FMI-HDP

Installation and Users Guide

4-CHANNEL MOBILE DIGITAL VIDEO RECORDER WITH REMOVABLE HARD DRIVE AND OPTIONAL SD CARD

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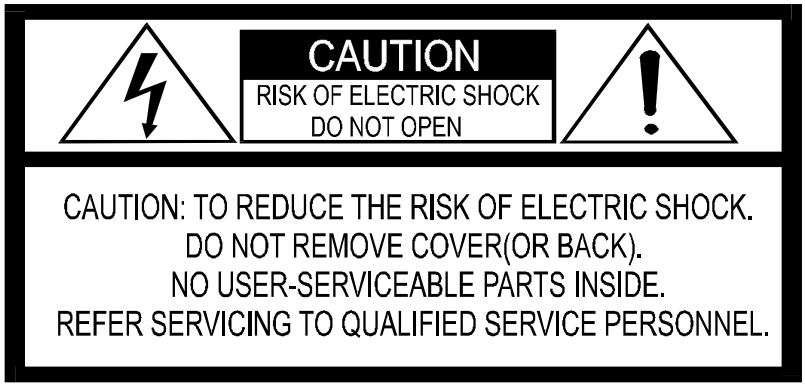
WARNINGS AND CAUTIONS

TO REDUCE THE RISK OF FIRE OR ELECTRIC SHOCK, DO NOT EXPOSE THIS PRODUCT TO RAIN OR MOISTURE. DO NOT INSERT ANY METALLIC OBJECTS THROUGH THE VENTILATION GRILLS OR OTHER OPENINGS ON THE EQUIPMENT.

CAUTION



EXPLANATION OF GRAPHICAL SYMBOLS

The lightning flash with arrowhead symbol, within an equilateral triangle, is intended to alert the user to the presence of un-insulated “dangerous voltage” within the product’s enclosure that may be of sufficient magnitude to constitute a risk of electric shock to persons.

The exclamation point within an equilateral triangle is intended to alert the user to the presence of important operating and maintenance (servicing) instruction in the literature accompanying the product.

IMPORTANT SAFEGUARDS

1. **READ AND RETAIN INSTRUCTIONS**
   Read the instruction manual before operating the equipment. Retain the manual for future reference.

2. **CLEANING**
   Turn the unit off and unplug from the power outlet before cleaning. Use a damp cloth for cleaning. Do not use harsh cleansers or aerosol cleaners.

3. **ATTACHMENTS**
   Do not use attachments unless recommended by manufactured as they may affect the functionality of the unit and result in the risk of fire, electric shock or injury.

4. **MOISTURE**
   Do not use equipment near water or other liquids.

5. **ACCESSORIES**
   Equipment should be installed in a safe, stable location. Any wall or shelf mounting accessory equipment should be installed using the manufacture's instructions. Care should be used when moving heavy equipment. Quick stops, excessive force, and uneven surfaces may cause the equipment to fall causing serious injury to persons and objects.

6. **VENTILATION**
   Openings in the equipment, if any, are provided for ventilation to ensure reliable operation of the unit and to protect if from overheating. These openings must not be blocked or covered

7. **POWER SOURCES**
   The equipment should be operated only from the type of power source indicated on the marking label. If you are not sure of the type of power supplied at the installation location, contact your dealer. For equipment designed to operate from battery power, refer to the operating instructions.

8. **GROUNDING OR POLARIZATION**
   Equipment that is powered through a polarized plug (a plug with one blade wider than the other) will fit into the power outlet only one way. This is a safety feature. If you are unable to insert the plug fully into the outlet, try reversing the plug. Do not defeat the safety purpose of the polarized plug.

   Alternate Warning: If the equipment is powered through a three-way grounding-type plug, a plug having a third (grounding) pin, the plug will only fit into a grounding-type power outlet. This is a safety feature. Do not defeat the safety purpose of the grounding-type plug. If your outlet does not have the grounding plug receptacle, contact your local electrician.

9. **CORD AND CABLE PROTECTION**
   Route power cords and cables in a manner to protect them from damage by being walked on or pinched by items places upon or against them.

10. **LIGHTNING**
    For protection of the equipment during a lightning storm or when it is left unattended and unused for long periods of time, unplug the unit from the wall outlet. Disconnect any antennas or cable systems that may be connected to the equipment. This will prevent damage to the equipment due to lightning or power-line surges.

11. **OVERLOADING**
    Do not overload wall outlets and extension cords as this can result in a risk of fire or electric shock.

12. **SERVICING**
    Do not attempt to service the video monitor or equipment yourself as opening or removing covers may expose you to dangerous voltage or other hazards. Refer all servicing to qualified service personnel.

13. **DAMAGE REQUIRING SERVICE**
Unplug the equipment from the wall outlet and refer servicing to qualified service personnel under the following conditions:

A. When the power supply cord or the plug has been damaged.
B. If liquid has spilled or objects have fallen into the unit.
C. If the equipment has been exposed to water or other liquids.
D. If the equipment does not operate normally by following the operating instructions, adjust only those controls that are covered by the operating instructions. Improper adjustment of other controls may result in damage to the unit.
E. If the equipment has been dropped or the casing damaged.
F. When the equipment exhibits a distinct change in performance.

14. **REPLACEMENT PARTS**
When replacement parts are required, be sure the service technician uses replacement parts specified by the manufacturer or that have the same characteristics as the original part. Unauthorized substitutions may result in fire, electric shock, or other hazards.

15. **SAFETY CHECK**
Upon completion of any service or repairs to the equipment, ask the service technician to perform safety checks to verify that the equipment is in proper operating condition.

16. **FIELD INSTALLATION**
The installation of equipment should be made by a qualified service person and should conform to all local codes.

17. **IGNITION TRIGGER CONNECTION**
For correct operation, it is very important to connect the main power to a constant 12V supply (not switched) and the Ignition Trigger to the Ignition power supply (switched).

MOBILE DIGITAL RECORDER DESCRIPTION

The Mobile Digital Recorder is a true VCR replacement with advanced features that take it beyond the standard lockbox-mounted VCR. The digital recorder features four video/audio inputs and one video /audio output. The DVR operates as a full duplex recorder/playback unit offering these key simultaneous features:

1. Quad video channel recording up to 720 x 480 resolution recording at up to 30 frames/sec (real time) or 1 frame/sec (time lapse) with simultaneous audio recording.

