DAFV²

Digital Audio Follows Video 2

E-SAM to MIDI Converter

Users Manual

JLCOOPER ELECTRONICS

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Introduction

The JLCooper DAFV² interfaces an edit controller to a digital audio mixer, for automated audio-follows-video applications. DAFV² receives RS-422 commands, using ESAM 2 and GVG 100 protocols. It then outputs MIDI commands to control your digital audio mixer.

In the past, audio-follows-video mixers have been somewhat limited in flexibility and features. For a given application, there may not have been enough audio inputs, or outputs, equalization, or bussing capability.

The DAFV² overcomes that problem, by allowing you to choose your own digital mixer for the functions, features and cost that meet your requirements. Adding DAFV² turns your existing digital mixer into an audio-follows-video mixer.

Please fill out the enclosed registration card and mail it in right away, so that we can notify you of any updates or related products.

How the DAFV² is used

Your digital audio mixer mixes the audio from various sources, typically at least two Video Tape Recorders (VTR's). The output of the mixer goes to another VTR, called the Record VTR.

JLCooper's DAFV² connects to your mixer using standard "MIDI" cables.

The DAFV² receives commands from an edit controller, so your mixer can do automatic transitions, that is, cuts and dissolves. The sound of the mix is dependent on the how the mixer is set up, especially its input trim/gain settings, equalization, additional signal processing, etc. The DAFV² is only responsible for automatically bringing up or down the level of certain channels. Though the inputs are typically stereo VTR's, other audio sources could include DAT machines, microphones or digital audio workstations.

DAFV² can also be put into a "Quad Mode", in which it performs crossfades between two 4 channel machines.

The edit controller's EDL (Edit Decision List) lets you specify the in and out points of the edit. The EDL may also select the kind of edit, which audio tracks of the Record VTR are being recorded, and which machines are program (currently hot) and which are preset (hot after the next transition.)

When the edit controller issues a crossfade command to the DAFV², channels which were hot are faded out, and channels which were cut are faded in. The edit controller sets the crossfade time.

It is recommended that you allow some time to set up, familiarize yourself, and experiment with the DAFV² before working on a commercial project.

The DAFV² also has the capability of setting individual channel levels from an edit controller that has the ability to send the appropriate commands.

Here is the minimum equipment required for an editing session using DAFV² used in conjunction with a digital audio mixer:

• A Compatible Digital Audio Mixer
• The DAFV² with its included power supply
• Two VTR's, whose stereo audio outputs go to the mixer
• Another VTR, to record the edited program
• A Monitor Amp, with speakers or headphones
• Associated cables, correctly connected
• Some videotapes with audio recorded on both tracks
• An Edit Controller and or Video Switcher, correctly connected to the DAFV²

Installation

Unpacking

When you receive your DAFV², you should receive the following items in the box:

- DAFV²
- This Users Manual
- Power Supply

Please take a moment to register your product at:

http://www.jlcooper.com

This will allow us to notify you of important updates and changes to software or features.

Mounting

The compact design of the DAFV² makes it easy to locate wherever you need it. The DAFV² is housed in a 'half rack' enclosure. It is designed to fit in a 1U, 19 inch rack shelf. The DAFV² is secured to the rack shelf by two screw holes in the bottom of the DAFV².

The DAFV² must be setup up in a location that does not experience vibration, excessive humidity, dust or temperature extremes.

Edit Controller Hookup

An edit controller or video switcher controls the DAFV² through a serial port. The port may be on a plug-in card or outboard interface box. Some edit controllers have a dedicated port just for an audio mixer.

Other edit controllers have a dedicated port just for a video switcher. By means of a 'Y' cord, DAFV² can "eavesdrop" on that port. The audio transition would occur when the edit controller sent a dissolve or cut command to the video switcher.

Edit controller interface cables are not standardized. Interfacing the DAFV² to your edit controller or video switcher may require special skills in making cables, and reading manufacturers' technical documentation.

Larger facilities will defer this chore to their engineering departments. If you do not have the experience to attempt to make the interface cable, we recommend that you ask your dealer to help you find a video service center that you can contract to assist you.

Video Switcher Hookup

DAFV² can get its commands from a 'Y' cord, listening in on the commands to a video switcher. This is the case when an edit controller does not have a separate serial port available.
When a command is sent to a machine via a serial protocol, the machine replies with a message of acknowledgment. In this case, the video switcher will reply with a message of acknowledgment. Therefore, transmission of acknowledgment messages from DAFV² must be blocked, so that these messages do not collide with the acknowledgment messages from the video switcher.

