VIDEO ENCODER/DECODER MODEL VED-I OPERATION

INTRODUCTION

The Video Encoder/Decoder Model VED-I will annotate video with precision time and date from either GPS or IRIG-B timecode inputs. Although designed primarily as a "video time stamp" the VED-I can be configured to display supplemental features such as GPS position or other RS-232 input, event times and counts, and a boresight crosshair. Select data can be edge-encoded at the left of the video picture, visible in underscan. Edge-code can be decoded by the VED under computer control from video playback. The position of a moveable crosshair is output along with the decoded data making the VED useful for video motion analysis.

POWER

The VED-I is powered by a nominal 12 VDC applied to the standard 2.1 mm jack with center pin positive. The jack has extended threads for use with a locking connector as well as standard plugs. The input voltage can be as low as 7 VDC, and as high as 30 VDC if the installation can dissipate some additional heat. A self-resetting polycrystalline fuse limits current to 0.5 amp for both internal circuitry and external devices receiving power from the DB-9 connector. The VED alone draws less than 0.1 amp. It is imperative that power sources capable of high currents, such as batteries, be connected to the VED-I through an in-line 1 amp fuse. **Note:** Some 2.1 mm plugs do not have recessed center sockets and may short circuit the supply if touched to the threaded portion of the jack during plug-in.

VIDEO IN/OUT

Input video is internally terminated at 75 ohms, and output video is designed to drive a single standard 75 ohm video input. The VED will work with color or monochrome video. An optional adapter is available to convert the video input and output to 4 pin mini-din connectors for use with S-video (Y/C) equipment. The VED can be converted for use with European standard PAL video.

INTERNAL SWITCHES

Four internal switches are used to configure the VED for custom operation. The switches are accessed, after disconnecting power, by removing the two screws from the connector panel and pulling the connector panel and attached circuit board out a few inches. Switch operation is as follows:

<u>Switch 1</u> controls the range of the hour offset rotary switch. In the "on" position the range of the hour offset is -12 to +3. In the "off" position the range is +12 to -3.

<u>Switch 2</u> selects field or frame operation. In the "off" position annotation changes on each video field at 60Hz. In the "on" position annotation changes every video frame at 30Hz. Choose frame mode to prevent blurred data, particularly milliseconds, when output video is captured by a video frame grabber or other device which displays two video fields combined into a frame.

<u>Switch 3</u> enables display of RS-232 serial input data from a GPS receiver. In the "on" position GPS lat/long will be displayed when available. In the "off" position display of GPS input is inhibited.

<u>Switch 4</u> enables edge-encoding. In the "on" position sign and numeric data from the bottom line display will be edge-encoded. In the "off" position edge-encoding is inhibited.

DATE AND TIME DISPLAY

The date and time are displayed in the lower left corner of the video picture. The bottom line is the time captured on the vertical sync of the video field or frame. The time accuracy is +/- one millisecond when a valid GPS or IRIG-B input is present. An internal clock synchronizes to the input and continues keeping time without interruption if the input drops out temporarily or is removed. The displayed time is offset to local time from the input time, which is presumably UTC (Universal Time Coordinate) also known as GMT (Greenwich Mean Time) and ZULU (Zero Meridian), by an integral number of hours selected by the hour offset rotary switch and displayed on the top line. The hour offset will cause the date to increment or decrement as necessary and correct for leap years. With valid GPS input, the date will be displayed on the top line in GPS convention of DDMMYY. Following the date is a status character which is an asterisk "*" when no valid input is present, and a space if the GPS pulse-per-second is missing. The status character changes to a slash "/" when valid input is present, and blinks when the receiver is acquiring or temporarily loses track. After the status character is either a space or a channel number designator for multi-channel installations. Next is the sign and magnitude of the hour offset. For standard IRIG-B input the date will be the day of the year, since the year is not available in the standard IRIG-B format. Likewise, receiver status is not available in the standard IRIG-B format so the status character will be a slash "/" to indicate a valid IRIG-B input, but will never blink since receiver status is unknown. However, if the source of IRIG-B timecode is the V-data Model GTP, full date and receiver status has been added to the IRIG-B format so the date and status will be displayed the same as with GPS input.

SERIAL RS-232 COMMUNICATIONS

All serial RS-232 communications with the VED-I are at 4800 baud, 8 data bits, 1 stop bit, no parity, no handshaking. Do not use generic cables to connect the VED-I to a computer or other equipment as there are special purpose inputs and outputs on the DB-9 connector in addition to those used for serial communication.

IRIG-B TIMECODE REQUIREMENTS

The opto-isolated IRIG-B timecode input of the VED-I uses an ungrounded BNC connector and requires a standard 3 volt peak-to-peak signal such as provided by the V-data Model GTP. The input is an LED so impedance is non-linear but always exceeds 1k ohms due to a series resistor. Ten IRIG-B inputs can be driven by the GTP output.