2. Playback of single or quad channel recorded audio/video

3. Playback of unrelated .avi files (eliminates need for a separate ad player)

4. Real time streaming to monitor live activity on any (or all) channels

5. FTP file transfer

6. TELNET for remote configuration

Up to eight simultaneous network sessions are supported where each can independently be used for streaming, FTP or TELNET. For example, 3 clients can all be streaming while other users are transferring files or sending configuration commands.

Multiple trigger inputs are available that can be connected so the recorder can be used as an event recorder. The triggered events are also logged along with the video and audio. The unit features LED Power and Record indicators as well as two programmable Open Collector trigger output.

The unit has low power consumption while recording and milliamp power consumption when powered off. The embedded operating system allows for instant power up less than 1 second. With selectable video quality and frame rates, the unit automatically calculates the amount of recording time available.

Conditioned power is provided to supply 12VDC to external cameras and other accessories such as a wireless Ethernet access point. The unit features an Ethernet port with a built-in web server and ftp server for archiving video, audio, and logged data.

All configurations feature removable storage media for easy video archiving. The free MDVR Video Player software provides optimal playback viewing of the multichannel .avi files created by the MDVR.

The small mechanical size allows several recorders to fit in the space of an existing VCR or allow the unit to be mounted in a standard automotive DIN format.

Feature Summary

- True low cost VCR replacement.
- Unparalleled Search capability with up to 90x Fast Forward/Rewind Review.
- Optional integrated GPS position and speed tracking and recording.
- Recording of GPS data to a video frame.
- Synchronization of the unit's time with the GPS satellite system.
- Recording to 2.5" mobile removable hard drive media for unmatched reliability. See
- Selectable record resolution: 720 x 480, 640 x 480, 360 x 240, or 320 x 240.
- Quad video input capabilities.
- Seven 24V tolerant configurable multi-event triggered inputs.
- Dedicated ignition trigger with configurable record start/stop/delay
- Output trigger to control other devices or light an external LED to indicate device status, e.g. when recording.
- Ethernet port for wired or wireless capabilities and FTP interface.
- Mobile power supply protection to allow direct connection of the unit to a vehicles 12V power supply without the use of any filtering.
- Mobile specific embedded operating system for unmatched reliability, security and fast power up times in less than 1 second.
- Video authentication support via the Graphical User Interface (GUI).
- Two RS232 interface for support of snap zoom camera, radar guns (Custom Signal Radar only), and output of GPS coordinates.
- Rugged Aluminum Extrusion construction designed for standard 1 DIN automotive installation.
- Thermal protection shutdown for below 0 or above 55 degrees C.

PRODUCT CONFIGURATIONS

MDVR with Removable hard drive Storage

This unit is distinguished by a lockable hard drive bay that holds the portable Hard Drive Carrier. The hard drive stores all MDVR data. It is available in a SATA or IDE configuration. The SATA configuration holds one 2.5" SATA drive. The IDE configuration holds two 2.5" IDE drives. Either configuration can use spinning disks or solid state drives, for more rugged environments.
The REMOVABLE HARD DRIVE CARRIER must be locked in place with the key to be recognized by the MDVR. Unlocking it, even before removing it, will disable it and halt recording. The removable hard drive mates with the desktop USB HARD DRIVE READER. This unit operates on wall AC power and is recognized by the computer as a mass storage device. The MDVR PLAYER SOFTWARE can be used directly to access stored media files or files can be copied to a more permanent location. See the section on FILE STRUCTURE for navigation information.

MDVR with Removable Single SD Card

This unit adds to the base Removable Hard Drive unit a single SD Card slot. The SD Card is used to extract just the recordings of Events and for installing system upgrades.

Inserting an empty SD Card initiates copy captured data surrounding an event. An extractable event is defined by the MARK trigger response. A configurable pre-event and post-event time will determine what is extracted. Under the SD Card slot is a status LED that is initially OFF. The LED will blink Red to indicate that Events have been recorded and are available for removal. The LED will blink Green while the copy is in progress and stay Green when the SD card can be removed. If the LED turns Red instead, that means the SD card is full but there are more events to be copied. Replacing the SD Card with another that has free space will allow the MDVR to continue exporting the event files.

The MDVR keeps track of the events exported so it will not indicate that events are present after they have been removed. However, if there is a need to remove the events again, power cycling the unit will cause the MDVR to rebuild its index and allow the user to extract the same events again. Note: events, along

with all other captured video remains on the hard drive normally even after SD event removal.

DIGITAL RECORDER FRONT PANEL OPERATION

The DVR features an illuminated keypad for easy operation in dark environments. Below is a description of the functions of the Digital Recorder front panel buttons. Some buttons will have different functions depending upon if the recorder is recording, stopped, or playing back video.

	**Power Button:** The unit is typically powered on by the **Ignition trigger**, but may alternately be powered on by pressing the **Power Button**. If manually powered on, the unit will remain powered on until the **Power Button** is pressed again or 10 minutes of inactivity. Holding the **Power Button** in for 10 seconds will perform a hardware reset of the entire MDVR unit.
	**Search/Menu Button**: Accesses the recorded video search menu. Pressing this button once brings up the search menu. Holding this **Search / Menu Button** for greater than 3 seconds brings up the main system configuration menu where all DVR functions can be changed and titles can be entered.
	**Left Arrow Key (mode dependant):** During Playback Mode: **Left Arrow Key** adjusts fast reverse playback speed from 0.5X to 90x From Pause mode **Left Arrow Key** is a frame step From Record Mode: Press and hold will manually control zoom out.

	**Right Arrow Key (mode dependant):** During Playback Mode: **Right Arrow Key** adjusts fast forward playback speed from 0.5X to 90x. From Pause Mode: **Right Arrow Key** steps one frame at a time From Record Mode: **Right Arrow Key** enables One Touch Zoom feature. Press and release will zoom to predefined setting and hold for 15 sec. Press and hold will manually control zoom in.
	**Up Arrow Key (mode dependant):** Playback Mode: During standard 1x playback, **Up Arrow Key** Cycles forward through the channels Live & Record Modes: In Live Video / Record mode, the **Up Arrow Key** cycles among channel views 1-4 and quad view. Quad view only appears when the resolution on all 4 channels is the same.
	**Down Arrow Key (mode dependant):** Playback Mode: During standard 1x playback, **Down Arrow Key** cycles backward through the channels. Live & Record Modes: In Live Video / Record mode, the **Down Arrow Key** cycles among channel views 1-4 and quad view. Quad view only appears when the resolution on all 4 channels is the same.
	**Pause Button:** The Pause Button allows pausing of playback video and resume play of video.
	**Stop Button:** The Stop Button stops the currently operation as displayed on the video output. If all playback features are operating the first press stops the Movie or recording Playback, the second stops Recording.
	**Record Button:** The Record Button begins recording on all enabled channels

BASIC ON SCREEN DISPLAY

The Display shown in Figure 7 is the basic Display for the Record, Live View and Playback Modes of operation. The video is recorded without these overlays, but the data shown is attached to each video frame as meta data for extraction by the video player software.