To disable the transmission of acknowledgment messages, make sure that the Y-cord leaves the DAFV² output pins 2 & 7 disconnected.
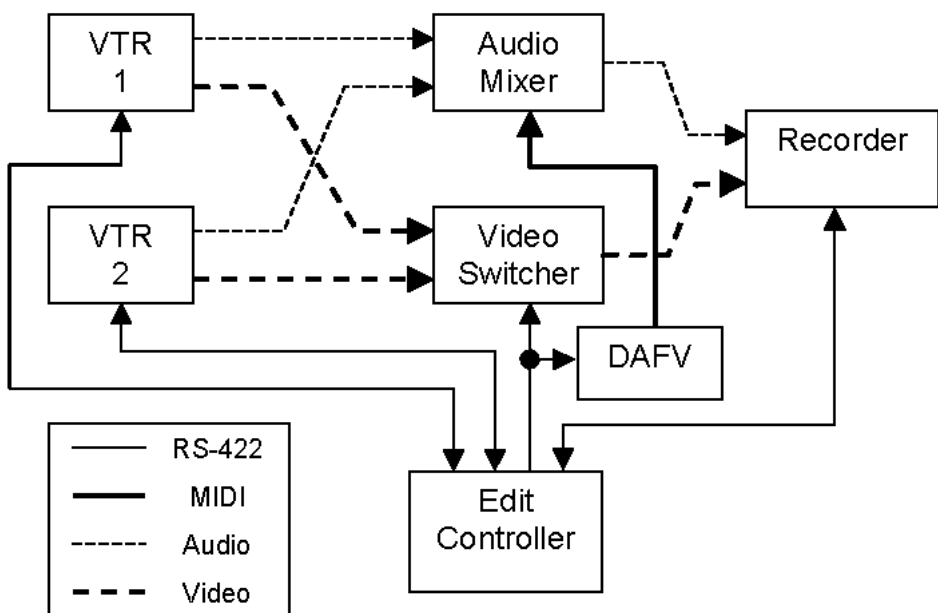
DAFV2 System Connection Diagram

Protocol Support and Pin Out

The JLCooper DAFV² responds to ESAM I & II, GVG-100, and RS-422. The DAFV² automatically detects and configures itself to receive the supported protocols.

The commands come into DAFV² via a 9-pin female Sub D connector on the rear. The pin-out conforms to SMPTE #113 standards and is detailed in the section *Technical Information*.

Sync

Connect the BNC connector to a source of house sync or blackburst. This can be any source of NTSC or PAL composite video. This sync connection is optional and is not required to operate the DAFV².

When sync is present, DAFV² waits until the next field edge (1/2 frame) before executing a command received from an edit controller. If sync is not present, the DAFV² automatically switches to an internal crystal generated clock. Accuracy is guaranteed, but field edge alignment is not. Under most situations, this is not important for audio editing, since the maximum error is 18 milliseconds.

The sync input is unterminated to allow it to be daisy chained with other video inputs.

Audio Hookup

You may connect the output of several audio sources to your mixer, such as VTRs, DATs, microphones and CDs. The individual VTR audio outputs are connected to the mic/line inputs of the mixer, using (up to) the first 16 channels. These channels will need to be bussed as needed to route the audio path to the various outputs for monitoring and recording. Refer to the operations manuals for your specific mixer for details.

Power

Connect the power supply to the power jack in the rear of the DAFV². The supply is 9 VDC at 500 mA (1/2 Amp), center positive. When the unit is powered up an LED is lit next to the power switch.

Power Line Conditioning

All microprocessor-based equipment (including VTRs, switchers, and audio processors) must be protected from variations in the AC line. The DAFV² is no exception. Power surges, lightning strikes, "brown outs", even nearby motorized equipment can interfere with the operation of the DAFV² and cause unwanted operation. In some cases, these events can cause permanent damage to the hardware.

It is strongly recommended that all your computer-related equipment be powered from an AC line conditioner. Multiple outlet 'power strips' usually have circuit breakers and some have surge suppressors. Ideally, the system should be protected with a power conditioner that includes both surge suppression and line filtering. Being plugged into conditioned power will provide protection for the mixer, edit controller, switcher, VTRs, and DAFV².

Configuration

On the back panel of the DAFV² are eight small DIP switches. They are used to select the type of mixer you are using and the mode of operation.

These switches will probably only need to be set once, unless you change mixers or significantly change the way your machines are connected to the mixer.

Selecting the Mode of Operation

When DAFV² receives a command from an Edit Controller, the mixer performs the transition by fading up some channels while fading down other channels.

If you have mono audio sources connected to the mixer, then each mixer channel is treated as a separate "machine" by the edit controller. In "Mono Mode", up to 4 mono "machines" may be controlled, using the mixer channels 1 through 4.

If you have stereo VTRs connected to the mixer, then you want each stereo pair to be treated as a separate "machine" by the edit controller. In "Stereo Mode", channels 1/2, 3/4, 5/6, and 7/8 are paired and treated as four machines by the edit controller.

If you have four channel machines connected to the mixer, and then each group of four input channels should be treated as a machine by the edit controller. In "Quad Mode", channels 1 through 4 are "machine 1", 5 through 8 are "machine 2", 9 through 12 are "machine 3", and 13 through 16 are "machine 4".

DIP switches 7 and 8 are used to select the operation mode:

Mono Mode

SW7 … Off
SW8 … Off

Stereo Mode

SW7 … On
SW8 … Off

Quad Mode

SW7 … Off
SW8 … On

Individual Source Mode (GrassValley Kayak)

Allows control of up to 16 sources.
SW7 … On
SW8 … On

Selecting the Mixer

Each supported mixer uses different MIDI commands for control.
The DAFV² rear panel DIP switches need to be set to correspond
to the mixer type.

