Rugged Video
High Definition Recorders

The Rugged Video line of HD video recorders are designed for aerospace and defense applications.

Commander Recorder
- 1080p HD Video
- Records to Four USB's
- Built-in 2.4" Display
- Logo Overlay & Pre-Roll
- GPS Integration
- Expandable with Modules

Crusader Recorder
- One, Two, Three or Four Channel Recording
- 1080p60 HD Video
- Accepts 3G-SDI, HD-SDI, SD-SDI, HDMI/DVI, or NTSC/PAL
- GPS Automation & Integration
- Built-in Audio Mixing
- WiFi Streaming
- Internal Battery Backup

TourMaster Recorder
- Four Channel Switching
- 1080p60 HD Video
- GPS Automation & Integration
- MP3 Soundtracks & Narrations
- Built-in Audio Mixing
- WiFi Streaming
- Internal Battery Backup
## Recorder Comparison

<table>
<thead>
<tr>
<th>Recorder</th>
<th>Commander</th>
<th>Crusader</th>
<th>TourMaster</th>
</tr>
</thead>
</table>
| **Applications** | Flight Training  
Flight Testing  
Aerial Patrol  
Airborne Law Enforcement  
Flight Tours | Aerial Patrol  
Airborne Law Enforcement  
Flight Testing | Flight Tours |
| **Video Channels** | Single  
Expandable to:  
2-4 Switching  
2-4 Multiplexed  
2-4 Linked Units | Single  
Expandable to:  
2-4 Switching  
2-4 Multiplexed  
2-4 Linked Units | 1-4 Switching |
| **Automation** | Optional with Switcher | Built-in Option:  
MP3 Audio (Narrations/Soundtracks)  
Camera Switching  
Recording  
Snapshots  
Text Overlay | Video:  
4 x USB 3.0  
Up to 2TB  
Snap/Reroll:  
1 x SD (SDHC)  
Automation:  
1 x SD (SDHC)  
Optional with Switcher |
| **Media Support** | | Video:  
4 x USB 3.0  
Up to 2TB  
Snap/Reroll:  
1 x SD (SDHC)  
Automation:  
1 x SD (SDHC)  
Optional with Switcher | Video:  
4 x USB 2.0/3.0  
Up to 2TB  
Automation:  
1 x SD (SDHC)  
Optional with Switcher |
| **GPS Integration** | Overlay:  
Speed  
Altitude  
Coordinates  
Heading  
G-Force X,Y,Z (current, min, max)  
Data Files:  
KML, GPX | Switcher  
Multi-plexer  
MultiLink Stacking  
CoPilot Control  
Narrator PTT  
GPS  
RF Remote  
Multiplexer  
MultiLink Stacking  
CoPilot Control  
Narrator PTT  
WiFi  
GPS  
RF Remote | Overlay:  
Speed  
Altitude  
Coordinates  
Heading  
Data Files:  
KML, GPX |
| **Expansion Modules** | Switcher  
Multi-plexer  
MultiLink Stacking  
CoPilot Control  
Narrator PTT  
GPS  
RF Remote | Switcher  
Multi-plexer  
MultiLink Stacking  
CoPilot Control  
Narrator PTT  
WiFi  
GPS  
RF Remote | Switcher  
Multi-plexer  
MultiLink Stacking  
CoPilot Control  
Narrator PTT  
WiFi  
GPS  
RF Remote |
| **Triggers** | Built-in & Remote:  
Record  
Snapshot  
Waypoint | Built-in & Remote:  
Record  
Snapshot  
Waypoint | Built-in & Remote:  
Camera Select  
Record  
Snapshot  
Waypoint |
| **Power** | DC 5-36V  
(10V Required for Camera Power)  
4.5W | DC 10-36V  
4.25W | DC 10-36V  
6.25W |
| **Dimensions/Weight** | 4.37” x 3.04” x 1.67”  
15.9oz | 5.00” x 5.00” x 1.85”  
22.5 oz | 5.00” x 5.00” x 3.34”  
31.4 oz |
RV-CMMD-BASE Single Channel

The Rugged Video Commander was designed as a multi-purpose Airborne Recorder.

