

# ROSTEC Engineering

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## ROSTEC APV4 PAL Video Reference Generator



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### Features

- Grade1 oven crystal master reference
- Excellent time and temperature stability
- Digital synthesis of all PAL video signal components
- Black burst or 100% EBU colorbar
- Genlock to WORD 44.1/48 kHz, AES/EBU 44,1/48 kHz, 10 MHz GPS.
- Frame/line genlock to external Video.
- Optional board for genlock to 2.048 MHz clock or 2Mbit E1 CCITT G703 formats.
- Easy operation via automatic input switching
- Build in flywheel for extended sync safety
- Configurable aux. outputs for lab use

### General description

The APV4 is a Video Reference Generator designed to operate as a Black Burst Video master reference in a sound setup, where one or more pieces of equipment need a PAL reference which has the correct timing relationship to the AES digital sound signal.

It generates a PAL video output signal by digital synthesis from a single crystal master reference, providing a stable and reliable phase relationship between line, frame and subcarrier components in the analog PAL signal.

The master reference can be slaved to a broad range of incoming sync formats, conforming to the relevant CCITT, ITU, SMPTE and EBU/AES specifications.

The genlock mechanism is based upon an extensive sync safety philosophy, guarding efficiently against sync dropouts by means of a built in flywheel and a unique glide principle. When the incoming sync momentarily is lost and reestablished, the video output signal will remain constant in time and frequency within narrow limits, exhibiting no jumps or interruption of continuity.

### Powering up

There are no special considerations to observe when powering up the unit. When an external reference is connected upon power up, the generator will reset itself as close as possible to the relevant sync position, and it will immediately be able to achieve lock, as long as the incoming reference is better than +/-30 ppm in absolute frequency precision.

### Color bar

The generator is equipped with a built in colorbar generator, providing a convenient means to test for testing a setup. The generated numbers are for 100% amplitude, 100% saturation PAL EBU color bars.

The numbers are based on NTSC values, which are very close to PAL values. It is not a reference color bar. It is a test tool.

Pressing a toggle switch on the front panel activates the color bar. The switch is recessed and time delayed, to avoid accidental use.

*Avoiding using the color bar, and thus keeping the HF content out of the sync signal reduces the possibility of producing jitter in audio equipment. Most pieces of audio equipment use standard video sync separators and input circuits with little or poor HF-screening. The HF content of the video signal may migrate to the digital audio chain, creating unwanted interference and jitter. Disabling the colorbar greatly reduces this possibility.*

### External sync inputs

When more than one input source is connected, the APV4 automatically selects the active input by priority: 1.Video, 2.GPS, 3.Word, 4.AES.

Only the AES input is terminated internally. Video, GPS and Word inputs are unterminated with two internally linked BNC connectors for easy daisy chain connection.

A switch on the back panel provides a ground lift of the video input, creating a balanced mode input configuration. Common mode range is 3,0 V.

## **External Video input**

The video input accepts standard Negative Going Sync Video with amplitudes ranging from 0,1 to 4,0 V.

**Note that the generator is not intended for use in a video-editing environment. The video input sync mechanism ignores the color subcarrier and does not provide a PAL4 or PAL8 field lock.**

*Thus the color information at the generators video output cannot be successfully mixed with the color information at the video sync input.*

*The generator provides a frame/line position and frequency lock, distinguishing only between odd and even frames.*

## **External GPS input**

The GPS input is intended for used with GPS receivers providing a 10 MHz output clock. There is no position information in the 10 MHz signal, so the video generator simply locks the leading edge of the video frame to the first available edge of the incoming 10 MHz square wave. In case of a sine wave input, the lock point will be approx. 20 nsec after the positive going zero crossing.

## **External 2Mbit E1 G703 input**

The GPS input can be changed into a 2Mbit E1 CCIT G703 input, by means of an optional decoder board. The board has a transformer balanced E1 line receiver interface, which performs clock recovery and jitter attenuation. The jitter attenuator is based on a local crystal controlled reference clock, able to phase lock to the recovered E1 line clock, providing excellent clock stability. The receiver has a jitter tolerance exceeding the requirements of Publications 43802, 43801, 62411 amended, TR-TSY-000170 and CCITT REC G.823

The recovered clock is evaluated for errors and continuity for 3 seconds, after which it is routed to the normal GPS input circuit.

Loss of signal is detected upon receiving 175 consecutive zeroes, after which frequency control immediately is handed over to the main flywheel circuit. The signal is accepted again when ones density reaches 12,5%, based on 175 bits periods

with less than 100 consecutive zeroes, as is prescribed in ANSI T1.231-1993.

## **External Word input**

The Word signal contains left/right information (X/Y preamble) so the video generator locks the start of the video frame to the leading edge of the incoming square wave.

The incoming sampling frequency is detected automatically, switching the internal counters to the correct relationship between video frame and sampling clock.

