Trooper® TR4 Plus Mobile Digital Video Recording (DVR) System

Installation and User's Guide

Seon Design® Inc.

Seon Design Inc. is a specialist in the design and manufacture of video surveillance systems for mobile applications. Seon has been the preferred solutions provider for the pupil transportation industry since 1999. Today, we are proud that our success in this area has made us the leading manufacturer of mobile video surveillance systems in North America.

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Who This Guide is For

The *Installation and User's Guide* is intended for anyone who needs to install and operate the Trooper TR4 Plus Mobile Digital Video Recording (DVR) System (TR4 Plus System). This Guide provides information and procedures for installing, configuring, operating, maintaining, and troubleshooting the TR4 Plus System.

This Guide replaces the *TR4-20 Full-Featured Mobile DVR System Installation and User's Guide* for the Trooper Plus-G Mobile DVR.

Conventions Used

⚠️ **CAUTION**

Cautions identify conditions or practices that could result in damage to the unit or to other equipment.

Important: These notes describe things which are important for you to know, but they are not as serious as a Caution.

Abbreviations and Acronyms

Acronym	Definition
DVR	Digital video recorder
FPS	Frames per second
GPS	Global positioning system
HD	Hard drive
IPS	Images per second
IR	Infrared
M-JPEG	Motion Joint Picture Experts Group
RA	Return Authorization
TCM	Transmission Control Module
UTC	Universal Time Coordinated

Related Documentation

Refer to the following related documentation.

SA Series Wedge Camera Setup Guide	Document part number 700-0004
SJ Series Dome Camera Setup Guide	Document part number 700-0049
HD Reader User's Guide	Document part number 700-0036
TR-INR Inertia Sensor Installation and User Guide	Document part number 700-0041
IR Illuminator Setup Guide (models RG-IRW and RG-IRN)	Document part number 700-0053
TR-CFR Compact Flash Reader and Conversion Software Installation and User's Guide	Document part number 700-0021

Optional Accessories

An optional remote control is available for use with the TR4 Plus DVR. Contact your sales representative at Seon Design for more information.

Finding Information Online

You can find information about Seon Design Inc,. as well as its products and services, by visiting **www.seon.com**.

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Introduction

This chapter describes the product features and components of the Trooper TR4 Plus Mobile Digital Video Recording (DVR) System (TR4 Plus System).

1.1. TR4 Plus System

The TR4 Plus System consists of the following components:

- TR4 Plus DVR
- Lock box
- Cameras
- Hard drive
- Cables and harnesses:
    - Power input harness for wiring of power and ignition trigger
    - Driver's alarm input switch and alarm input cable for event searching
    - Camera cable using a single connector
    - Signals cables for wiring of input signals
    - Speed cable (if purchased)
    - GPS receiver and cable (if purchased)
    - In-line fuses on the power and ignition lines for added protection

1.2. TR4 Plus System Product Features

The TR4 Plus System has been designed using extremely reliable and easy-to-use technology, including:

- Rugged digital video recorder
- M-JPEG compression
- Four video channel and two audio channels
- Replaceable/upgradeable hard drives to extend recording times
- Downloadable images and video using CompactFlash® cards
- On-screen display of operational status (time, date, vehicle identification, vehicle speed, GPS data, signals, and system voltage)
- Smart-Start™ to prevent potential damage from voltage spikes and drops during vehicle start-up
- Advanced Smart-Temp™ and built-in heater to ensure safe operation over a wide temperature range
- Configurable software
    - Configurable image quality and recording rate
    - Repeat recording, user selectable ON or OFF
    - Variable delay-on and delay-off recording, selectable up to 60 minutes
    - Twelve daily/weekly timers to set the DVR recording time
- Temporary power for setup and playback without turning on the vehicle ignition
- Front panel video output jack for setup and playback