Features
- 1080p HD Video
- Records to 4 USB Drives
- 2.4” Chroma LCD
- Full Color Logo Overlay
- Pre-Roll Video Intros
- GPS Integration for Overlay and Data File Recording
- Internal Battery

Applications
- Flight Training
- Flight Tours
- Aerial Patrol/Mapping
- Flight Testing
- Airborne Law Enforcement
- Mission Recording/Debriefing

Add-on Modules
- Four Channel Switcher
- Four Channel Multiplexer
- MultiLink up to Four Units
- CoPilot Control Module
- Narrator PTT Module

FUNCTIONAL DIAGRAM
# Specifications

## Video

### SDI Input
- SD-SDI—SMPTE 259M (576i, 480i)

### Resolutions
- 1080p30, 1080i60, 1080i50, 720p60, 720p50, 720p30, 720p25, 480i30, 576i25

### Compression/Bitrate
- H.264 (AVC, MPEG-4 Part 10) Main Profile
  - 500Kb/s to 12.5Mb/s
- MPEG-4
  - 500Mb/s to 5Mb/s

### Output
- Composite/Analog NTSC/PAL

## Audio

### Input/Sources
- External: Analog Stereo, Line Level up to 8V P-P
- General Aviation, Helicopter (U174), Bose 6-Pin Microphone, AUX Jack Input, RCA Input, 1/4" Input, XLR input

### Compression
- AAC at 64Kb/s (16KHz)

## Triggers/Indicators

### Triggers
- Top Panel: Power On/Off, Record, Snapshot, Waypoint, Menu Navigation
- Rear Connector (Remote Mounting): Record, Snapshot, Waypoint
- RF Remote: Record, Snapshot, Waypoint (Optional)

### Indicators
- On Screen: Live Video, Record Status & Duration, Time, Disk Space, Battery Level.
- Top Panel: Power, Record, Fault, GPS
- Rear Connector (Remote Mounting): Record, Fault, GPS

## Display

### Properties
- 2.4" Chroma LCD
- 400 cd/m² (nit)
- Anti-Glare/UV Coating

### Onscreen Elements
- Live View & Playback
- Status: Time/Date, Disk Space, Record Time, Battery Level, Audio Gain, Video Source, Resolution, Encoding
- Settings Menu: Video, Audio, OSD, Playback, Settings, Record

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Phone: 414-399-3370  
E-mail: sales@ruggedvid.com  
Web: http://ruggedvid.com  
Rugged Video, LLC  
10555 N. Port Washington Rd. #204  
Mequon, WI 53092  
USA
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<th>Specifications</th>
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<tbody>
<tr>
<td><strong>GPS/Data</strong></td>
</tr>
</tbody>
</table>
| **Input** | RS-232 Baud 2400 to 115200  
Garmin 18x LVC, 5Hz  
Garmin Aviation NAV  
Standard NMEA 0183 |
| **Sample Rate** | Overlay: 20Hz  
KML/GPX: 1Hz or 5Hz  
Accelerometer: 20Hz |
| **Sentences** | GPS: GPRMC, GPGGA, GPGSA, GPVTG  
CUSTOM: $ASCII, TEXT 1, TEXT 2, TEXT 3<CR><LF> |
| **Overlay Data** | Coordinates (Degrees, Degrees Minutes, Degrees, Minutes, Seconds)  
Speed (KT, MPH, KPH)  
Altitude (Meters, Feet)  
Heading (Degrees)  
Time/Date  
Custom (Three Lines)  
G-Force X, Y, Z (Min, Max, Current) |
| **GPS Companion Files** | KML & GPX - Synced with Video  
GPS Supports Waypoints |

| **Media** |
| **SD** | SD, SDHC, SDXC (For Snapshots & Pre-Roll Video) |
| **USB** | USB 3.0 (SanDisk CZ80 or Better) up to 2TB  
*Must be extreme performance drive for HD Video & Multiple USB Recording. |

| **Power** |
| **Input** | DC 5-36V (10V Required for Camera Power)  
4.5W  
Compatible with 12V, 14V, 24V, and 28V Aircraft Power Systems |

| **Physical** |
| **Temperature Range** | Operation: -40°C to +85°C (-40°F to 185°F)  
Storage: -55°C to +105°C (-67°F to 221°F) |
| **Dimensions** | L, W, H  
4.37” x 3.04” x 1.67”  
111mm x 77mm x 42mm |
| **Weight** | 15.9oz  
450g |
The Rugged Video Crusader was designed as a video recording solution for professional aerospace applications.

