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REVISION HISTORY

REVISION	DESCRIPTION	DATE
1.0	Original Version	Oct 02
1.1	Spec updated to Rev A PCB	Nov 02
1.2	Fixed formatting and typos	Jul 07

1. OVERVIEW

The 500ADA-EQ Equalizing Analog Distribution Amplifier is a general purpose amplifier for distributing analog video signals. The 500ADA-EQ features one balanced equalized input with nine outputs. The 500ADA-EQ amplifier has been designed to distribute a wide range of analog video signals. It can also distribute other pulses and signals that are less than 2Vp-p.

The 500ADA-EQ is housed in the 500FR exponent Frame that will hold up to 16 modules:

Features:

- 75 Ohm or high impedance input (jumper selectable)
- High common mode range and common mode rejection ratio (CMMR)
- Gain control
- Jumper selectable AC or DC coupling
- Jumper selectable fast or slow back porch clamp
- DC level control when clamp is enabled
- Cable equalizer adjustment range: 0 to 300m of 8281 or 1694
- Looping feature with external "T" connector
- Consistent input impedance if card power is lost

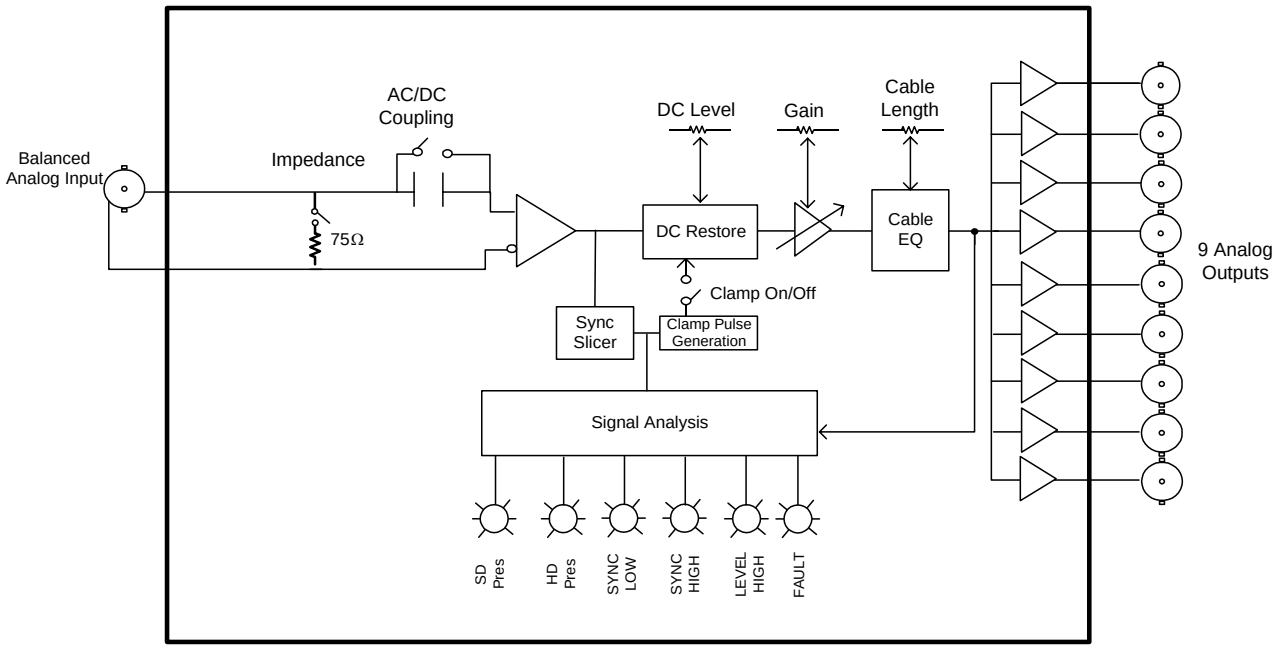

Figure 1-1: 500ADA-EQ Block Diagram

2. INSTALLATION

The 500ADA-EQ comes with a companion rear panel overlay that can be placed over the rear panel BNC connectors to identify their function. For information on inserting the module into the frame see section 3 of the 500FR chapter.