1.3. TR4 Plus DVR

1.3.1. DVR Front Panel Features

The TR4 Plus DVR has important features on the front panel such as the Temporary Power button, hard drive lock, removable hard drive, SHUTTLE/JOG wheel, DVR buttons, the CompactFlash card slot and the VIDEO out jack. See Figure 1-1. See Table 1-1 for a brief description of each feature.
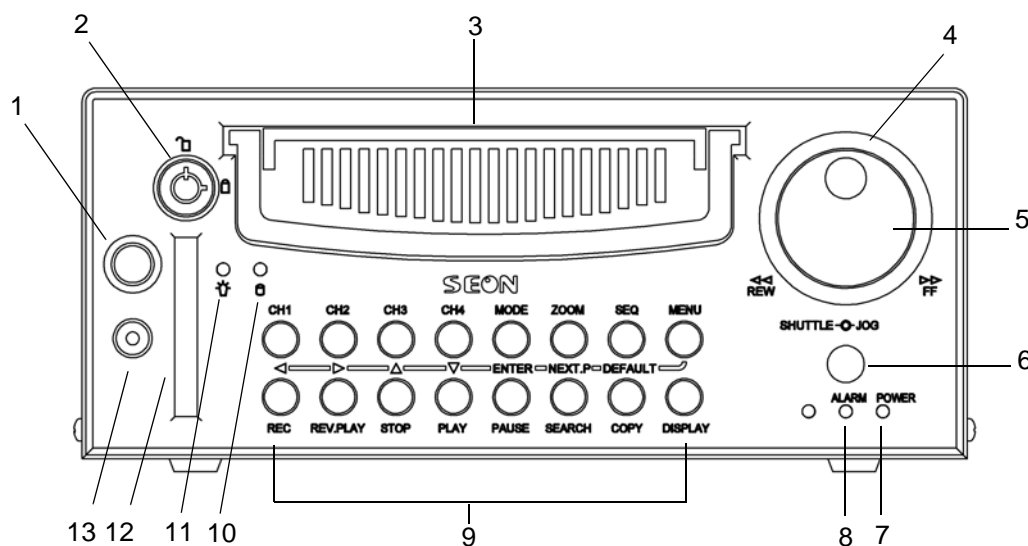
Figure 1-1 TR4 Plus DVR front panel

Table 1-1 Front panel features

Item	Feature	Description
1	Temporary Power button	• If the vehicle ignition is turned OFF, pressing the button for 3 seconds powers up the DVR but does not start recording. You have time to change settings in the menu system or play back short video clips. • If the vehicle ignition is turned ON, pressing the button for 5 seconds during the Delay-On interval will power up the DVR and start recording. • If the vehicle ignition is turned ON, pressing the button for 5 seconds during the Delay-Off interval bypasses the Delay-Off Time and powers down the DVR immediately. (For more information on Delay-On and Delay-Off, see "Using the Record Mode/Schedule Menu" on page 3–7.)
2	Hard Drive lock (unlocked and locked positions)	Requires the proper key to unlock the hard drive in order to remove or insert and lock the hard drive.
3	Removable Hard Drive	Remove the hard drive for playback at a remote location using the HD Reader ("Downloading Video to a Personal Computer" on page 4–11), swap to another DVR, or upgrade to a larger hard drive.

Table 1-1 Front panel features

Item	Feature	Description
4	SHUTTLE wheel (outer wheel)	Adjusts the video playback speed. See "Using the SHUTTLE/JOG Wheel to Adjust the Playback Speed" on page 4–4.
5	JOG wheel (inner wheel)	• Used to change the value of a menu item. • Use to adjust the video playback speed. See "Using the SHUTTLE/JOG Wheel to Adjust the Playback Speed" on page 4–4.
6	Infrared (IR) Remote Control receiver	Used with the optional IR remote control pointed at the receiver.
7	POWER–DVR Power indicator (green)	Illuminates when the DVR is powered up.
8	ALARM—Alarm Event indicator (red)	Illuminates when an external alarm input has been initiated and remains illuminated for the duration of the alarm.
9	DVR Buttons	See Table 1-2.
10	Hard Drive Access indicator (yellow)	Illuminates when the DVR is accessing the hard drive.
11	Hard Drive Power indicator (green)	Illuminates when the hard drive has been properly inserted in the hard drive tray, and the hard drive lock has been turned to the locked position.
12	CompactFlash card slot	Supports a CompactFlash memory card (CF Card) and is used for: 1. Copying video and audio information. 2. Receiving software program updates from the CF Card. (For more information, see "Formatting the CompactFlash Card" on page 3–25.)
13	VIDEO OUT—Video Output jack (yellow)	Used for: 1. Live viewing 2. Playback 3. System configuration. The front panel VIDEO OUT jack has the same function as the VIDEO OUT jack on the back panel. Only one device at a time can be connected to either jack.