Features
- One, Two, Three or Four Channel Recording
- 1080p60 HD Video
- Accepts 3G-SDI, HD-SDI, SD-SDI, HDMI/DVI, or NTSC/PAL
- Built-in GPS Automation
- GPS Integration for Overlay and Data File Recording
- Built-in Audio Mixing
- WiFi Streaming
- Internal Battery Backup

Applications
- Aerial Patrol/Mapping
- Flight Testing
- Airborne Law Enforcement
- Mission Recording/Debriefing

Add-on Modules
- Four Channel Switcher
- Four Channel Multiplexer
- CoPilot Control Module
- Narrator PTT Module
### Specifications

**Video**

<table>
<thead>
<tr>
<th>SDI Input</th>
<th>3G-SDI—SMPTE 424M (1080p60, 1080p59.94, 1080p50)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>HD-SDI—SMPTE 292M (1080i60, 1080i59.94, 1080i50, 1080p30, 1080p29.97, 1080p25, 720p60, 720p50, 720p30)</td>
</tr>
<tr>
<td></td>
<td>SD-SDI—SMPTE 259M (576i, 480i)</td>
</tr>
<tr>
<td>HDMI/DVI Single Link (DVI-D) Input</td>
<td>1920x1080p60, 1920x1200p50, 1440x900p60</td>
</tr>
<tr>
<td></td>
<td>1280x1024p60, 1280x1024p30, 1280x960p60, 1280x960p30</td>
</tr>
<tr>
<td></td>
<td>1280x720p60, 1280x720p50, 1024x768p60, 1024x768p30</td>
</tr>
<tr>
<td></td>
<td>800x600p60, 1080i60, 1080i50, 1080p30, 1080p25</td>
</tr>
<tr>
<td></td>
<td>1080i60, 1080i59.94, 1080i50, 720p60, 720p50, 720p30, 720p25</td>
</tr>
<tr>
<td></td>
<td>480p60, 480p30, 576p50</td>
</tr>
<tr>
<td>CVBS Input</td>
<td>Composite/Analog NTSC, PAL, SECAM</td>
</tr>
<tr>
<td></td>
<td>75ohm 1V p-p</td>
</tr>
<tr>
<td>Resolution/Frame rate</td>
<td>Resolutions: 1920x1200, 1920x1080, 1680x1050, 1600x900, 1440x900</td>
</tr>
<tr>
<td></td>
<td>1280x1024, 1280x920, 1280x720, 1024x768, 800x600</td>
</tr>
<tr>
<td></td>
<td>640x480, 640x360, 352x288, 352x576, 352x240, 352x480</td>
</tr>
<tr>
<td></td>
<td>720x240, 720x288, 720x240, 720x480, 720x576</td>
</tr>
<tr>
<td>Framerates</td>
<td>(60,50,30,25,20,15,10,8,6,5,4,3,2,1)</td>
</tr>
<tr>
<td>Compression/Bitrate</td>
<td>H.264 (AVC, MPEG-4 Part 10) Baseline, Main, and High Profile</td>
</tr>
<tr>
<td></td>
<td>32Kb/s to 16.5Mb/s CBR or VBR</td>
</tr>
<tr>
<td></td>
<td>MJPEG</td>
</tr>
<tr>
<td></td>
<td>2Mb/s to 55Mb/s VBR</td>
</tr>
</tbody>
</table>

**Audio**

<table>
<thead>
<tr>
<th>Input/Sources</th>
<th>External: Analog Stereo, Line Level up to 8V P-P</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>General Aviation, Helicopter (U174), Bose 6-Pin</td>
</tr>
<tr>
<td></td>
<td>Microphone, AUX Jack Input, 1/4” Input, XLR input</td>
</tr>
<tr>
<td></td>
<td>Internal: MP3 (Automator SD Card)</td>
</tr>
<tr>
<td></td>
<td>Soundtracks, Narrations, Safety Messages, Background Music</td>
</tr>
<tr>
<td></td>
<td>Embedded: SDI, or HDMI</td>
</tr>
<tr>
<td>Output/Destination</td>
<td>Output to Headset(s)/Audio Panel</td>
</tr>
<tr>
<td></td>
<td>MP3 Narrations, Soundtracks, etc. via Automator and/or</td>
</tr>
<tr>
<td></td>
<td>Mixed Automator Audio &amp; AUX Input (iPod, etc.)</td>
</tr>
<tr>
<td>Audio Mixing</td>
<td>External/Internal Source Mixing</td>
</tr>
<tr>
<td></td>
<td>Independent Level Adjust 0 to 10x Volume</td>
</tr>
<tr>
<td></td>
<td>2 x Master Gain</td>
</tr>
<tr>
<td>Compression</td>
<td>AAC at 64Kb/s or 128Kb/s (32KHz, 44.1KHz, 48KHz)</td>
</tr>
<tr>
<td></td>
<td>G.711 at 64Kb/s</td>
</tr>
</tbody>
</table>