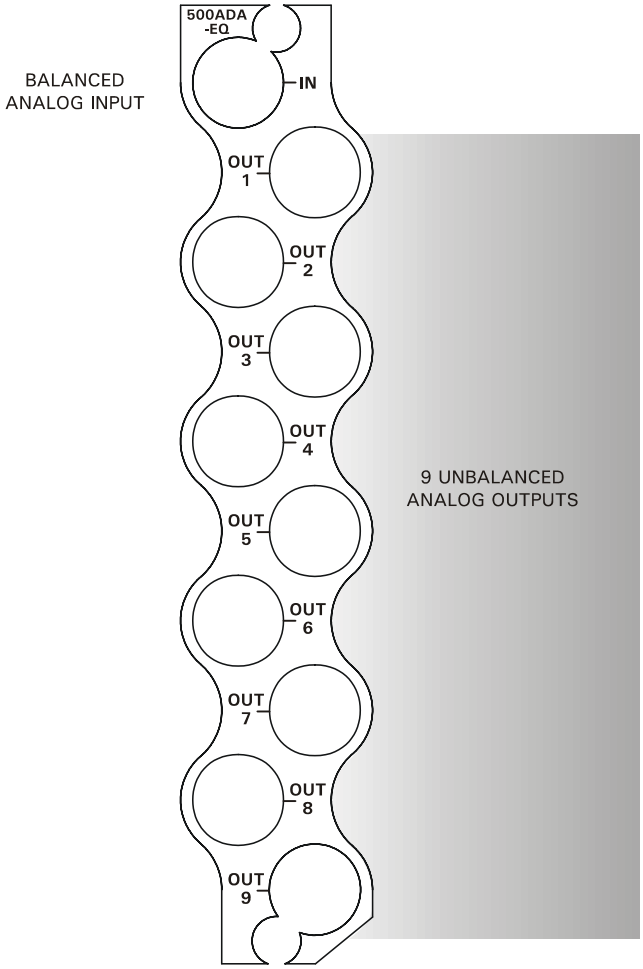

Figure 2-1: 500ADA-EQ Rear Panel Overlay

IN Input (isolated) BNC connector for analog video signals. The TERM jumper located on the module near the back determines whether the input signal will be high impedance or terminated with 75 ohms. (See section 6.2) The INPUT jumper located on the module near the back determines whether the input signal will be AC or DC coupled. (See section 6.3)

OUT 1 to 9 There are nine BNC connectors with equalized, level and DC adjusted copies of the input signal.

3. SPECIFICATIONS

Note: At the time of printing, this product has only been qualified for use with standard definition signals. It, however, has been designed to work with high definition signals. Frequency, phase response as well as cable equalization will not be optimized at the upper frequency range of high definition video bandwidths.

All specifications, unless indicated, are measured under the following conditions:

- 1 Vp-p video applied
- 75 Ohm card input terminated
- AC coupled
- DC restore clamp turned on with slow time constant
- DC level adjusted for blanking at 0V
- Gain adjusted for unity operation into 75 Ohm load
- Cable equalizer set to 0 length

3.1. ANALOG VIDEO INPUT

Standards: Any analog video format, up to 2Vp-p and 30MHz bandwidth
Connector: 1 BNC input per IEC 169-8
Common mode range: >6Vp-p
CMRR: >70dB to 1kHz
Signal amplitude: 2.5Vp-p max
Cable equalizer: 0 to 300m of Belden 8281 or 1694 cable
Impedance: 75Ohms terminated, 35kOhms Hi-Z (jumper selectable)
Coupling: AC or DC (jumper selectable)
Return loss: > 40dB to 10MHz, >30dB to 30MHz
Clamp range: >+/- 600mV
Fast clamp attenuation of 60Hz: >36dB