1.3.2. DVR Buttons

The DVR buttons on the front panel illuminate when the buttons are activated. Table 1-2 provides a brief description of the DVR buttons.

For detailed information on using the DVR buttons, see "Using the DVR Buttons" on page 4–2.

Table 1-2 Description of DVR buttons

Button	Description
CH1/LEFT ARROW	Pressing the CH1 button/LEFT arrow button • Displays camera 1 on the monitor. • Decreases the value of menu items in the menu system.
CH2/RIGHT ARROW	Pressing the CH2/RIGHT arrow button • Displays camera 2on the monitor. • Increases the value of menu items in the menu system.
CH3/UP ARROW	Pressing the CH3/UP arrow button • Displays camera 3 on the monitor. • Scrolls up one line of text or moves to the next field in the menu system.
CH4/DOWN ARROW	Pressing the CH4/DOWN arrow button • Displays camera 4 on the monitor. • Scrolls down one line of text or moves to the next field in the menu system.
MODE/ENTER	Pressing the **MODE** button changes the display from quad mode (all four cameras displayed) to PIP (picture-in -picture) mode. • In PIP mode, press the CH1 button to change which camera is in large image and which is the small PIP image. • In quad mode, press any of the camera channel buttons to see that image full screen.
ZOOM/NEXT.P	• Pressing the **ZOOM** button during recording or playback magnifies the image on the screen $2\times$. Use the CH1/LEFT, CH2/RIGHT, CH3/UP, and CH4/DOWN buttons to move the position of the image on the screen. • Press **ZOOM** again to exit Zoom mode.
SEQ/DEFAULT	• Pressing the **SEQ** button during recording or playback cycles the display between quad image mode and individual camera views. The cycle time for each view is 3 seconds. • Press **SEQ** button again to exit **SEQ** mode.
MENU	Pressing the **MENU** button enters and exits the main menu of the DVR.
REC	Pressing the **REC** button starts the DVR recording if the DVR is not playing video or in the menus. When the DVR is recording, the **REC** button is illuminated.
REV.PLAY	During playback or when the video is stopped, pressing the **REV.PLAY** button starts playing the video in reverse.
STOP	Pressing the **STOP** button stops the DVR from recording or playing.
PLAY	If the DVR is not recording, pressing the **PLAY** button starts playing the recorded video and audio.
PAUSE	Pressing the **PAUSE** button pauses the video playback and provides a still frame video image.

Table 1-2 Description of DVR buttons

Button	Description
SEARCH	Pressing the **SEARCH** button provides a Search menu for quickly finding the desired information. Exit the Search menu by pressing the **MENU** button. See "Using the Search Function" on page 4–4.
COPY	Pressing the **COPY** button provides a menu for backing up information to a CompactFlash card. See "Using the COPY Button" on page 4–8.
DISPLAY	• Pressing the **DISPLAY** button provides on-screen information such as the recording speed, current time, date, system voltage, hard drive, and recording status. • Pressing the **DISPLAY** button several times lets you choose the desired the on-screen information. If the GPS display is turned ON, the vehicle latitude, longitude, and speed are displayed on-screen.

1.3.3. DVR Back Panel Features

The back panel has the input connectors where the cables and harnesses connect to the DVR. See Figure 1-2.