Time & Date:
This time and date is either entered manually and kept current with by the MDVR or is acquired and synchronized by the GPS unit if the option is selected.

Trigger Inputs:
There are 7 user selectable trigger inputs with a 4 character symbol.

MDVR Status:
Displays the status of the MDVR; includes idle, record, playback, playback speed, and pause.

MDVR Name:
This is the 14 character field to identify car, officer and MDVR unit.

GPS Information:
This included Latitude, Longitude and current vehicle speed
Note: vehicle speed from radar is used instead of GPS when available.

Remaining Record Time (displayed in STOP record mode only):
This is the remaining storage time left on the Hard Drive in units of hours:minutes.

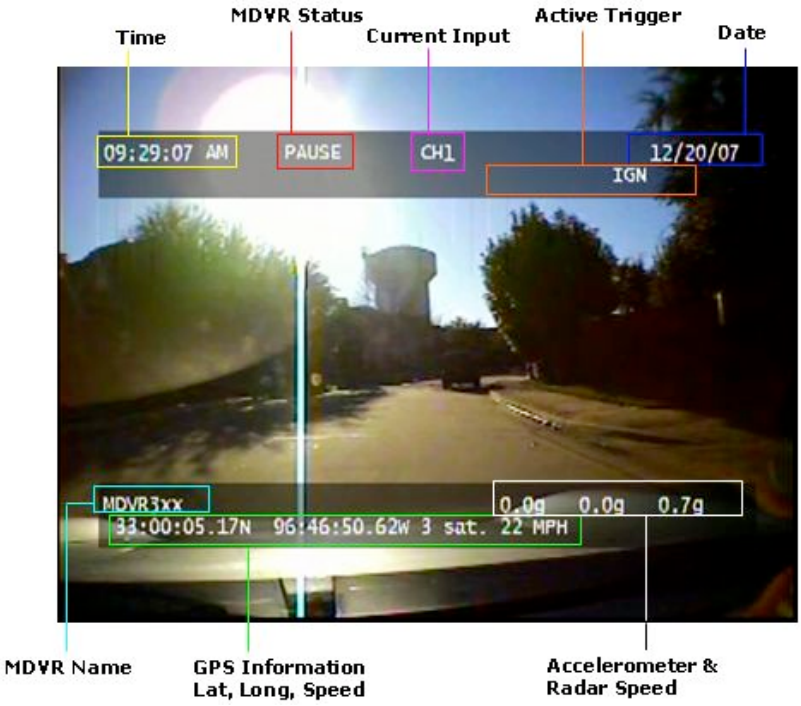


Figure 1 - On Screen Display (OSD)

SYSTEM STARTUP FEATURES

At power up and any media insertion the MDVR searches the hard drive first, then the SD card(s), if present for a folder named "SYSTEM". The first SYSTEM folder found will be used as the startup folder and its contents processed. The following features are available via the SYSTEM folder.

INSTALLING SYSTEM UPGRADES

Software / Firmware updates are distributed in files with a *.dvr extension. Mount either the removable hard drive or optional SD card to a PC. Find or create at the root of that media a SYSTEM folder. Copy the *.dvr file into the SYSTEM folder. Remove this media from the PC and install it into the MDVR and then power cycle the MDVR. The MDVR will automatically install the *.dvr file.

Placing multiple *.dvr files in a SYSTEM folder will have unpredictable results and is not advised. The system will not re-install the same upgrade so there is not a problem to leave the *.dvr file on the media until the next upgrade opportunity.

Figure 2 - Firmware Upgrade

NOTE: During upgrade the Power switch is disabled. Do not remove power during this time.

Automatic Movie Playback

The SYSTEM folder is searched for an "**SYSTEM-content-001.avi**" file. This movie file will be played to the system video outputs during normal operation. Stopping the movie playback will revert the system to its default of showing the real time camera video. Accessing the configuration menus will cause the menus to appear on-screen but the movie will continue to play. Once the movie is stopped it can only be restarted by power cycling the system or re-inserting the media.

Normally it is recommended that this file should be loaded to the SYSTEM directory when the media is removed from the MDVR and connected to the PC or USB Hard Drive Carrier, however it can be replaced using the FTP interface. In this case the new file shall be named "**new-content-001.avi**". After uploading this file, another file named "**new-content.ready**" is placed in the same directory. This file is used only as an indicator to the MDVR that the uploaded file is ready to replace the existing file at the next media insertion or power up, therefore it may be of zero length (it is not read).

Use of the "**new-content.ready**" indicator file is useful when uploading large .avi files to many MDVRs and there is a need to activate them all at once. Since the "**new-content.ready**" file is very small but movie files can be large and time consuming to upload, many devices can have their replacement movie activated quickly, especially if the FTP operations are scripted.

AUTOMATIC CONFIGURATION SCRIPT

The MDVR will execute all commands in a "**setup.txt**" script file. The format of the script file is the same as the TELNET command line. Any command you can enter via telnet can be put in the script file.

One use for this feature is for the police market so the officer can insert his SD card, or personal removable hard drive, and have the name of the MDVR configured with to officer's name or vehicle

ID. This information will appear in the metadata of the recorded video.

MDVR MENU STRUCTURE

Press the SEARCH button and release. The Display shown in the Figure below is the video search menu used for searching recorded video filesets on the Hard Drive. The column on the left shows the days with the column on the right showing time in that day. A pound symbol in the right column signals that the recording was triggered by an event.

Figure 3 - Playback Menu

Video playback can be accessed at any time and is available during recording without interrupting the current recording activity.

Main Menu Access:

1) Hold the SEARCH button for three to four seconds.
2) To scroll menu use UP and DOWN ARROW buttons.
3) To make menu selections use the RIGHT ARROW as “Enter”.
4) To return to a previous screen use the SEARCH button as “Back”.