3.2. ANALOG VIDEO OUTPUTS

Number of Outputs: 9 Per Card
Connector: BNC per IEC 169-8
Output impedance: 75 Ohm
Gain control range: ± 5dB
DC level < +/- 100mV (with DC Coupling active and back porch clamp disabled)
DC level Control range: < +/- 200mV(with back porch clamp enabled)
Freq. Response: < ±0.05dB no equalization (to 5.5MHz)
< ±0.09dB for 5 to 100m Belden 8281 or 1694 (to 5.5Mhz)
< ±0.15dB for 100 to 300m Belden 8281 or 1694 (to 5.5Mhz)
Differential Gain: <0.17 % 0 to 300m
Differential Phase: < 0.19 deg 0 to 300m
C/L gain inequality: <+/-0.1% for all cable lengths
C/L Delay: <+/-2nsec
Output isolation: >42dB to 10MHz, >32 dB to 30MHz
Output return loss: >40dB to 30MHz
Noise performance: <-78dB RMS NTC7 weighting,
<-70dB RMS 15kHz to 5.5MHz

3.3. ELECTRICAL

Voltage: + 12VDC
Power: 1.2 Watts.

3.4. PHYSICAL

Number of slots: 1

4. STATUS LEDS

The 500ADA-EQ has seven LED Status indicators on the front card edge to show operational status of the card at a glance. Figure 6-1 shows the location of the LEDs.

Two large LEDs on the front of the board indicate the general health of the module:

LOCAL FAULT: This Red LED indicates poor module health and will be On during the absence of a valid input signal, or if a local input power fault exists (i.e.: a blown fuse). The LOCAL FAULT indication can also be reported to the frame through the FRAME STATUS jumper.

MODULE OK: This Green LED indicates good module health. It will be On when a valid input signal is present, and the board power is good.

There are five small LEDs that indicate the status of the input video.

SD/HD Video Presence Indicators: The width of sync is measured to determine if video is present and if it is NTSC/PAL-B or if it is analog high definition video. If sync is approximately 4.7µsec wide, the green **SD PRES** LED is illuminated. If sync is approximately 0.6µsec wide, the green **HD PRES** LED is illuminated. If neither sync size is present, both LEDs are turned off.

This technique will also successfully detect HD signals with bi-level sync generated by Evertz DACs for applications with computer monitors. Other manufacturers of DACs may not have the same sync size so the detection may not work with these signals.

Sync High/Low Indicators: The sync level of the processed video is measured to determine if its amplitude is approximately correct. If sync is below 270mV then the amber **SYNC LOW** LED is turned on and if sync is above 320mV then the amber **SYNC HIGH** LED is turned on. This measurement takes place AFTER all of the card processing. This means that if the card is not calibrated properly, the indicators will not represent the proper state of the video. This includes improper setting of restored DC level, poorly equalized video and wrong gain settings.

These indicators will NOT indicate properly when the input video is AC coupled and the DC restore clamp is turned off.

Video High Indicator: The level of the processed video is measured to determine if its amplitude is approaching the 100% level. If in one field, the video is ever above 700mV then the amber **VIDEO HIGH** LED is turned on for a short duration. If the video is consistently too "hot", then the light will always be on. This measurement takes place AFTER all of the card processing. This means that if the card is not calibrated properly, the indicator will not represent the proper state of the video. This includes improper setting of restored DC level, poorly equalized video and wrong gain settings.

These indicators will NOT indicate properly when the input video is AC coupled and the DC restore clamp is turned off.

5. CIRCUIT DESCRIPTION

The input signal enters the board through a BNC with isolated ground so that balanced input processing may be done to remove any common mode hum that may have been added to the signal and ground shield. On-board jumpers allow you to configure the input impedance and input coupling (AC/DC).