**Triggers/Indicators**

<table>
<thead>
<tr>
<th>Triggers</th>
<th>Front Panel: Power On/Off, Record</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Rear Connector (Remote Mounting): Record, Snapshot, Waypoint</td>
</tr>
<tr>
<td></td>
<td>RF Remote: Record, Snapshot, Waypoint (Optional)</td>
</tr>
<tr>
<td>Indicators</td>
<td>Front Panel: Power, Record, Fault, GPS</td>
</tr>
<tr>
<td></td>
<td>Rear Connector (Remote Mounting): Record, Fault, GPS</td>
</tr>
</tbody>
</table>
## Specifications

### Automation

<table>
<thead>
<tr>
<th>Event Triggering</th>
<th>Time, Speed, Direction, Waypoint, Waypoint &amp; Direction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trigger Action</td>
<td>Start/Stop Recording</td>
</tr>
<tr>
<td></td>
<td>Take Snapshot(s)</td>
</tr>
<tr>
<td></td>
<td>Play MP3 (Soundtrack, Narration, etc.)</td>
</tr>
<tr>
<td></td>
<td>Overlay Custom Text on Video (Three Positions)</td>
</tr>
</tbody>
</table>

### GPS/Data

<table>
<thead>
<tr>
<th>Input</th>
<th>RS-232 Baud 2400 to 15200</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Garmin 18x LVC, 5Hz</td>
</tr>
<tr>
<td></td>
<td>Garmin Aviation NAV</td>
</tr>
<tr>
<td></td>
<td>Standard NMEA 0183</td>
</tr>
<tr>
<td>Sample Rate</td>
<td>20Hz</td>
</tr>
<tr>
<td></td>
<td>KML/GPX: 1Hz or 5Hz</td>
</tr>
<tr>
<td>Sentences</td>
<td>GPS: GPRMC, GPGGA, GPGSA, GPVTG</td>
</tr>
<tr>
<td></td>
<td>CUSTOM: $ASCII, TEXT 1, TEXT 2, TEXT 3&lt;CR&gt;&lt;LF&gt;</td>
</tr>
<tr>
<td>Overlay Data</td>
<td>Coordinates (Degrees, Degrees Minutes, Degrees, Minutes, Seconds)</td>
</tr>
<tr>
<td></td>
<td>Speed (KT, MPH, KPH)</td>
</tr>
<tr>
<td></td>
<td>Altitude (Meters, Feet)</td>
</tr>
<tr>
<td></td>
<td>Heading (Degrees) - VTG only</td>
</tr>
<tr>
<td></td>
<td>Time/Date</td>
</tr>
<tr>
<td></td>
<td>Custom (Three Lines)</td>
</tr>
<tr>
<td>GPS Companion Files</td>
<td>KML &amp; GPX - Synced with Video</td>
</tr>
<tr>
<td></td>
<td>GPS Supports Waypoints</td>
</tr>
</tbody>
</table>

### Media

<table>
<thead>
<tr>
<th>SD</th>
<th>SD, SDHC, SDXC (For MP3 &amp; Automation Information)</th>
</tr>
</thead>
<tbody>
<tr>
<td>USB</td>
<td>USB 2.0/3.0 (6MB/s write speed or better) up to 2TB</td>
</tr>
<tr>
<td></td>
<td>Supports Most USB 3.0 Drives</td>
</tr>
</tbody>
</table>

### Power

<table>
<thead>
<tr>
<th>Input</th>
<th>10 to 36VDC 4.25W</th>
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<tbody>
<tr>
<td></td>
<td>Compatible with 12V, 14V, 24V, and 28V Aircraft Power Systems</td>
</tr>
</tbody>
</table>

### Physical

| Temperature Range | Operation: -40°C to +85°C (-40°F to 185°F) |
|                  | Storage: -55°C to +105°C (-67°F to 221°F)      |
| Dimensions       | 5.00" x 5.00" x 1.85" / 127mm x 127mm x 47mm   |
| Weight           | 22.5oz / 638g                                   |
The Rugged Video TourMaster was created specifically to meet the needs of professional air tour operators.