The Display shown in Figure 10 below is the main unit menu. From this menu access to all other setup screens is possible.

Figure 4 - Main Menu

Figure 5 - System Menu

System Menu (Figure 11)		
Field	**Action**	**Default**
OSD	Enables or disables on screen display	Enable
Record Mode	Toggles between continuous recording or stop trigger recording	Stop
Units	Modifies unit system between Metric or English.	English
GP Out 1 Mode	Configurable Open Collector output. Notification of state of one of the MDVR attributes. See details below.	Record
GP Out 2 Mode	Configurable Open Collector output. Notification of state of one of the MDVR attributes. See details below.	Power
Time Setup	Brings up the Time Setup menu.	
Password Setup	Brings up the Password Setup Menu	
Advanced Setup	Brings up the Advanced Setup menu	

General purpose trigger outputs are configurable to indicate the following conditions:

RECORD	unit is recording

PLAY	unit is in playback mode
POWER	unit is powered on
TRIGGER_ACTIVE	any of the X triggers are in the active state
DISK_FULL	Recording is in STOP mode, disk is full so recording has stopped
T1-T7	activated when the specified trigger has voltage applied (HIGH state)
USER_CONTROL	User has sent the trigger command to the MDVR using telnet protocol
ACCEL	acceleration has exceeded normal limits as defined in GPS Setup Menu
SPEED	speed has exceeded normal limits as defined in GPS Setup Menu

MDVR PASSWORD MENUS

Figure – Password setup

A password can be used to control access to some or all configuration functions. A display must be connected to the video output of the MDVR to display the password prompt. When the user attempts to use a protected feature the display will prompt for the password. The front panel keys are used to select each character and enter the password before access is granted.

The password field consists of 6 characters with a default password of: “123456”. After this sequence is entered, the system allows access for 30 minutes (or after cycle power) before the password is enabled again. The unit supports 4 levels of password protection with the ability to

enable any or all levels. These are defined below:

- All Keys: Any key press required a password.
- Power-off: The Power button requires a password.
- Playback: Video playback requires a password.
- Menu: Access to the menus requires a password.

		Default
		Date
		Time
TimeZone	Offset from GPS reported time. Set to zero if no GPS	0 Note: -6 for Central US time
Daylight Savings	Automatic adjustment for daylight savings time change.	ON
Format	Clock format for 12 or 24 hour display.	12HR

Advanced Setup Menu (Figure 13)		
Field	**Action**	**Default**
Restore Defaults	Restores the factory default settings.	
Disk to Erase	Sets the target disk for the Erase and Format operations	C:
Erase Media	Permanently deletes all recorded data except SYSTEM directory from the selected media. Note: Not normally needed unless correcting an error.	
Format Media	Permanently deletes all recorded data from the selected media and installs DVR filesystem. Note: Not normally needed unless correcting an error. Use in response to “No Disk” error when disk is installed (system can not read disk) Faster than Erase Media	
Network Setup	Opens the Network Setup menu.	

Figur

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Network Setup (Figure 14)		
Field	**Action**	**Default**
IP Address	Manually entered IP address. Note: Requires power cycle to take effect	
Subnet Mask	Manually entered subnet mask. Note: Requires power cycle to take effect	
FTP Username	Manually entered username for FTP transactions	USER
FTP Password	Manually entered password for FTP transactions	PASS
Save	After configuration, the save option must be selected.	

Figure

Title Setup (Figure 15)		
Field	**Action**	**Default**
System Name	14 character name (ie. Car # / Officer / Other)	MDVR3xx
Trigger x	4 character trigger name	1 – 7

Figur

Trigger Setup (Figure 16)		
Field	**Action**	**Default**
Trigger 1-7	Enter a name for the trigger event / Enter if the trigger is active high or low / Select the action for the trigger event (MARK, START, STOP, RECORD while active, DISPLAY)	Trigger-x / Active H / No Action
Ignition Setup	Displays settings for ignition options.	

Triggers can be configured to the following actions. All triggers are recorded in the meta-data.

- MARK: Starts a recording if not already recording and labels the recording as an event in the file name.
- START [RECORD]: Starts a recording and will record until the stop button is pushed on the front of the unit or the storage media is full. The MDVR has pre-event recording and will record from a short time before the event.
- STOP [RECORD]: Stops a recording if the unit is recording.
- RECORD: Starts a recording and records while the trigger is active. Stops recording when the trigger is not active.
- DISPLAY: Will display the trigger event on the OSD and will record the trigger in the file meta-data.

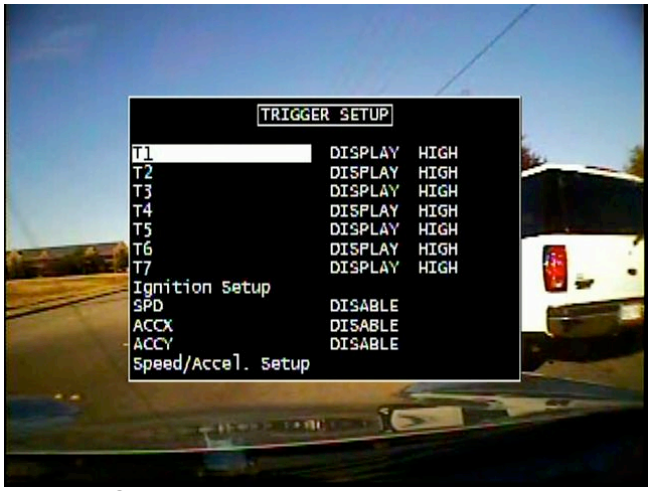

Figure 10 - Trigger Setup Menu

Ignition Setup (Figure 17)		
Field	**Action**	**Default**
Record Control	Enables or disables immediate recording at unit startup. When enabled the Record Start and Stop delays are activated.	Enable
Record Start Delay	Delay time before record start following ignition ON.	0Min
Record Stop Delay	Delay time before record stop following ignition OFF.	0 Min
Power Off Delay	Delay time after ignition OFF and Recording stopped with no activity before unit power off. Note: setting this field to minus 1 ('-1') keeps unit on indefinitely until power removed. Caution: This can run a battery down.	10 Min

The ignition trigger has special handling inside the MDVR intended to support motor vehicle applications where recording can start and stop automatically. Enabling the Record Control field in the Ignition Setup turns ON the automatic recording features. The following table details how specific events are handled.

