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Video Encoder/Decoder Model VED-M
Operation Manual

Description

The Video Encoder/Decoder (VED) Model VED-M has two modes of operation, encode and decode. When GPS data from an external GPS receiver is available, the VED automatically enters the encode mode. In encode mode GPS data is inserted into camera video in both alpha-numeric and edge-code format. The edge-code data consists of one bit per video line placed immediately after horizontal sync. Edge-code data appears at the far left of the screen in a video monitor capable of underscan. The edge-code is not visible in normal scan. When video containing edge-code is input, the VED automatically enters the decode mode. In decode mode the edge-code is read and GPS data is output in simulation of a GPS receiver.

Applications

The VED with video camera and video cassette recorder (VCR) comprise a complete GPS data acquisition and retrieval system. In the encode mode imagery and GPS data are stored together on convenient video tape. In the decode mode GPS data is recovered from the playback video and output in a form compatible with popular moving map programs, thereby allowing simultaneous viewing of camera picture and map location. Since complete GPS data is stored on each video field, the VED will output GPS data even when the VCR is paused, or when the input is a captured video image. For fleet vehicle identification, the VED serial number is included in the on-screen display. A rotary switch allows GMT or UTC time to be offset to local time. The hour offset is also displayed to maintain a link to UTC time. Internal switches allow for top or bottom screen display, and selection of English or metric units.

Power

The VED operates at 100 milliamps with nominal 12 VDC (9-16 VDC) input power. Input power up to 30 VDC can be used provided that the installation allows for dissipation of 3 watts of heat from the VED enclosure. The power input connector is a 2.1 mm jack with long barrel to allow use of locking plugs. The center pin is positive and reverse polarity protection is built-in. Input power is routed through a polycrystalline self-resetting fuse inside the VED to several pins on the COM connector to provide power to the GPS receiver and other sensors. It is recommended that the power source be fused at 1 amp for additional protection. **Note:** Some 2.1 mm plugs do not have recessed center pins. Avoid use of these plugs. If the center pin contacts the barrel of the jack during insertion, a short circuit will occur.

Encode Mode

On power-up the VED begins searching for either GPS input or edge-coded video input to determine whether to enter encode or decode mode. If GPS data is detected the VED enters the encode mode and begins inserting alpha-numeric data and edge-code data into the video. Once the encode mode is entered, removal of GPS input will cause the warning "NO GPS IN" to be displayed. If GPS input is present but the receiver is not tracking, the warning "ACQUIRING" will be displayed. If neither warning is displayed, the GPS data is valid.

As a minimum, the VED requires the $GPRMC message in RS-232 form (4800 baud, 8 data bits, 1 stop bit, no parity) to be input from an external GPS receiver. If the $GPGGA message is also present, receiver status and altitude will be added to the display. If a pulse-per-second is available from the GPS receiver, precision time will be displayed to the millisecond, otherwise time will be displayed to the second. When millisecond time is displayed, it is sampled at vertical sync and updated on each video field.

Assuming that the $GPRMC and $GPGGA messages are input and the receiver is tracking, the display will be as follows:

Bottom line from left; serial number, latitude, longitude, speed, course.
Top line from left; date, time, hour offset, receiver status, altitude.

The receiver status consists of the number of satellites separated by a "/" or a "*" from the horizontal dilution of precision (HDOP). If more than 9 satellites are tracked the number of satellites tracked remains at 9. A "/" indicates normal track, and a "*" indicates differential track. The HDOP ranges from 00 to 99 and is an indication of the quality of the position fix based on geometry. Smaller numbers indicate higher quality, with 00 or 01 being excellent.

To access the internal switches and adjustment, disconnect power and remove the two screws from the rear connector panel. Slide the rear connector panel and attached board out a few inches to gain access to the switches. The potentiometer adjustment is factory set and determines the width of the lines of displayed data. Adjustment is correct when the lower line is fully visible and centered horizontally on the video monitor in normal scan. The four internal switches control display options as follows:

Switch 1 determines the polarity of the hour offset. In the on position, hour offsets of -12 to 0 to +3 are obtained by using the rotary switch. In the off position, hour offsets of 12 to 0 to -3 are obtained.
Switch 2 in the on position displays data at the bottom of the video picture. In the off position data is displayed at the top of the picture.
Switch 3 in the on position displays altitude in feet. In the off position altitude display is in meters.
Switch 4 in the on position displays speed in MPH if switch 3 is on, and Km/H if switch 3 is off. In the off position speed is displayed in knots regardless of the position of switch 3.