Yamaha 02R (for 02R96 see below)

SW1 … Off
SW2 … Off
SW3 … Off
SW4 … Off

Yamaha 01V/03D, Roland VM-C7100/VM-C7200

SW1 … On
SW2 … Off
SW3 … Off
SW4 … Off

Generic MIDI Control Change (Yamaha M7CL)

These messages are detailed in the section *Technical Information*.
SW1 … Off
SW2 … On
SW3 … Off
SW4 … Off

Yamaha DM1000/DM2000/02R96

SW1 … On
SW2 … On
SW3 … Off
SW4 … Off

MIDI Volume (Tascam TM-D1000)

SW1 … Off
SW2 … On
SW3 … On
SW4 … Off

Mackie D8B

SW1 … Off
SW2 … Off
SW3 … On
SW4 … Off

Soundcraft Spirit Digital 328

SW1 … On
SW2 … Off
SW3 … On
SW4 … Off

Sony DMX-R100

SW1 … On
SW2 … On
SW3 … On
SW4 … Off

Switch 4
On for 24 frame - HDTV Applications
Off for all other applications.

Switches 5 and 6 are reserved for future use.

Setting Up the Mixer

The DAFV² controls the mixer using MIDI commands.
The digital mixer usually needs to be set up to receive MIDI commands.

The procedure for doing this is different for each mixer. Generally speaking, you usually go to a "MIDI Setup" page, and turn MIDI Receive "ON". You must usually also set the "MIDI Channel" to "Channel 1." On some mixers you must also set the communication speed" and the "communication port." Below are some specific notes for the supported mixers regarding settings that must be made on the mixer to allow the mixer to be controlled by MIDI commands.

Yamaha M7CL

Tap Setup, Tap MIDI
Set RX Port = MIDI, Set RX Channel = 1
Enable Control Change Receive, Set Mode = Table
Tap the Control Change tab.
Refer to DAFV Addendum regarding mapping.

Yamaha 02R (not 02R96)

Select the MIDI Setup screen.
Set Receive Channel to 1.
Enabled Parameter Change.
(See page 159 of the 02R owner's manual for more information).

Yamaha 01V

Select MIDI Setup screen.
Under receive (Rx), set Control Change to ON.
Param Change to OFF.
Confirm also the PORT is set to MIDI.

Yamaha 03D

Select MIDI Setup screen.
Under receive (Rx), set Control Change to ON.
Param Change to OFF.
Select Utility screen.
Under Host Interface, select STANDARD I/F.
Under General Setup, set Rx port to CH 1, MIDI.

Yamaha DM1000/DM2000

Press Display Access MIDI. Select SETUP tab.
Set Parameter Change RX=ON, Channel RX =1, Fader
Resolution=LOW
Press Display Access Setup. Select MIDI/HOST tab.
Set RX Port = MIDI

Mackie DM8

You must have Version 2.01 or newer to operate with DAFV².
Open the "Channel List" window (control B.)
On all input channels that are to be controlled by the DAFV², set
the following: Ch. = Ch. 1 Mode = In MIDI = On
Any other control parameters should be left in their default
settings. Then, you must go to the FILE menu and select Save
Session (or use keyboard shortcut CTRL S.) (Without this Save
operation, you will need to edit the CHANNEL LIST each time.)

Roland VM-C7100/VM-C7200

These mixers where not available at the time of manual printing.
Please contact the factory for an addendum relating to Roland VM-
C71000 setup, when it becomes available.

Spirit Digital 328

Press MENU button (lower right of display).
Scroll down with Param to until "Automation Setup" is flashing,
press ENTER.
If the display indicates "MIDI Dynauto:OFF", turn Param to set
"MIDI
Dynauto:ON". Press Exit.
Mic/Line channels 1 through 16 will be controlled

Testing your Setup

To aid in troubleshooting your setup, the DAFV² will bring all the faders associated with Video 1 to the topmost position and all other faders to the bottommost position after power up. For example, in stereo mode, faders 1 and 2 will go to the topmost position while faders 3 – 16 will go to the bottommost position.

DAFV² Basic Operation

Signal Indicator

On the right side of the front panel is an LED that will show you if your DAFV² is receiving messages. When the DAFV² first receives RS-422 data, it momentarily flashes ON. Once it has received either ESAM2 or GVG protocol, it will turn on solid.

Subsequent RS-422 commands will cause it to flash off momentarily.

Preparing for the Edit Session

Monitoring Audio

Prior to doing any editing, verify your audio hookup. At least you will want to make sure you can monitor (listen to) every audio channel and set record and playback levels. Since each mixer and mixer application is different, if you are new to mixing, have an experienced person help you set up your mixer.

For those of you fairly new to mixers and mixing, here is a very general check list of common switches and settings that should be checked if you are having difficulty hearing audio playback from your VTRs. Confirm the following:

• The source VTR is in play and that there is an audio signal coming out (meter indication.)
• Mixer inputs are switched to the correct input jack and level (MIC / LINE switch and Input Trim).
• Mixer inputs are not attenuated. (Many digital mixers have a programmable Attenuator function.)
• Audio signal is on the expected fader or pot (check "Reverse" or "Flip" switch, if any).
• Fader or Pot is up.
• Channel is ON, not CUT or MUTED.
• Channel assign switch is pressed, routing the signal to a group or L / R bus.
• If channel is assigned to a group, the group fader is also up and assigned to L / R bus.
• Master Faders and Control Room Pot up.