Record Control Setting	Ignition	State of Manual Power button	System Behavior
DISABLE	ON	Turning ON	**Turn ON**
DISABLE	OFF	Turning ON	**Turn ON, but turn OFF automatically after idle for Power OFF Delay**
DISABLE	OFF	Turning OFF	**Turn OFF immediately (under manual control)**
DISABLE	Turning OFF	ON	**Turn OFF after Power OFF Delay**
DISABLE	ON	Turning OFF	**Turn OFF immediately (under manual control)**
DISABLE	ON	ON	**Turn OFF after Power OFF Delay**
DISABLE	Turning ON	OFF	**Turn ON (for completely manual operation, disconnect ignition trigger)**

ENABLE	ON	Turning OFF	**Ignition priority so ignore manual request. Stay ON**
ENABLE	ON	Turning ON	**Turn ON, can only happen if power was lost.**
ENABLE	OFF	Turning ON	**Turn ON, but turn OFF automatically after idle for Power OFF Delay**
ENABLE	Turning OFF	ON	**Turn OFF after Record Stop Delay if recording, else turn OFF immediately**
ENABLE	OFF	Turning OFF	**Turn OFF immediately (under manual control)**
ENABLE	ON	ON	**Stay on indefinitely (no Power OFF Delay)**
ENABLE	Turning ON	OFF	**Turn ON, start recording after Record Start Delay**

Figu

MDVR IGNITION / POWER ON CONNECTION

MDVR Ignition Trigger Power ON Control
The MDVR features an auto power on and begin record function on the "ignition trigger". When this trigger goes high, the DVR will turn on and then, after the user selectable power on delay, begin recording..

MDVR Ignition Trigger Power OFF Control
After the ignition trigger goes low (car turned off), the DVR will turn off if it was idle. If it is recording it will continue recording for the Record Stop Delay and then turn off. Note: the Power Off Delay setting has no effect on ignition controlled power offs.

MDVR Power Button Control (while Ignition Trigger OFF)
If the ignition trigger is low (car off), the power is controlled only by the **Power Button**. When the button is pressed, the unit will turn on until the button is pressed again or several minutes of inactivity have passed (as set by the Power Off Delay). The Power Off Delay setting is an inactivity timer that is intended to help prevent draining the vehicle battery when the MDVR is used while the ignition is OFF.

Comm. *X* Setup (Figure 18)		
Field	**Action**	**Default**
Baud Rate	Selects Baud Transfer Rate • 9600, 4800, or 38400	9600
Parity	Selects none, even, or odd parity.	None
Data Bits	Selects number of data bits.	8
Stop Bits	Selects number of stop bits.	1
Protocol	Protocol selection (zoom cameras): • None • Visca (Sony) • Costar	Costar
One Touch Zoom	Zoom control feature, in percentage.	100 PCT

Figur

Camera x Setup (Figure 19)		
Field	**Action**	**Default**
Frame Rate	Control setting for frame rate. Choices are: DISABLED,1, 5, 7.5, 10,15,30,CUSTOM* Note: DISABLED is not available on channel 1. System must record on at least channel 1.	30 fps
Image Size	Selects the image resolution: D1 – 720 x 480 VGA – 640 x 480 QD1 – 360 x 204 QVGA – 320 x 240	320 x 240
Image Quality	Image quality selection of HIGH, MEDIUM HIGH, MEDIUM, MEDIUM LOW, LOW, CUSTOM*. Lower image quality provides longer record times due to higher compression rates.	MEDIUM
Audio Recording	Selects whether to record audio (ON), or no audio (OFF).	ON
Audio Volume	Volume control setting.	12dB

***CUSTOM – set via telnet command. See section on TELNET COMMANDSl**

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Use Time	
GPS Form	
Calib Acce	

The GPS Setup Menu is only shown when a GPS device is installed. **The local time used by the product is calculated by adding the Time Zone Offset to the GPS time. Usually GPS provides coordinated universal time (UTC time). Set your offset from GPS time in the Time Setup menu (under System Setup).**

Figu

Disk		
Perc Use		
Perc		
Firm Vers		
MAC Address	Ethernet MAC address of the unit. Unique for each unit.	

Figure 15 - System Information

REMOVABLE HARD DRIVE

The removable hard drive can be loaded with up to 2 IDE 2.5" hard drives or 1 SATA 2.5" hard drive. The DVR treats all hard drive memory as a large storage area but the Advanced Setup menu offers disk specific operations (erase, format). Configuring the removable drive with 2 drives provides some redundancy but since data is stored in one file during capture, the loss of a drive will remove half the onboard storage and data.

FILE STRUCTURE

In the root directory of the Hard Drive, the DVR will create a new subdirectory for each day of recording. The subdirectory is named as follows:

Mmm.dd.yyyy

- Mmm - 3 letter month abbreviation, e.g. Jan, Feb, Mar,…Dec
- dd - day (01 - 31)
- yyyy - 4 digit year, e.g. 2006

Each subdirectory will contain a fileset of one or more AVI files that are grouped by file name. In order to minimize the effect of a forced shutdown where any open files may be lost the DVR periodically closes the file record and opens a new one. In addition, to help navigate records for events the DVR closes the current file and opens a new one each time an event is triggered, so triggered events can be found and viewed easily. The file naming convention is as follows:

Mmm.dd.yyyy_hh.mm.ss [#] –[seq].avi

- Mmm.dd.yyyy - same as directory name
- hh.mm.ss - 24 hour time in hours, minutes, and seconds when this fileset began recording. This is the local time, so if a GPS is used to obtain UTC time, this filename will be the UTC plus the timezone offset.
- '#' – Marks a file that was initiated due to an 'event' of interest as defined by the trigger condition of MARK..
- -[seq] – sequence number of file in the fileset. Sequence numbers start with '-001' and increment from there, however if the DVR is in continuous record mode, where the oldest files are overwritten, sequence number '-001' may be deleted. Therefore the lowest sequence number is the beginning of the available acquisition.
- avi - AVI file extension

EXAMPLE:

Found in the C\ Mar.12.2008 directory:

Mar.12.2008-17.36.48-001.avi	Record button manually pressed
Mar.12.2008-17.36.48#-002.avi	Trigger event occurred
Mar.12.2008-17.36.48#-003.avi	Another event occurred
Mar.12.2008-17.36.48-004.avi	No even occurred, DVR created next file in sequence automatically

FTP COMMANDS

The DVR supports only the following FTP commands in a DOS window:

cd	Changes Directory.
dir	Directory Listing.
ls	List directory.
get	Gets a file from the DVR.
put	Writes a file to DVR.
rmdir	Removed a directory from the DVR.