## **External AES input**

When the incoming sampling frequency is 48 kHz, the video generator uses the Channel Block Start information in the AES signal to lock the Z-preamble to the video frame start.

When the incoming sampling frequency is 44.1 kHz, the generator switches to word mode, due to the lack of useful relationship between the AES blocks and the video field at this frequency. (See Relationship Video, Word and AES)

## **Flywheel indicator**

When the input is lost, an internal flywheel circuit immediately takes over, keeping both clock frequency and position of the preambles inside narrow limits. When the input returns, the generator slowly corrects for the accumulated drift in time, gently bringing the relevant leading edges back into perfect sync.

When operating in flywheel mode, the flywheel inertia will gradually be exhausted and it will eventually expire after 10, 20, 40 or 80 seconds, depending on jumper settings on the main board. If the input is not reestablished before timeout, clock control is handed over to the internal crystal reference.

## **LOCK/FREE indicators**

The LOCK LED indicates that the video is locked to incoming sync. When flywheel or internal crystal reference is selected, the FREE LED will

light up. Also when the generator is searching for lock, FREE lights up until phase lock is achieved. If FREE stays on longer than expected (see the various lock times) it indicates that the incoming sync is invalid or outside the capture range of the generator (typically +/-30 PPM).

### ***Composite Video outputs***

The composite video outputs are available on four BNC connectors on the back panel. The outputs are individually buffered, 75 ohms and 300 mV when terminated according to the PAL/CCIR Video standard.

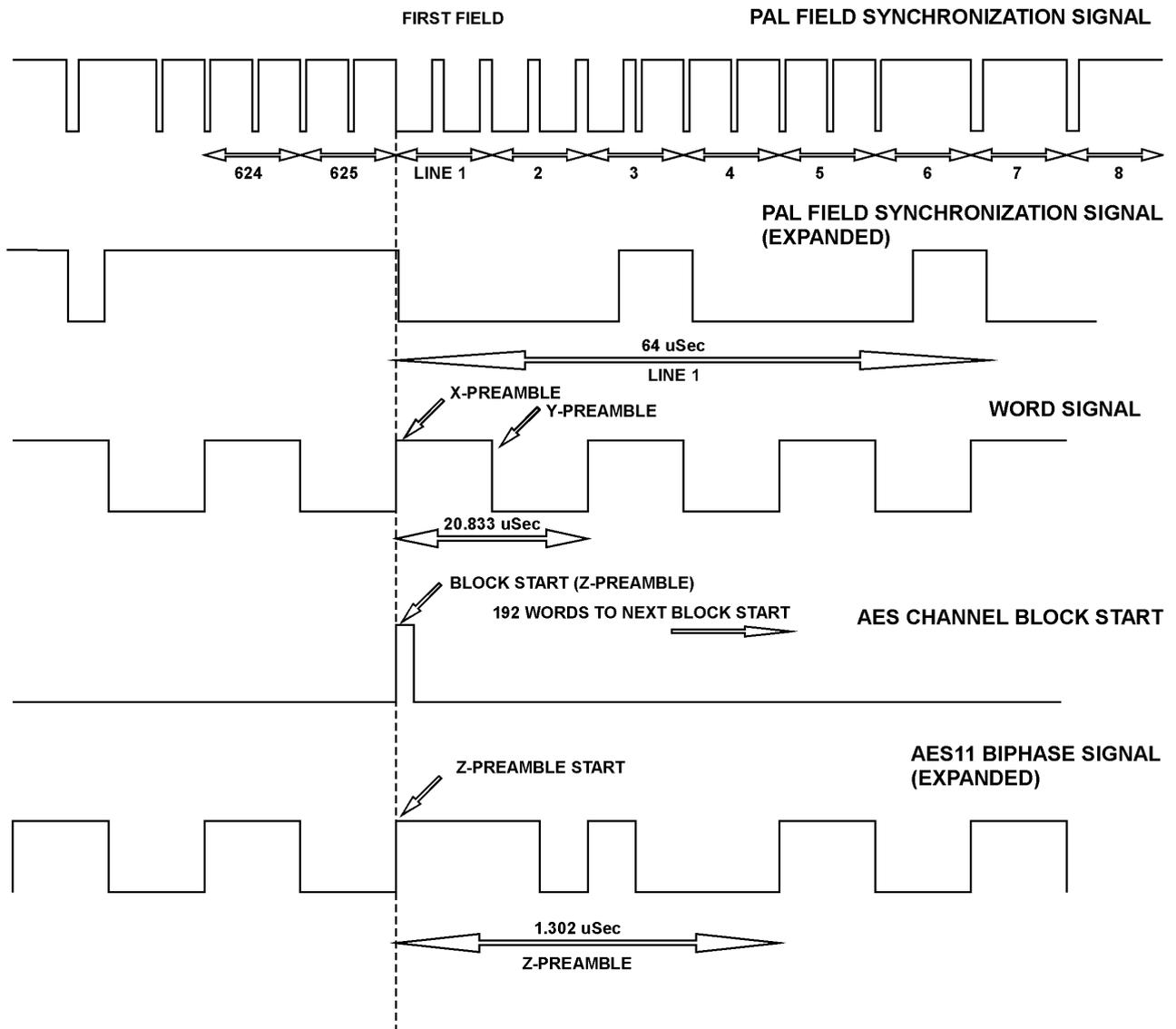
The output signal is PAL B/G 625 line interlaced 8-field PAL sequence, black level (black burst) or EBU colorbar. Colorbar mode is selected on the front panel by a pressing and holding the switch for 2 seconds.