Decode Mode

If GPS input is not present on power-up, the VED will enter the decode mode when edge-coded video is detected. In the decode mode, GPS data is output in RS-232 form (4800 baud, 8 data bits, 1 stop bit, no parity) each time the edge-code changes, which is normally once per second. If the edge-code is not changing such as when the VCR is paused, the output repeats at intervals of about 1.5 seconds. If edge-code is absent or unreadable, a "?" is displayed at the top of the edge code column on each read attempt.

The VED output in decode mode is formatted as a $GPRMC message to simulate the output of a GPS receiver. The $GPRMC message contains local time determined by the hour offset rather than UTC time. This avoids a discrepancy between the output data and the time displayed on the video monitor. Magnetic deviation is not included in the message. A dummy $GPGSA message is output for compatibility with certain moving map programs, but the message contains no valid data.

Computer Adapter Cable

This optional "Y" adapter cable allows a computer to monitor live GPS data from the receiver in encode mode, and playback GPS data in decode mode. Wiring is as follows:

Connector	DB15F	DB15M	DB9F
Connections	4 - - - - - - - - white - - - - - - -	4	
	5 - - - - - - - - blue - - - - - - - -	5	
	8 - - - - - - - - green - - - - - - -	8	
	10 - - - - - - - red - - - - - - - -	10	
	11 - - - - - - - orange - - - - - -	11	
	14 - - - - - - - black - - - - - - -	14	
	15 - - - - - - - brown - - - - - -	15	
		6 - - - - - - - red - - - - - - - - -	2
		7 - - - - - - - green - - - - - - -	3
		13 - - - - - - black - - - - - - -	5

S-Video (Y/C) Adapter

This option adapts the BNC video in/out connectors on the VED to 4 pin mini-DIN connectors for use with S-Video (Y/C) cameras and recorders. Separation of luminance and chrominance is preserved.

AC Power Adapter

This option is a 9 VDC, 500 milliamp output wall transformer which allows the VED to be used with 120 VAC, 60Hz power.

GPS Receivers

V-data can supply 12 channel GPS receivers by **GARMIN International**. The receiver, designated **GPS-35V**, has integrated antenna, 16 foot cable, and VED compatible DB15M connector. Mounting options including magnetic, suction cup behind windshield, permanent flange, and 1 inch 14 TPI marine socket.

The receivers are shipped from **V-data** with $GPRMC, $GPGGA, $GPGSA messages enabled and the pulse-per-second enabled. The VED requires the $GPRMC message as a minimum, but other messages and the pulse-per-second can be enabled or disabled as desired by sending setup commands to the receiver through the optional computer adapter cable via RS-232 communications at 4800 baud, 8 data bits, 1 stop bit, no parity. The following setup commands can be sent:

To disable all messages $PGRMO,,2<CR><LF>
To enable all messages $PGRMO,,3<CR><LF>
To disable specified message $PGRMO,*,0<CR><LF>
To enable specified message $PGRMO,*,1<CR><LF> Where * is replaced by the name of the message. Available messages are GPGGA, GPGSA, GPGSV, GPRMC, GPVTG, GPRME, PGRME, PGRMV, PGRMF, LCGLL, and LCVTG. **Note:** Enabling too many messages may slow output interval to two seconds or more.
To disable pulse-per-second $PGRMC,,,,,,,,,,,1<CR><LF> (12 commas)
To enable pulse-per-second $PGRMC,,,,,,,,,,,2<CR><LF>

The GPS receiver is wired to the DB15M connector as follows:

Receiver Signal	**Wire Color**	**DB15M Pin**
GPS Power	Red	10
GPS Ground	Black	14
Pulse-Per-Second	Gray	4
Receiver Setup	Blue	8
GPS Data	White	5
Power Control	Yellow	not connected
Aux. Output	Purple	not connected
Differential Corrections	Green	not connected (see below)

The receivers are differential ready and differential correction input to the receiver is accomplished by adding another cable to the DB15M backshell. Limited power for the differential receiver is available on Pin 11 with ground on Pin 15. If the differential receiver is externally powered, connect the signal ground to Pin 15 and connect the signal to the unconnected green wire inside the DB15 backshell. Baud rate selection is automatic.