Chapter 2, "Installation" provides information on the different cables and harnesses. See "Connecting to the DVR Back Panel" on page 2–5 for more information.
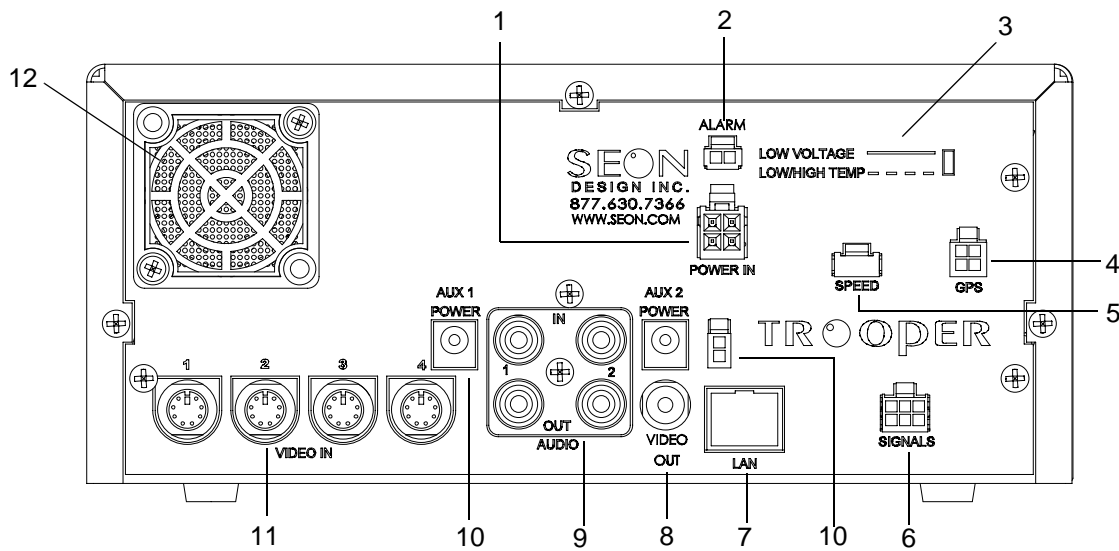
Figure 1-2 TR4 Plus DVR back panel

Table 1-3 Back panel features

Item	Feature	Description
1	POWER IN	Power and ignition harness connector: 4-pin

Table 1-3 Back panel features

Item	Feature	Description
2	ALARM IN	Alarm input connector: 2-pin
3	LOW VOLTAGE LOW/HIGH TEMP	Low voltage and Low/High temperature indicator (red)
4	GPS	GPS input connector: 4-pin
5	SPEED	Speed input connector: 3-pin
6	SIGNALS	Signals input connector: 6-pin (5 used)
7	LAN	Ethernet LAN connector
8	VIDEO OUT	Video output jack: Yellow RCA style
9	AUDIO IN 1, 2 AUDIO OUT 1, 2	Audio input jacks: White RCA style Audio output jacks: Red RCA style
10	AUX POWER 1, 2	Auxiliary Power jacks: 2.1 mm barrels or 2-pin connector
11	VIDEO OUT	Camera input connectors: 4 × 6-pin mini-DIN
12	FAN	Fan with filter and removable cover

1.4. Lock Box

The lock box secures the DVR into a location on the bus and provides the following features:

- A locking door which prevents unauthorized access to the DVR controls. Authorized personnel can use the lock box key to remove the hinged locking door when access to the DVR is necessary.

- A sliding rail system that allows for easy DVR installation and exchange.

- A slotted cable entry that allows connectors to be inserted into the lock box after installation.

- Mounting patterns that can accommodate a horizontal installation (flat on the floor or under a seat) or a vertical installation. (For installing the DVR under a seat, use of the Underseat Mounting Bracket Kit is recommended. For installing the DVR in a vertical mount, the Vertical Mounting Bracket Kit is recommended. Contact your sales representative at Seon Design for more information.)

Installation

This chapter provides information and procedures for installing the TR4
Plus System.

2.1. Installing the TR4 Plus DVR and Lock Box

The TR4 Plus DVR is designed to be installed in the lock box which is secured to the mounting surface using the screws provided. The lock box can be installed flat on the floor or under a seat (horizontal installation) or vertically on the floor (vertical installation), depending on your requirements. The lock box has a removable, hinged locking door, and a sliding rail system to allow for easy installation and exchange of the DVR.

The TR4 Plus DVR has connections to the front and back of the unit which are secured once the DVR is installed and the lock box is locked. Cable grommets on the lock box allows connectors to be inserted into the lock box after installation.