Because of these limits, FTP does not work within Internet Explorer. It does work from the DOS command-line FTP.

'rmdir' must be used with caution. The DVR does not ensure that the directory is empty prior to deleting the directory. Deleting a directory does not automatically delete the files in that directory. The application (or user) of FTP must ensure that the directory is empty prior to removing a directory, or else space on the Hard Drive will become unavailable for use.

TELNET COMMANDS

The MDVR3xx accepts ASCII commands via an Ethernet Telnet session. A telnet session may be used to control the MDVR remotely. All features of the keypad can be controlled via telnet commands and some extended features are only accessible via telnet.

cd	Change Directory.
date [mm/dd/yy]	Set/query date.
display [Channel]	Set/query audio/video output. CHANNEL may be '1', '2', '3', '4', or 'quad')
exit	Exits Telnet.
format /x	Formats disk x, where x = c,d,e,….
keylock [on | off]	Set/query front panel keylock.
ls [-l]	Get short/long directory listing.
media	Query media or disk status.
mute [on | off]	Set/query audio output mute.
pwd	Print working directory.
play date [Mmm.dd.yyyy]	Set/query playback date.
play time [hh.mm.ss]	Set/query playback time.
play position [sss]	Set/query playback position (in seconds)
play rate [rateFactor]	Set/query playback rate (-90 <= rateFactor <= 90)
play [on | off]	Set/query playback state
record [on | off]	Set/query record state
restore-config	Restore default DVR parameters
save-config	Save DVR parameters
set [param] [value]	Set/query DVR parameters (see below)
shutdown	Turn off the DVR

time [hh:mm:ss]	Set/query time
Trigger [1 | 2] [on | off]	Turns on/off indicated trigger (GPOUT)
version	Query DVR version string

Examples for PLAY command

1) Query available dates, then select one

```
play date
100 Sep.01.2007
100 Sep.11.2007
200 OK

play date Sep.11.2007
200 OK
```

2) Query available times, then select one

```
play time
100 14:12:32
100 15:47:05
200 OK

play time 14:12:32
200 OK
```

3) Query current playback information for selected date/time
- query returns the following parameters:
  State, Date, Time, Length, Position
  . State : "On" or "Off"
  . Date : as shown in examples above
  . Time : as shown in examples above
  . Length : length of video clip in seconds
  . Position : current playback position in seconds

```
play
200 Off, Sep.11.2007, 14:12:32, 637, 0
```

4) Begin playback, seek 30 seconds into the video, fast forward (30x)

play on
play position 30
play rate 30

5) Pause video, then stop playback

play rate 0
play off

TELNET PARAMETER SPECIFICATION

Parameters are supplied to the SET command to provide extended configuration setup. Sending the command SET [param] with no value will read and display the current value. Sending SET [param] [value] changes the setting on the DVR. The following parameter names are case sensitive and must be typed exactly as shown (including “dots” and “dashes”.

camera-1.uSecsPerFrame
Defines recording frame rate by specifying the number of microseconds to wait between each recorded frame.
A value of 0 indicates that this camera is not to be recorded.
Value must be a multiple of 33,333.
Maximum value is 299,997,000 (299.9 secs or 5 minutes).

camera-1.bitRate
Specifies recording bit rate in bits/seconds.
Must be a multiple of 500,000 (0.5 Mbit/sec).
Minimum value is 500,000 (0.5 Mbit/sec).
Maximum value is 20,000,000 (20 Mbits/sec)

camera-1.resolution
ASCII string which specifies image resolution (or frame size).
"D1" - 720x480
"VGA" - 640x480
"QD1 - 360x240 (Quarter-D1)
"QVGA - 320x240 (Quarter-VGA)

camera-1.audio
Specifies whether audio is to be recorded on this channel.
"OFF" - do not record audio for this channel
"ON" - record audio for this channel

camera-2
Same as camera-1, except settings are for camera input #2.

camera-3
Same as camera-1, except settings are for camera input #3.

camera-4
Same as camera-1, except settings are for camera input #4.

dvr.version
Read-only parameter, contains DVR firmware version number

dvr.macAddr
Read-only parameter, contains DVR MAC address

dvr.temperature.min
Read-only parameter, contains minimum operating temperature of the DVR at which point the hard-disk is turned off to prevent damage.

dvr.temperature.max
Read-only parameter, contains maximum operating temperature of the DVR at which point the hard-disk is turned off to prevent damage.

file.maxSize
Defines maximum file size for the DVR to generate. Once this size is reached, the DVR will continue recording in a new file.
Must be a multiple of 1,048,576 (1 MByte).
Minimum value is 512 MByte.
Maximum value is 1 GByte.

file.maxTime
Defines maximum amount of time to record in a single file. Once this time is reached, the DVR will continue recording in a new file.
maxSize and maxTime are used at the same time. When either limit is reached a new file is created.
Minimum value is 60 seconds.
Maximum value is 600 seconds (10 minutes).
Must be a multiple of 60 seconds.

net.ipAddr
IP address of DVR.
Default value is 192.168.2.110 (this will change in the future).

net.subnetMask
Ethernet subnet mask.
Default value is 255.255.255.0

net.userName
Network login username (used by FTP).

net.password
Network login password (used by FTP).

net.ftpTimeout
Timeout in seconds for FTP to close in inactive connection.
Minimum value is 60 (1 minute).
Maximum value is 600 (10 minutes).
Increment is 60.

net.telnetTimeout

Timeout in seconds for Telnet to close in inactive connection.
Minimum value is 60 (1 minute).
Maximum value is 3600 (60 minutes).
Increment is 60.

system.title1
Up to 32 ASCII characters to identify system

system.title2
Up to 32 ASCII characters to identify system

system.title3
Up to 32 ASCII characters to identify system

uart-1.device
Selects external device which is connected to serial port #1.
"Costar" - indicates Costar camera is attached
"None" - indicates serial port is unused.

uart-1.baudRate
Specifies serial port baud rate.
“4800”
"9600"
"38400"

uart-1.numDataBits
Specifies number of data bits. Must be 5, 6, 7, 8, or 9.

uart-1.numStopBits
Specifies number of stop bits. Must be 1 or 2 (1.5 is not supported).

uart-1.parity
Specifies serial port parity
"none"
"odd"
"even"

uart-2
Same as uart-1, except settings are for serial port 2

ETHERNET STREAMING PROTOCOL

OVERVIEW

The DVR streams audio/video data on TCP port 1234. This port is used for audio/video only. No control information is sent via this port.