• No stray "SOLO" or "PFL" buttons pressed.
(There are usually only a few hundred of these. It is hoped that the mixer has LEDs on each one of these buttons to tell which one has been pressed.) If the mixer has PFL (Pre Fade Listen) switches, and, in the signal flow of the mixer these are before the channel inserts, you should be able to monitor any channel of any machine, even if they are cut by the DAFV².

Setting Record VTR Input and Output Levels

Before the session, the input and output levels should be set on the Record VTR.

Using a tone generator, oscillator, or test tape, play tone into the record VTR. Adjust the tone level at the source for 0 VU.

Put the Record VTR into EE, that is, you want the Record VTR's meters to monitor the input signal. Set record levels for 0 VU, to match the source level.

Record 30 seconds of tone.

Play back the tone, and if necessary adjust the VTR's output levels so that they are the same as the record levels.

Setting Source Input Levels

If your source tapes were recorded with bars and tone, and your source VTR's have output level adjustments, then cue the source VTR to bars and tone. (If your source tapes were recorded without tone, adjust each scene for consistency as required.)
Play back bars and tone, and adjust the Source VTR tracks 1 and 2 playback levels to 0 VU on the VTR's meters.
Since the DAFV² will perform the transitions on the channel's faders, using trim or input gain controls on the mixer adjust the actual balance or sound of the mix. Follow the mixer's instructions for manually setting the Input Trim level knobs.
Further fine adjustments to the mix can be performed using programmable attenuators, if your mixer has this feature. If it does not, then level matching can be performed using the output level controls of the VTR.

Audio Editing Procedures

Program and Preset Bus

The DAFV² works in a manner similar to a video switcher. Input audio sources are assigned to Program or Preset buses. The buses toggle, that is, change places after a transition. What was once the Preset bus becomes the Program Bus, and vice versa. In other words, inputs are assigned to the Preset Bus before an edit point occurs. These input signals appear on the Program Bus after the transition occurs.

The Edit Controller can assign a machine to the Program Bus, which simply means that the machine will be brought up (hot). The Edit Controller can then assign a machine to the Preset Bus, which simply means that it is brought down (cut), until the transition occurs.

At the transition, the machine assigned to the program bus fades out and the machine assigned to the preset bus fades in. Keep in mind that these are called "bus" only from the standpoint of the edit controller or switcher. The audio signal path isn't really bused (routed) anywhere unless you setup your mixer to send the signal path to an output.

Definition of Crossfade (Dissolve), and Cut

A crossfade (or dissolve) simply means to fade out some audio signals while fading in other audio signals. For users of Edit Controllers, this can be more precisely defined as a transition or swap of the program and preset bus. Since an Audio crossfade corresponds to a Video Dissolve, we use the terms interchangeably.

Suppose that you have two VTRs, connected to four inputs of your mixer. The DAFV² is configured for Stereo Mode. When you turn the DAFV² on, you can only hear the output of VTR A, because VTR B's audio output has been cut by DAFV².

A Cut is a fast transition, one occurring within an interval of a frame, is usually called a Cut instead of a crossfade. An edit controller can only change the transition time, the time it takes to fade out a machine while fading in another machine. DAFV² transition time range is 0 to 255 frames. (Approximately 10 milliseconds to 10 seconds.)

Edit Controller Operation

An edit controller is a computer-based interface responsible for tying together all VTRs, ATRs, switchers and mixers.
Its purpose is to coordinate the various machines and initiate execution of cuts, crossfades and other effects.

The edit controller may be a generic software package for a PC, with interface cards to connect to various machines, or it may be a dedicated package targeted around a certain brand of video switcher.

In a small post facility, it may also be the front-end to an integrated desktop video editing / effects processor.

Please notice that though the DAFV² has the ability to respond to serial commands to execute instructions, a given edit controller might not have the ability to send all the commands required to access every parameter within the DAFV².

In other words, your edit controller may or may not be able to take full advantage of all the features of the DAFV². You may remotely control the following parameters of the DAFV²:

> • Program Bus Assignments
> • Preset Bus Assignments
> • Transition Time
> • Initiate Transition
> • Stop Transition
> • Fader Level Range

Machine / Crosspoint Numbers

The user interface of an edit controller is the Edit Decision List (EDL). The EDL allows the user to define edits by specifying a machine or crosspoint number, edit point, type of edit, and transition time. The EDL is where edits are entered and edited, and then executed.

Machines (such as VTRs) are given numbers to identify them in the EDL. This number is called the Machine Number or Crosspoint Number. The editing system uses these Machine Numbers to assign the DAFV² inputs to Program and or Preset Buses. These Machine Numbers should be entered on a "hardware" menu in the Editing System.

An EDL command to "Dissolve from Machine 1 to Machine 2" puts Machine 1 (VTR A) on the Program Bus and Machine 2 (VTR B) on the Preset Bus.

When an edit controller sends a command to assign Machine 0 to a Bus, this results in the Bus Assignments turning off.
For example, a command to put Machine 0 onto Preset Bus would turn off everything on the Preset Bus.

