC
- Analog Audio Out 1
- Analog Audio Out LTC

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## Merlin05 Batch Recorder (BREC) and Dual Stream Decoder

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### Panel2003B Rack Mountable Panel Box for the Merlin Capture/Codec

The Skymicro Panel B connects to 1 Merlin board and provides additional input and output capabilities. The circuitry in the Panel2003B regenerates the signals from a Merlin Capture/Codec and demultiplexes the audio data to multiple audio connectors. This should be purchased when you need broadcast INPUTS and OUTPUTS or when you exceed a cable run or more than 50 feet.

The Panel2003B has the following inputs and outputs included:

- Serial Digital Video (SDI) In
- Serial Digital Video (SDI) thru
- Serial Digital Video (SDI) Out 1
- Serial Digital Video (SDI) Out 2
- Composite/Genlock In
- Composite/Genlock Thru
- Composite Out
- Component In (YCrCb or RGB)
- Component Out (YCrCb or RGB)
- AES/EBU Digital Audio In 1
- AES/EBU Digital Audio In 2
- AES/EDU Digital Audio In 3
- AES/EDU Digital Audio Out 1
- AES/EDU Digital Audio Out 2
- AES/EDU Digital Audio Out 3
- Analog Audio In 1
- Analog Audio In 2
- Analog Audio In 3
- Analog Audio In 4
- Analog Audio Out 1
- Analog Audio Out 2
- Analog Audio Out 3
- Analog Audio Out 4
- LTC In
- LTC Out
- RS-422 9 Pin Control Port

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## **Merlin05 DV and MPEG-2 Recorder and Dual Stream Decoder**

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Skymicro, Inc.  
2060D Ave. Los Arboles PMB344  
Thousand Oaks, CA 91362-1361  
(805) 491-8995  
[www.skymicro.com](http://www.skymicro.com)