Features
- Seamless Four Camera Switching
- GPS Automation
- Commander Upload Software
- 1080p60 HD Recording
- Professional Audio Mixing
- WiFi Streaming to iPad/Tablet
- Internal Battery Backup

GPS Automation
- Automatic Operation
  - Camera Switching
  - Soundtracks
  - Narrations
  - Recording
  - Labels & Credits

Upload Software
- Digital Delivery
- Automatic Upload
- Ultra-Fast USB Duplication
- Increased Marketing
- Increased Sell Through

Applications
- Helicopter Tours
- Flightseeing
## Specifications

### Video

**4 x SDI**
- 3G-SDI—SMPTE 424M (1080p60, 1080p59.94, 1080p50)
- SD-SDI—SMPTE 259M (576i, 480i)

**1 x HDMI/DVI Single Link (DVI-D)**
- 1920x1200, 1920x1080, 1680x1050, 1600x900, 1440x900
- 1280x1024, 1280x920, 1280x720, 1280x640, 1024x768, 800x600
- 640x480, 640x360, 352x288, 352x576, 352x720, 352x480
- Framerates: (60, 50, 30, 25, 20, 15, 10, 8, 6, 5, 4, 3)

**1 x CVBS**
- Composite/Analog
- Resolution: NTSC, PAL, SECAM
- 75ohm 1V p-p

### Audio

**Input/ Sources**
- External: Analog Stereo, Line Level up to 8V P-P
- General Aviation, Helicopter (U174), Bose 6-Pin Microphone, AUX Jack Input, RCA Input, 1/4" Input, XLR input
- Internal: MP3 (Automator SD Card)
- Soundtracks, Narrations, Safety Messages, Background Music
- Embedded: SDI, or HDMI

**Output/ Destination**
- Output to Headset(s)/Audio Panel
- MP3 Narrations, Soundtracks, etc. via Automator and/or Mixed Automator Audio & AUX Input (iPod, etc.)

**Audio Mixing**
- External/Internal Source Mixing
- Independent Level Adjust 0 to 10x Volume
- 2 x Master Gain

**Compression**
- AAC at 64Kb/s or 128Kb/s (32KHz, 44.1KHz, 48KHz)
- G.711 at 64Kb/s

### Triggers/Indicators

**Triggers**
- Front Panel: Power On/Off, Record, Automation, Camera Select
- Rear Connector (Remote Mounting): Record, Snapshot, Waypoint, Camera Select
- RF Remote: Record, Snapshot, Waypoint (Optional)

**Indicators**
- Front Panel: Power, Rec, Error, GPS, Camera Sel., Automation Status
- Rear Connector (Remote Mounting): Record, Fault, GPS, Camera Sel.
## Specifications

<table>
<thead>
<tr>
<th>Automation</th>
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</thead>
<tbody>
<tr>
<td><strong>Event Triggering</strong></td>
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<tr>
<td><strong>Trigger Action</strong></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>GPS/Data</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Input</strong></td>
</tr>
<tr>
<td><strong>Sample Rate</strong></td>
</tr>
<tr>
<td><strong>Sentences</strong></td>
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<tr>
<td><strong>Overlay Data</strong></td>
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<tr>
<td><strong>GPS Companion Files</strong></td>
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<table>
<thead>
<tr>
<th>Media</th>
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<tbody>
<tr>
<td><strong>SD</strong></td>
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<tr>
<td><strong>USB</strong></td>
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<table>
<thead>
<tr>
<th>Power</th>
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<tbody>
<tr>
<td><strong>Input</strong></td>
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<table>
<thead>
<tr>
<th>Physical</th>
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<tbody>
<tr>
<td><strong>Temperature Range</strong></td>
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<tr>
<td><strong>Dimensions</strong></td>
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<tr>
<td><strong>Weight</strong></td>
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