Procedures for Edit Controlled Cut

- Check that you have followed the procedures for preparing for a session, specifically, that all interconnections have been made and levels are set.

- Ensure that the edit controller is communicating with DAFV².

- On the edit controller, set up a cut by marking Source VTR and Record VTR in and out edit points. On the edit controller, program the mode of the audio edit, A1, A2 or both. That is to say, set up the Record VTR to record on track 1, track 2, or both.

- Select the desired input source(s) on the DAFV² Program Bus.

- Select by entering machine / crosspoint numbers and destination bus on the edit controller.

- Select the inputs that will go to the Record VTR after the cut. Select by entering machine / crosspoint numbers and destination bus on the edit controller.

- Monitor the edit off the Record VTR.

- Set the input levels by playing the source VTRs and match levels with VTR outputs or mixer input trims.

- Preview the edit. If necessary, adjust input levels on mixer, and trim edit points on the edit controller.

- Perform the edit on the edit controller

- Play the edit using the edit controller, and check for audio level consistency from scene to scene.

Procedures for Edit Controlled Dissolve

- Check that you have followed the procedures for preparing for a session, specifically, that all interconnections have been made and levels are set.

- Ensure that the edit controller is communicating with DAFV².

- Set up a dissolve on the edit controller by marking Source VTR and Record VTR in and out edit points. On the edit controller, program the mode of the audio edit, A1, A2, or both. That is to say, set up the Record VTR to record on track 1, track 2, or both.

- Select the desired input sources by entering machine / crosspoint numbers and destination bus on the edit controller.

- Select the inputs that will go to the Record VTR after the dissolve. Select by entering machine / crosspoint numbers and destination bus on the edit controller.

- Monitor the edit off of the Record VTR.

- Set the input levels by playing the source VTRs and match levels with VTR outputs or mixer input trims.

- Preview the edit.

- Perform the edit on the edit controller

- Play the edit using the edit controller, and check for audio level consistency from scene to scene.

Mix Under Mix (or 'Ducking')

When working with music and dialogue, there are times when the project calls for an edit that begins with music. Then, dialogue comes in and the music level drops. When the dialogue is finished, the music must return to its exact previous levels. This is called 'Ducking'.

To accomplish this, set DAFV² to Quad mode. Say that one VTR (or another source of music such as a CD) has music on two tracks. These tracks are connected to mixer channels 1 and 2. Another VTR has dialog on two tracks. These tracks are connected to mixer channels 7 and 8. You need to send the music source in not two but four inputs of your mixer. This can be accomplished easily if you have an audio patch bay. Patch the direct out of Channels 1 and 2 into the inputs 5 and 6 of the mixer.

Using programmable attenuators or trim controls as necessary:
Set the level of channels 1 and 2 for the music (loud).
Set the level of channels 5 and 6 for the music (soft).
Set the level of channels 7 and 8 for the dialog.

Before the edit, "Machine 1" (that is, the music only) is on the Program Bus. The edit consists of a dissolve to "Machine 2". But because the music has been patched over to Machine 2 channels, the dissolves will both bring up the dialog, and set the music to a lower level. The next edit is a dissolve back to Machine 1. This restores the music to its original level. Therefore, the edit will simultaneously bring up the dialogue and lower the music. Transitioning back will fade out the dialogue and raise the music to its previous levels.

Technical Information

This section covers the serial RS-422 protocol used by the JLCooper Electronics DAFV² ESAM/GVG-to-Digital Mixer converter.

Electrical

As implemented on the DAFV², the RS-422 protocol is as follows:

- 38400 bits/sec

- 1 start bit

- 8 data bits

- 1 parity bit
  Note: Parity (Odd/Even) is automatically set

- 1 stop bit

The RS-422 comes into the DAFV² via a 9-pin female Sub D connector on the rear. The pin-out conforms to SMPTE #113 standards, and is as follows:

    Pin 1 … Ground
    Pin 2 … Output (-)
    Pin 3 … Input (+)
    Pin 4 … Ground
    Pin 5 … no connection
    Pin 6 … Ground
    Pin 7 … Output (+)
    Pin 8 … Input (-)
    Pin 9 … Ground

DAFV² can be used in an eavesdrop mode, that is, connected to a video switcher output via a "y" cord. If this is done, a cable with pins 2 and 7 disconnected will be needed to prevent DAFV²'s tallybacks from interfering with the video switcher's tallybacks.

ESAM Protocol

Note: All numbers in hex.

Select Command

When the DAFV² is first turned on, it is in an idle state. In order to select the unit, the following bytes must be sent:

```
<break> 88 A6 03
```

This string should only be sent once to select the DAFV². After this, normal commands may be sent. The following are the commands recognized by the DAFV²:

Transition Command

```
03 01 A9 C0
```

Upon receipt of this string, the DAFV² will send back an 80 as acknowledgment, and will start a transition at the currently active transition rate.

Transition Rate Command

```
04 01 A7 00 rr
```

Upon receipt of this string, the DAFV² will send back an 80 as acknowledgment, and will store rr as the transition rate in frames.