For video applications, the synchronization pulses are analyzed for position and size information. A clamp pulse is generated from the sync information and a clamp signal is delivered to a DC restorer circuit that positions the blanking level to ground. This feature can be enabled with a jumper, the time-constant of the clamping action may be fast or slow and the DC level may be set with a card edge POT.

An adjustable gain stage feeds the cable equalizer that can adjust the frequency response to match the attenuation of up to 300m of coaxial cable. Three separate OP-Amps drive the nine output BNC's with 75-Ohm output impedance.

6. JUMPERS AND USER ADJUSTMENTS

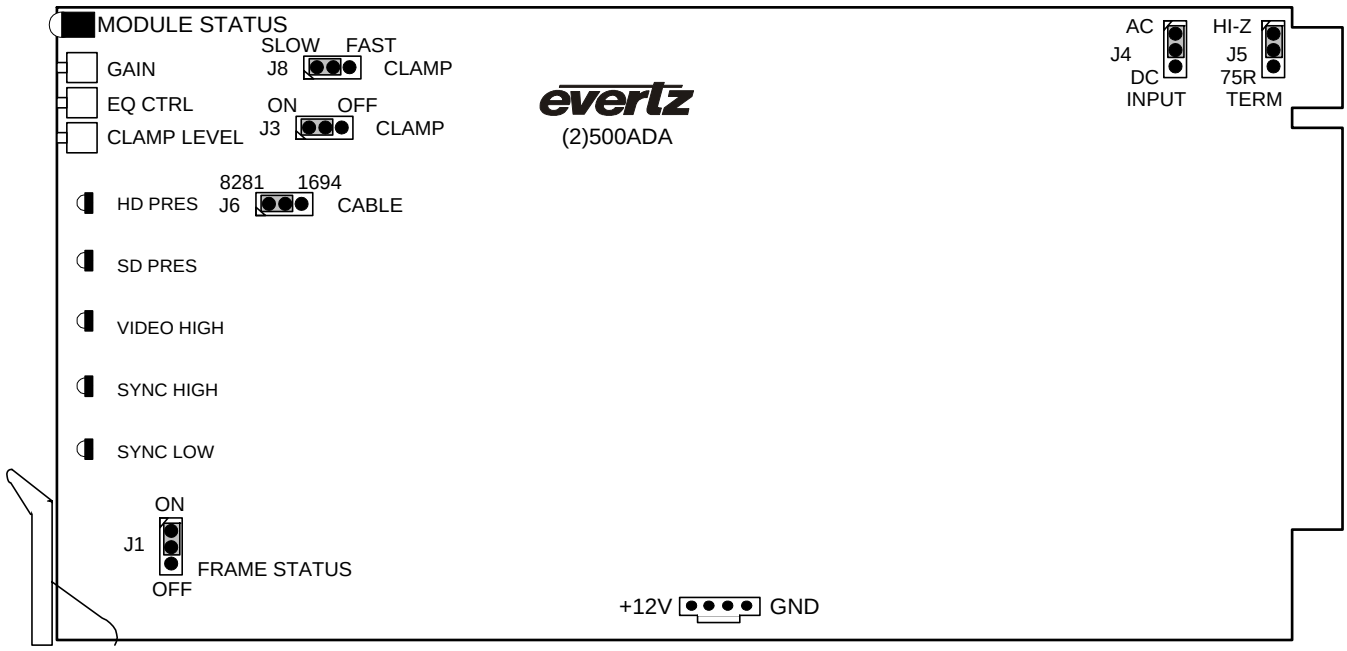

Figure 6-1: LED and Jumper Locations

6.1. SELECTING WHETHER LOCAL FAULTS WILL BE MONITORED BY THE GLOBAL FRAME STATUS

The FRAME STATUS jumper J1, located at the front of the module determines whether local faults (as shown by the Local Fault indicator) will be connected to the 500FR frame's global status bus.