All control will be performed using standard commands via the Telnet interface on TCP port 23.

The DVR allows multiple clients to stream audio/video if desired. This is limited to a maximum of 8 external connections (RS-232, Telnet, FTP, or Streaming).

Video data is sent every frame. Audio data is buffered and sent five times a second, or every 200 milliseconds.

BANDWIDTH THROTTLING

If Ethernet bandwidth (or client resources) become congested, the DVR will throttle bandwidth by dropping video frames. No audio will be dropped. Dropped video frames are marked in the data stream by sending zero length video frames so that the client can keep track of dropped frames to ensure audio/video synchronization.

DATA STREAM FORMAT

The data stream consists of audio/video blocks. Each block begins with an 8 byte header which contains an audio/video stream identifier and a block length. This header is the standard AVI data chunk header and is defined as follows:

chunkId: 32-bit audio/video stream identifier
chunkSize: 32-bit integer indicating number of data bytes following this header

The stream identifiers are (in little endian format):

Video Stream #1: 0x63643030 ("00dc")
Audio Stream #1: 0x62773130 ("01wb")

Video Stream #2: 0x63643230 ("02dc")
Audio Stream #2: 0x62773330 ("03wb")

Video Stream #3: 0x63643430 ("04dc")
Audio Stream #3: 0x62773530 ("05wb")

Video Stream #4: 0x63643630 ("06dc")
Audio Stream #4: 0x62773730 ("07wb")

If any video frames are dropped by the DVR, they are indicated by receiving a video chunk with a size of 0 bytes.

AUDIO/VIDEO SYNCHRONIZATION

Upon receiving a connection to TCP port 1234, the DVR streaming task will synchronize itself to the audio/video stream and begin streaming of data as follows:

While buffering 200 ms of audio data, send video frames.
The client should buffer these video frames.
Send 200 milliseconds of audio data to client.
The client can now begin playback (or may wish to buffer another 200 ms chunk of audio/video data).

HARDWARE INSTALLATION

The MDVR features dual captured nuts in both sides of the unit allowing for multiple installation options. Utilizing standard brackets, the MDVR can be installed as a bottom mount as shown in Figure 1 and as a DIN mount as shown in Figure 2. Care must be taken to not obstruct the ventilation holes in the bottom of the unit to ensure proper operation over the specified temperature range.

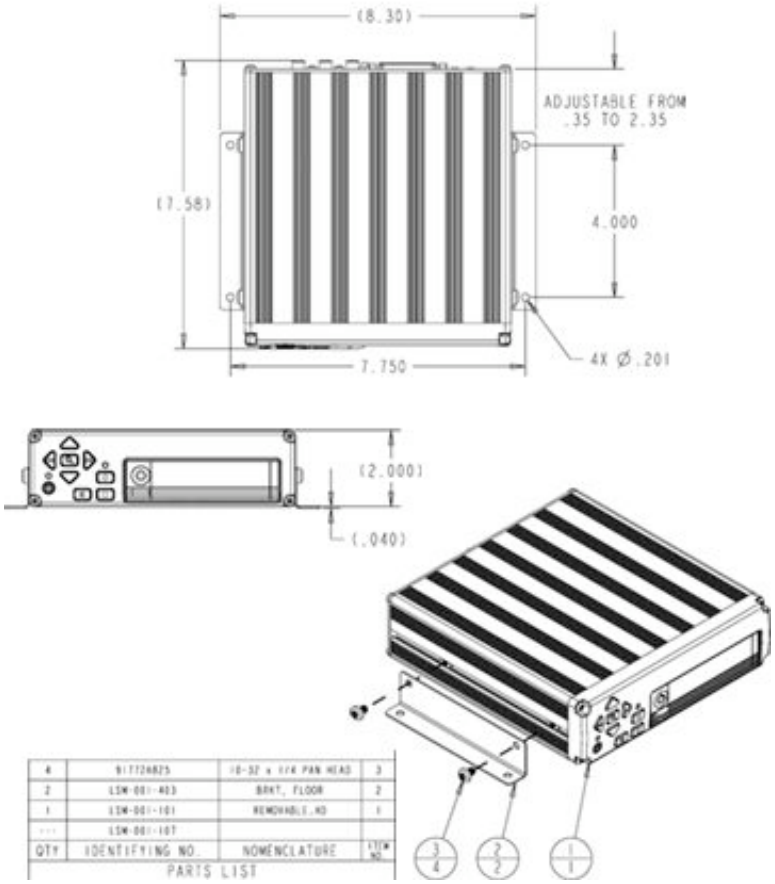
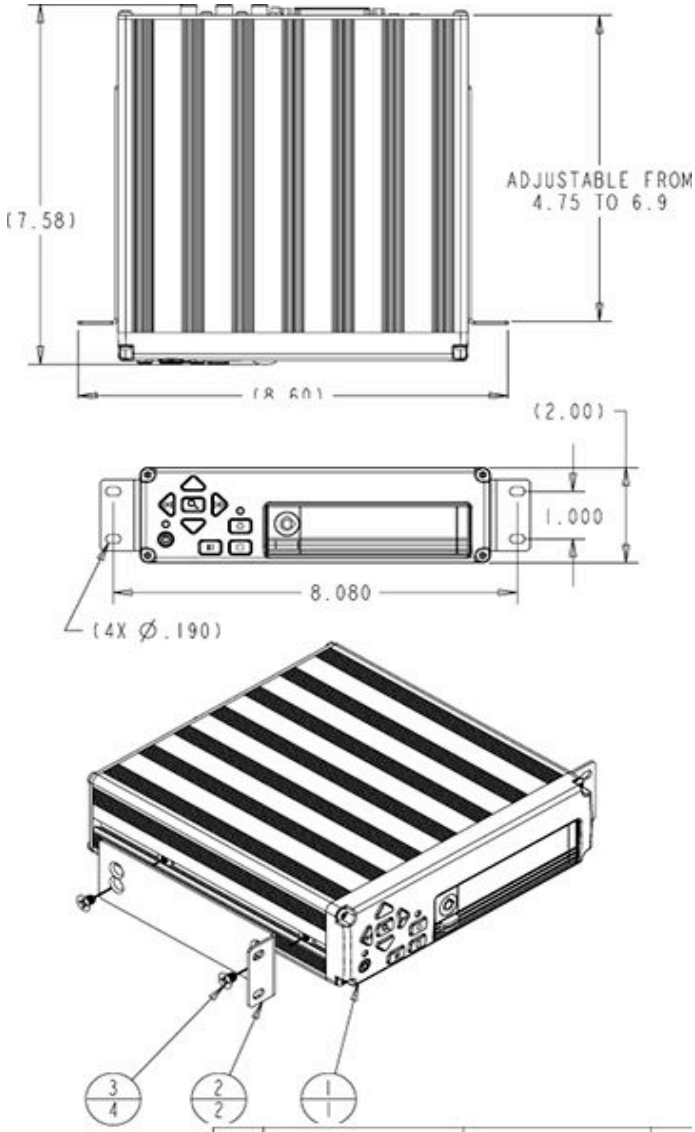