All Stop Command

```
02 01 A0
```

Upon receipt of this string, the DAFV² will send back an 80 as acknowledgment, and stop any current transition in progress, and return to previous state.

Program Crosspoint Command 'From Machine'

```
03 01 B4 nn
```

Used in Mono, Stereo, Quad and Individual Source modes.
Upon receipt of this string, the DAFV² will send back an 80 as
acknowledgment, and will use nn to set the Program Crosspoint or
'From' source. nn = 0 for no input, nn = 1 for "Machine 1" input
(i.e. audio inputs 1 & 2 for stereo operation, and audio inputs 1
through 4 for quad operation.), nn = 2 for "Machine 2" input, etc.

Preset Crosspoint Command 'To Machine'

```
03 01 B5 nn
```

Used in Mono, Stereo, Quad and Individual Source modes.
Upon receipt of this string, the DAFV² will send back an 80 as
acknowledgment, and will use nn to set the Preset Crosspoint or
'To' source. nn = 0 for no input, nn = 1 for "Machine 1" input (i.e.
audio inputs 1 & 2 for stereo operation, and audio inputs 1 thru 4
for quad operation.), nn = 2 for "Machine 2" input, etc.

Program Crosspoint Command 'From Sources'

```
04 01 A3 bitmap1 bitmap2
```

Used in Individual Source Mode.
Upon receipt of this string, the DAFV² will send back an 80 as
acknowledgment, and will use bitmap1 and bitmap2 to set the
Program Crosspoint or 'From' sources. This command allows up
to 16 sources to be selected.

Preset Crosspoint Command 'To Sources'

```
04 01 A3 bitmap1 bitmap2
```

Used in Individual Source Mode.
Upon receipt of this string, the DAFV² will send back an 80 as
acknowledgment, and will use bitmap1 and bitmap2 to set the
Preset Crosspoint or 'To' sources. This command allows up to 16
sources to be selected.

Fader Level Command

```
02 01 AD fn vv
```

Upon receipt of this string, the DAFV² will send back an 80 as acknowledgment, and will use fn to determine the fader number to which the value vv will be applied. fn is in the range from 1 to 16, and vv is in the range from 0 to FF, with 0 indicating off, and FF full on. This will become the maximum level a given channel may reach when acting as an active crosspoint.

Grass Valley Protocol

Note: All numbers in hex.
A BREAK character is followed by anything EVEN, other than 88. DAFV² responds with 84 (to all commands).

Command Structure - LB NC CM
LB =   Length Byte
NC =   No Care (1 or 5 for audio or video)
CM =   Command.

Commands
FB 0B - Auto Crossfade Start
(push button #11)

CC 0x 0y 0z - Transition time, MSB first, BCD
Example: 244 frames = CC 02 04 04

F2 NC - All stop

C1 0m - Program crosspoint assign,

C2 0m - Preset crosspoint assign
m = machine number 0 through 3

MIDI Control Change Messages

The DAFV² firmware v1.10 and later adds support for MIDI Control Change messages. This documents details these messages.

The DAFV² is a protocol converter, which converts ESAM and Grass Valley GVG100 video router messages into MIDI message that many modern digital audio mixers can understand. The DAFV² can control groups of 1, 2 or 4 audio channels. The DAFV² can also control any of 16 individual audio channels.

In v1.10 firmware, support was added for a specific type of MIDI messages called Control Change messages. These are 3 byte messages that are in the form:

```
B0 <parameter> <value>
```

The DAFV² uses one message for each of the 16 faders that are controllable. Those messages are detailed in the table below.

Fader	1	=	B0	01	<value>
Fader	2	=	B0	02	<value>
Fader	3	=	B0	03	<value>
Fader	4	=	B0	04	<value>
Fader	5	=	B0	05	<value>
Fader	6	=	B0	06	<value>
Fader	7	=	B0	07	<value>
Fader	8	=	B0	08	<value>
Fader	9	=	B0	09	<value>
Fader	10	=	B0	10	<value>
Fader	11	=	B0	11	<value>
Fader	12	=	B0	12	<value>
Fader	13	=	B0	13	<value>
Fader	14	=	B0	14	<value>
Fader	15	=	B0	15	<value>
Fader	16	=	B0	16	<value>

Fader to MIDI Control Change Mapping

Many modern digital audio mixers have MIDI ports. Most have the ability to map MIDI Control Change messages to user definable parameters. In the following example, we will show step by step how to configure the DAFV² to control a pair of stereo faders on a Yamaha M7CL Digital Mixing Console. You may not be using this specific console but the steps should be similar.

On the DAFV², configure the unit to transmit Control Change message by setting the rear panel DIP switches to:

> Switch 1 = Off
> Switch 2 = On
> Switch 3 = Off

In addition, set the rear panel switches for stereo mode.

> Switch 7 = On
> Switch 8 = Off

In stereo mode, when the DAFV² receives a router command for Video Source 1, it will send the appropriate messages for Audio Channels 1 and 2. The specific mapping of the Video Sources to Audio Channels for the various modes of DAFV² operation is detailed in the following tables.