GPS RECEIVER REQUIREMENTS

To function with the VED-I a GPS receiver must be the V-data GPS-28 or equivalent, with a pulse-per-second output and a $GPRMC message output in RS-232. The pulse-per-second must be between 10 milliseconds and 100 milliseconds in duration with an amplitude switching from ground to between +3 volts and +15 volts, such that the rising edge marks the second. The $GPRMC message must terminate after the pulse-per-second and 100 milliseconds before the next pulse. A 100ma PTC acts as a jumper to select +12VDC or +5VDC power to the GPS receiver on Pin 1 of the DB-9 connector with ground on Pin 5. The pulse-per-second is input to Pin 4 and the $GPRMC message to Pin 3. The pulse-per-second can also be applied to the BNC connector for IRIG-B, if it will drive the LED used in the opto-isolated input.

SERIAL DATA OR GPS POSITION DISPLAY

If internal Switch 3 is in the "on" position, RS-232 data input to Pin 3 on the DB-9 connector from a GPS receiver will be used to display latitude and longitude from the $GPRMC message on the top line. Non-GPS data will be displayed on the top line if terminated by a CTL-T (H14) and on the bottom line if terminated by CTL-B (H02). Input data must be numbers, punctuation, or upper case letters (ASCII Hex values 20 through 5F). Strings up to 24 characters long can be displayed and excess characters will be ignored. Strings less than 24 characters will be filled out with black spaces. Empty strings (stand alone termination characters) will cause the display area to be cleared.

EVENT DISPLAY AND OUTPUT

The event display can be activated by a momentary connection of the Run Counter input on Pin 8 or the Event Counter input on Pin 7 of the DB-9 connector, to ground on Pin 9. The Event Counter increments on each ground input. Each ground input to the Run Counter alternately turns on and erases the event display. Another input to the Run Counter within a few seconds of an erasing input will cause the Run Counter to increment. An input to the Run Counter at a later time will reset the Run Counter to 001 and the Event Counter to 000. Each increment of the Run Counter or Event Counter captures Event Time to an accuracy of +/- one millisecond. Each Time capture produces a serial TTL RS-232 output on Pin 2 of the DB9 connector. The output format is identical to the display format and is 24 characters terminated with a carriage return. Counter inputs are inhibited until output is complete, resulting in a maximum event input rate of approximately 20Hz. Inherent input debouncing allows the counter inputs to be used directly with switches, contacts, and open collector or drain devices. The Run Counter can also be activated by the lower case letter "d" received as RS-232 input, and the Event Counter by the lower case letter "s", but the resulting Event Time will be up to 33 milliseconds late due to processing time for serial input.

BORESIGHT CROSSHAIR

A boresight crosshair can be activated by momentary connection of Pin 6 on the DB-9 connector to ground on Pin 9 or by an optional momentary switch mounted on the front panel. Each ground input sequences the crosshair from White to Black to Off. The position of the boresight crosshair can be changed in the Decode Mode and the new position will be retained upon return to the Encode Mode, but the crosshair will return to screen center when power is cycled. The crosshair can also be activated by the lower case letter "a" received as RS-232 input.

EDGE-ENCODING

If internal Switch 4 is in the "on" position, up to 24 characters of sign and numeric data on the bottom line will be edge-encoded. Serial data written to the bottom line for edge-encoding should be in fixed format with place-holding zeros since non-numeric delineator characters will be lost. Encoding the time uses 9 edge-code characters leaving 15 for the rest of the line. If less than 24 sign or numeric characters are displayed on the bottom line, the edge-code will be filled out to 24 characters with trailing spaces.

DECODE MODE

In the Decode Mode a moveable crosshair and the crosshair position are displayed. If edge-encoded video is present at the video input, the edge-code can be read and output along with the crosshair position. The Decode Mode is accessed and controlled by single lower case letter commands in RS-232 format received on Pin 3 of the DB-9 connector. Output is on Pin 2 and ground is on Pin 5. The following commands are recognized:

lower case letter command	result
l	change between encode and decode mode
a	crosshair black/white
s	read command
r	crosshair right
q	crosshair left
w	crosshair up
e	crosshair down
p	origin at center
u	origin at lower left
i	origin at current position
o	crosshair home to origin

A read command results in an output of crosshair position and decoded data for a total of 33 characters including the carriage return. A checksum in the edge-code assures that data will be read correctly or not at all. If edge-code is not present or unreadable, only the crosshair position will be output for a total of 9 characters including the carriage return. The output is formatted as follows:

character number	data type	example	
1-4	Crosshair X position	+000	
5-8	Crosshair Y position	+000	
9-17	Hours through milliseconds	235959999	
18-32	Event or user serial data	999	Run Count
		999	Event Count
		235959999	Event Time
33	carriage return		

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