FRAME STATUS: To monitor faults on this module with the frame status indicators (on the power supply's FRAME STATUS LED's and on the Frame's Fault Tally output) install this jumper in the On position.

When this jumper is installed in the Off position local faults on this module will not be monitored.

6.2. SELECTING THE INPUT TERMINATION

The input termination may be set via card jumper J5 to either 75 Ohms (default) or Hi-Z (34k Ohms). Set it to Hi-Z when using a "T" connector to loop the signal through several device inputs.

6.3. SELECTING THE INPUT AC/DC COUPLING

The input may be AC or DC (default) coupled into the input-circuitry using jumper J4. Use AC coupling in applications when the input signal has a large (>2V) DC level. In some non-video applications that do not have DC information (i.e. digital AES audio), AC coupling can be used to remove any DC level that may have built up in its transmission. The DC Restoring (clamp) circuitry will work with either AC or DC coupling in video applications.

6.4. DC RESTORING (CLAMP) OPERATION

A clamp pulse is generated from the sync information and a clamp signal is delivered to a DC restorer circuit that positions the blanking level to ground. This feature will work with standard definition analog NTSC and PAL-B sync structures. Analog tri-level sync 1125-line high definition video (SMPTE 240M) will also be detected and DC restored. In addition, most versions of bi-level sync that has been applied to 1125-line high definition video will be supported.

The clamp position and size will successfully DC restore HD signals with bi-level sync generated by Evertz DACs for applications with computer monitors. Other manufacturers DACs may not have the same sync size and the DC restoring may not work with these signals.

The clamp action can be enabled with a jumper, the time-constant of the clamping action may be fast or slow and the DC level may be set with a card edge POT. For non-video, applications disable the clamp with the jumper (J3). For removing low frequency distortions (<1kHz) from clean video, use the clamp time-constant (J8) in the FAST position. If the video has a sizeable amount of noise (i.e. a low quality off-air signal) the fast clamp will generate a line-to-line level distortion (also called "piano-keying") because of the noise. In this situation, use the SLOW clamp position of (J8). The **CLAMP LEVEL** POT on the card front edge allows you to adjust the DC level that the back porch is being clamped to. This allows you to set the output DC level to values other than back porch to ground.

Do NOT turn on the clamp when distributing Pb and Pr signals. Standard Definition and High Definition component Pb and Pr signals have waveforms that extend below blanking level. The right level and duration of a negative going video signal may be interpreted as a sync signal, enabling a clamp pulse in active video. This will cause the DC restorer circuit to distort the video, creating a large Average Picture Level (APL) change.

6.5. GAIN ADJUSTMENT

The **GAIN** POT on the cards front edge allows you to adjust the input signal level. Turning the POT clockwise will increase the gain.

There is enough range on this control to counteract the video level error due to a missing or double terminated coaxial connection. This will create a frequency response problem due to the mis-termination.

TIP: Set the DC LEVEL before adjusting the gain. The Gain control amplifies the signal around ground. By setting the back porch to ground first, you may avoid re-adjusting the gain.

6.6. CABLE EQUALIZATION OPERATION

With the cable equalizer **EQCTRL** POT set fully counter-clockwise, the cable equalizer will be set to the "zero length". As you turn the POT clockwise, more cable equalization is added. To set the POT to the correct position, perform the following calibration:

1. Supply the cable being equalized with a multiburst or horizontal sweep test signal.
2. Make sure the driving level from the test generator is calibrated to unity.
3. Set the cable type termination jumper (J6) to the type of cable you are using (either 8281 or 1694). If you are using a different type, then use either setting.
4. Make sure the card input termination and the test gear is terminated properly.
5. Adjust the DC level if the clamp is enabled and calibrate the GAIN level POT for unity output at low frequencies.
6. Adjust the "EQCTRL" POT until the 500ADA output signal has flat frequency response.

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