Video	1	=	Fader	1
Video	2	=	Fader	2
Video	3	=	Fader	3
Video	4	=	Fader	4

Mono Mode of Operation

Video	1	=	Fader	1
			Fader	2
Video	2	=	Fader	3
			Fader	4
Video	3	=	Fader	5
			Fader	6
Video	4	=	Fader	7
			Fader	8

Stereo Mode of Operation

Video	1	=	Fader	1
			Fader	2
			Fader	3
			Fader	4
Video	2	=	Fader	5
			Fader	6
			Fader	7
			Fader	8
Video	3	=	Fader	9
			Fader	10
			Fader	11
			Fader	12
Video	4	=	Fader	13
			Fader	14
			Fader	15
			Fader	16

Quad Mode of Operation

Video	1	=	Fader	1
Video	2	=	Fader	2
Video	3	=	Fader	3
Video	4	=	Fader	4
Video	5	=	Fader	5
Video	6	=	Fader	6
Video	7	=	Fader	7
Video	8	=	Fader	8
Video	9	=	Fader	9
Video	10	=	Fader	10
Video	11	=	Fader	11
Video	12	=	Fader	12
Video	13	=	Fader	13
Video	14	=	Fader	14
Video	15	=	Fader	15
Video	16	=	Fader	16

Kayak Mode of Operation

Now that the DAFV² is configured to transmit fader messages when it receives a Video Source change or transition command, it is time to configure the audio mixing console.

The first thing to do is to enable the console to receive MIDI. The DAFV² transmits its MIDI messages on MIDI Channel 1. You will need to configure the console to receive MIDI on MIDI channel 1.

Next, since the DAFV² is configured to send MIDI Control Change messages to the console, the console must be enabled to accept MIDI Control Change messages.

There are two types of MIDI Control Change messages, the shorter 'Control Changes' or 'Table' and the longer NRPN or Nonregistered Parameter Number. The DAFV² transmits the shorter 'Control Changes' or 'Table' messages. Your console must be enabled to respond to the shorter 'Control Changes' or 'Table' messages.

Finally, the Control Change messages must be mapped to actions on the console. Most consoles have a table, which allow the operator to enter this mapping. For the Yamaha M7CL, tap the Control Change tab from the MIDI setup page.

In the Control Change table, enter the desired mapping. For example, you may want the DAFV² Fader output messages to map directly to the physical console faders in the following fashion:

DAFV² Fader	1	=	Console Input Fader	1
DAFV² Fader	2	=	Console Input Fader	2
DAFV² Fader	3	=	Console Input Fader	3
DAFV² Fader	4	=	Console Input Fader	4
DAFV² Fader	5	=	Console Input Fader	5
DAFV² Fader	6	=	Console Input Fader	6
DAFV² Fader	7	=	Console Input Fader	7
DAFV² Fader	8	=	Console Input Fader	8
DAFV² Fader	9	=	Console Input Fader	9
DAFV² Fader	10	=	Console Input Fader	10
DAFV² Fader	11	=	Console Input Fader	11
DAFV² Fader	12	=	Console Input Fader	12
DAFV² Fader	13	=	Console Input Fader	13
DAFV² Fader	14	=	Console Input Fader	14
DAFV² Fader	15	=	Console Input Fader	15
DAFV² Fader	16	=	Console Input Fader	16

Example Control Change Event Mapping

Using the Control Change Event table, you are not limited to the Input Faders 1-16 on the console. DAFV² Fader output messages can be mapped to any available event. Depending on the mixer, these can be events such as subgroups, DCAs or mix matrices.

Troubleshooting

If the DAFV² does not give the expected results, take some time to do some troubleshooting.

- Confirm the DIP switch settings.

- Check that the cables are correctly wired and connected.

- Check that power is connected and the DAFV² is switched on, indicated by the LED next to the power switch.

If you are unable to make the edit controller communicate with the DAFV², review the edit controller's documentation to verify that any user-definable menu items have been set correctly.

If you are still experiencing difficulties, please refer to the fine print following regarding warranty and service information.

To aid in troubleshooting your setup, the DAFV² will bring all the faders associated with Video 1 to the topmost position and all other faders to the bottommost position after power up. For example, in stereo mode, faders 1 and 2 will go to the topmost position while faders 3 – 16 will go to the bottommost position.

Care and Service

If properly cared for, your DAFV² should provide years of troublefree performance. While the DAFV² is built in a rugged enclosure, please avoid dropping the DAFV².

The DAFV² must be setup up in a location that does not experience vibration, excessive humidity, dust or temperature extremes.

Clean with a soft, damp cloth. Do not allow liquids, dust or other foreign matter to get inside the unit.

There are no user-serviceable parts in the DAFV². Please refer to the JLCooper Electronics Limited Factory Warranty on the following page for detailed warranty and service information.

RoHS Statement of Compliance

16 September 2009

Re: DAFV²

This is a declaration that the items described (herein as RoHS "Class 1") do not contain one or more than one:

RoHS restricted substances above the homogeneous material concentration limit (Threshold Level) per the EU/RoHS directive effective July 1, 2006 and amending document(s).
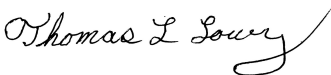
JLCooper Electronics products will meet MIL-I 45208. The Company is currently implementing procedures for ISO 9000:2000, after which feasibility research will begin for ISO 14000 considerations.