Black level can be adjusted by an internal trimmer to +/- 0,3V. Default factory setting is 0,00V

### ***AUX1 and AUX2 Outputs***

The two AUX outputs are 75 ohms buffered configurable outputs. A range of internally generated signals can be brought out on the BNC connectors by means of open solder pads on the PCB. These pads can be connected to various point of interest on the main board.

## Relationship between Video, Word and AES



The generator places the video field start, word start and AES block start as seen on the graphic representation above.

At 48 kHz sampling frequency, the relationship is straightforward, when it comes to synchronization.  
 1 Video field = 5 channel blocks = 960 words  
 1 channel block = 192 words

At 44.1 kHz sampling frequency, the relationship is less useful

1 video field = 882 words

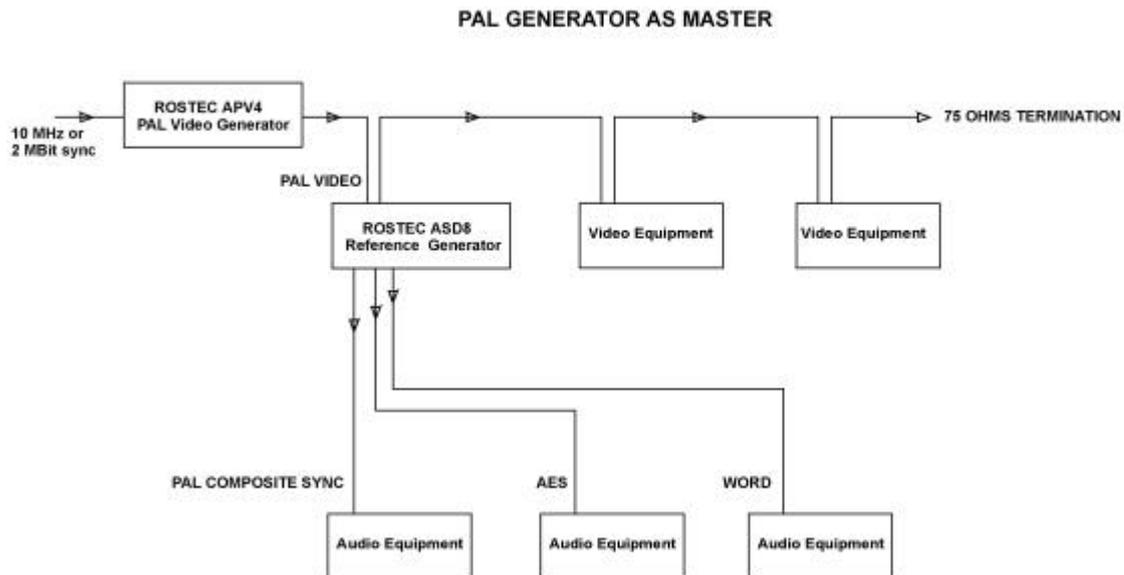
But the AES block is still 192 words, so no simple defined position of the AES block start in the video field is possible.

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## Typical connection schematic



### Mechanical and electrical specifications:

**Dimensions** : Width 19 inch , height 1U (44 mm), depth 320 mm

**Weight** : 5,5 kg

**Power requirements**: 180 - 240 VAC 50 Hz, 8 Watts

**Reference Inputs** : Composite PAL Video, balanced 5 kohms, 0,1 -4,0V PP  
: AES balanced 110 ohms RS422  
: SDIF-2 Word clock, 10 kohms, TTL level  
: 10 MHz clock, 10 kohms, TTL level  
: Optional 2Mbit E1 CCITT G703 transformer balanced input, 1kohm.

**Outputs** : 4x Composite PAL, black level or color bar. 75 ohms, 0,3V PP terminated  
: 2x AUX output, configurable, 75 ohm, TTL level  
: 1x No-sync alarm relay, SPDT 100V 0.5A

**Stability/accuracy** : Oven crystal accuracy > 1 ppm/25 deg. C,  
: Oven crystal stability > 0.5 ppm 0/+50 deg. C  
: PLL capture range typ +/-30 ppm  
: PLL jitter < 2 nsec, 700Hz - 100kHz  
: Hue accuracy > 2 degrees  
: SC-H phase accuracy > 2 degrees