Figure 16 – MDVR Bottom Mounting Diagram



QTY	IDENTIFYING NO.	NOMENCLATURE	ITEM NO.
4	90273A825	10-32 x 1/4 FLAT HEAD	3
2	LSM-001-404	BRKT, PANEL	2
1	LSM-001-101	REMOVABLE,HD	1
---	LSM-001-108		

Figure 17 - MDVR Front Mounting Diagram

MDVR CONNECTION

The MDVR features a variety of connection points for various accessories as shown in Figure 3 below:

Figure 18 - MDVR Connection Guide

The external connections feature:

- Quad camera audio and video input
- Video / Audio monitor output

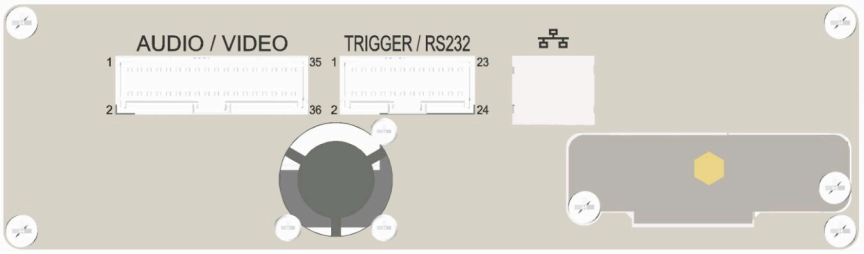
Standard TCP/IP Ethernet connection featuring:

- Built-in File Transfer Protocol (FTP) server

Main Molex Connector featuring:

- Direct automotive power connection. The MDVR features an internal reset capable fuse.
- 7 trigger inputs and 1 ignition.
- 2 configurable Open Collector trigger outputs.

BACK PANEL CONNECTION DETAIL



Audio / Video Connector (J3)	
Molex 5613409000 Pins	
Pin #	Function
1,3,5,7,9,11,13, 15,17,19,21,23	Ground
2	Audio Out
4	Audio Out
6	Video Out
8	Ignition input indication
10	Input 1 – Audio In
12	Input 1 – Video In
14	Input 2 – Audio In
16	Input 2 – Video In
18	Input 3 – Audio In
20	Input 3 – Video In
22	Input 4 – Audio In
24	Input 4 – Video In
25	-12V Camera 1 Power
26	+12V Camera 1 Power
27	-12V Camera 2 Power
28	+12V Camera 2 Power
29	-12V Camera 3 Power
30	+12V Camera 3 Power
31	-12V Camera 4 Power
32	+12V Camera 4 Power
33	Main Power (-)
34	Main Power (+)
35	Main Power (-)
36	Main Power (+)

Trigger / RS232 Connector (J4)	
Molex 51353-2400 Connector	
Molex 5613409000 Pins	
Pin #	**Function**
1,3,9, 15,21,22	Ground
2	Trigger 1
4	Trigger 2
6	Trigger 3
8	Trigger 4
10	Trigger 5
12	Trigger 6
14	Trigger 7
16	GP Open Collector 1 output
18	GP Open Collector 2 output
20	12V Audio Power
5	Serial kypd Transmit (future)
7	Serial kypd Receive (future)
11	Serial 1 Transmit (Radar Gun)
13	Serial 1 Receive (Radar Gun)
17	Serial 2 Transmit (Zoom camera)
19	Serial 2 Receive (Zoom camera)
23	Ignition input indication
24	Unused

Specifications	
Recording Capabilities	Four NTSC video camera inputs up to 30 fps with synchronized audio and meta-data.
Meta-Data Capture for Each Frame	Input voltage, unit temperature, 14 character unit name, panic button events, all triggers status and names, operating mode & version numbers, time & date, optional GPS lat/long/speed.
Compression	Motion JPEG compression w/ 5 selectable compression ratios.
Resolution:	Selectable 720 x 480, 640 x 480, 360 x 240, or 320 x 240.
Frame Rate:	Selectable 30 FPS to 1/1 FPS.
Video File Format	8 channel AVI (4 video, 4 audio) playable with Player application (Windows Media Player only plays first video/audio channel)
Archive Media Type:	2.5" EIDE Mobile Hard Drive support up to 120GB.
Typical Record Time	40 GB Hard Drive: 46 hrs typ up to 66 hrs. 80 GB Hard Drive: 92 hrs typ up to 132 hrs. 120 GB Hard Drive: 130 hrs typ up to 200 hrs.
Power Supply Input Rating	Standard automotive power range; 8 – 24 Volts.
On Power Consumption w/o Cameras	< 470 mA
Off Power Consumption	< 10 mA
12V Camera Power Output Max	12V @ 1 Amp regulated switched power outputs.
External Trigger inputs:	7 input triggers plus the ignition trigger.
External signal outputs:	2 Open Collector output.
Transient Protection	2500 Watts for 10ms
Operating Temperature:	5 C ~ 55 C (41 F ~ 131 F) ambient temperature.
Operating Vibration:	Linear 5-300 Hz, 1.0G (0 to peak)
Unit Weight:	2 kg (4.5 lbs)

Unit Size:	7 in (178 mm) x 2 in (51 mm) x 8 in (203 mm); 1DIN Mountable