RoHS Class 1 OEM Products:

Hazardous Substance	Allowed PPM Level
Cadmium (Cd)	100ppm (0.01%)
Lead (Pb)	1000ppm (0.1%)
Mercury (Hg)	1000ppm (0.1%)
Hexavalent Chromium (CrVI)	1000ppm (0.1%)
Polybrominated Biphenyl's (PBB's)	1000ppm (0.1%)
Polybrominated Diphenyl Ethers (PBDE's)	1000ppm (0.1%)

Supplier evidence of compliance on file meets or exceeds trace ability requirements of ISO 9000:2000. Where feasible, JL Cooper seeks suppliers with ISO 9000:2000 Quality and ISO 14000 Environmental Certification.

Sincerely,

Thomas L. Lowry
_____
Thomas L. Lowry
Quality Assurance Department

Declaration of Conformity

JLCooper Electronics declares that the product named below conforms to:

C E

Low Voltage Directive (LVD) 2006/95/EC
(Superceded LVD73/23/EEC) on 16th January 2006.

Low Voltage Directive (LVD) 73/23/EEC
(Directive 73/23/EC has recently been the subject of a codification,
requiring a new number)

DAFV2

Warning: The installer is responsible for protection against personal contact
with all live connections to power supplies, which contain hazardous voltages.

Company Address:
142 Arena Street
El Segundo, CA, 90245 U.S.A.

Product Name: DAFV²
Product Type: MIDI Interface
Model Number: DAFV²
Date of Issue: 16 September 2009

Authorized by: *Thomas L Lowry*

Title of Authority: Quality Assurance
Declaration Reference: CE/EEC2007TLL

JLCooper Electronics Factory Warranty

JLCooper Electronics ("JLCooper") warrants this product to be free of defects in materials or workmanship for a period of 12 months from the date of purchase. This warranty is non-transferable and the benefits apply only to the original owner. Proof of purchase in the form of an itemized sales receipt is required for warranty coverage. To receive service under this warranty, customers in the United States should contact the JLCooper factory at (310) 322-9990 and talk to a service technician. If necessary, a Return Authorization number may be issued. For our customers outside the United States, it is recommended that you first contact your Dealer or Distributor, since they may offer their own service or support policy. If local support is not obtainable, please send a FAX to JLCooper's Service Department at +1 310 335 0110 with a detailed description of the service required. Upon issuance of return authorization, the product should be packed in the original shipping materials and shipped prepaid and insured to: Service Department, JLCooper Electronics, 142 Arena Street, El Segundo, CA 90245. Please include the following: copy of the sales receipt, your name and address (no P.O. Boxes, please), a brief description of the problem, and any other related items discussed with the service department and considered necessary to evaluate the product or effect a repair. The return authorization number must be clearly written on the outside of the package. JLCooper will at its option, without charge for parts or labor, either repair or replace the defective part(s) or unit. Shipping costs are not covered by this warranty. JLCooper's normal repair turn around time at the factory is approximately 15 business days from receipt of product to shipping. Your actual turn around time will include return shipping. Actual turn around time will vary depending upon many factors including the repeatability of the customer's reported complaint, the availability of parts required for repair, the availability of related products needed to evaluate the product if necessary. Priority services are available at additional cost. These should be discussed with the service technician at the time the return authorization is issued. This warranty provides only the benefits specified and does not cover defects or repairs needed as result of acts beyond the control of JLCooper including but not limited to: abuse, damage by accident/negligence, damage from using incorrect power supply, modification, alteration, improper use, unauthorized servicing, tampering, or failure to operate in accordance with the procedures outlined in the owner's manual; nor for natural or man-made events such as, but not limited to flooding, lightning, tornadoes, earthquake, fire, civil unrest, war, terrorism, etc.

THE DURATION OF ANY OTHER WARRANTIES, WHETHER IMPLIED OR EXPRESS, INCLUDING BUT NOT LIMITED TO THE IMPLIED WARRANTY OF MERCHANTABILITY, IS LIMITED TO THE DURATION OF THE EXPRESS WARRANTY HEREIN. JLCOOPER HEREBY EXCLUDES INCIDENTAL AND CONSEQUENTIAL DAMAGES, INCLUDING BUT NOT LIMITED TO: LOSS OF TIME, INCONVENIENCE, DELAY IN PERFORMANCE OF THIS WARRANTY, THE LOSS OF USE OF THE PRODUCT OR COMMERCIAL LOSS, AND FOR BREACH OF ANY EXPRESS OR IMPLIED WARRANTY OF MERCHANT-ABILITY APPLICABLE TO THIS PRODUCT. JLCOOPER SHALL NOT BE LIABLE FOR DAMAGES OR LOSS RESULTING FROM THE NEGLIGENT OR INTENTIONAL ACTS OF THE SHIPPER OR HIS CONTRACT AFFILIATES. THE CUSTOMER SHOULD CONTACT THE SHIPPER FOR PROPER CLAIMS PROCEDURES IN THE EVENT OF DAMAGE OR LOSS RESULTING FROM SHIPMENT. THIS WARRANTY SHALL BE GOVERENED BY THE LAWS OF THE STATE OF CALIFORNIA.