Planning an installation

Check that you have all the system components and inspect the units for any scratches or damage. The lock box key is required to unlock the door of the lock box and remove the components that are placed inside the box for shipping such as the camera and the harnesses. Assemble the necessary tools for installation.

Materials required

You will need these materials to complete the TR4 Plus DVR installation:

- TR4 Plus DVR
  - DVR keys for securing the removable hard drive
- Lock box
  - Lock box keys for securing the hinged locking door
- Cameras
- Power and ignition harness (20 foot)
  - Fuses: 5 A power fuse and 1 A ignition fuse
  - Fuse holders
- Butt splice connectors
- Four #10 × ¾" sheet metal screws
- Four #10 × 1" self-drilling screws
- Alarm input switch
- Alarm input cable (20 ft)
- Signal harness (20 ft)
- Speed harness (20 ft) (if purchased)
- GPS receiver and cable (20 ft) (if purchased)

Longer cables

Longer cables are available by contacting your Seon sales representative.

Important note

Important: If you are mounting the lock box under a seat, please contact your Seon Design sales representative or dealer for information on the Underseat Mounting Bracket Kit before starting the installation.

Important: If you are mounting the lock box vertically, please contact your Seon Design sales representative or dealer for information on the Vertical Mounting Bracket Kit before starting the installation.

2.2. Step 1: Installing the Lock Box

The lock box has a door and lid which need to be removed in order to secure the base in its location. The lock box can be mounted either on the floor or underneath a seat.

Important: If you are mounting the lock box under a seat, contact your Seon Design sales representative or dealer for information on the Underseat Mounting Bracket Kit.

The lock box can be installed horizontally (see "Horizontal Installation"). Four mounting points are located on the base of the lock box for securing the unit and raising the unit off the mounting surface by 3/16".

The lock box can be installed vertically (see "Vertical Installation" on page 2–4). Three mounting points are located on the back of the unit for securing the unit and raising the unit off the mounting surface by 3/16".

Important: It is not recommended that the lock box be installed on its left or right side where the cables enter the unit.

2.2.1. Horizontal Installation

To install the lock box horizontally:

1. Unlock the door with the lock box key and remove it from the lock box.

2. Slide the DVR out of the lock box by pulling on the two bracket tabs at the front of the DVR.

3. Detach the lid from the lock box by removing the two retaining screws on either side of the lid near the front of the lock box.

4. Determine whether the power and camera cables will enter the lock box on the left or the right side. If necessary, swap the cable grommet and the hole plug. See Figure 2-1.

5. Use the four #10 × ¾" sheet metal screws or #10 × 1" self-drilling screws to secure the base of the lock box to the floor.

6. Slide the lid on to the lock box and secure it with the two retaining screws.
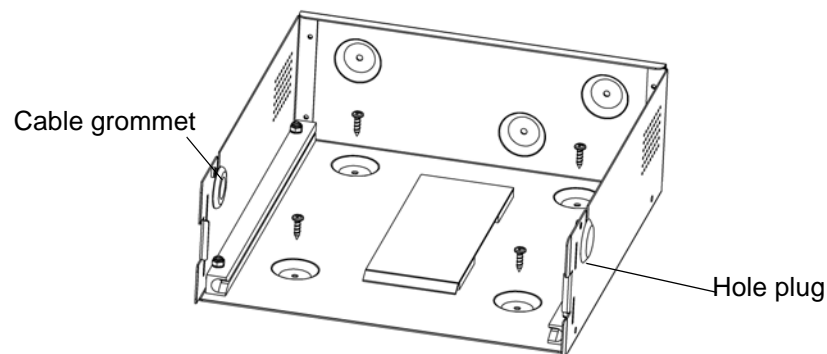
Figure 2-1 Lock box horizontal installation

2.2.2. Vertical Installation

To accommodate installation in a difficult location, the lock box can be mounted vertically. See Figure 2-2 on page 2–4.

Important: It is highly recommended that the Vertical Mounting Bracket Kit is used to help stabilize the lock box in a vertical installation. If you are mounting the lock box vertically, please contact your Seon Design sales representative or dealer for information on the Vertical Mounting Bracket Kit before starting the installation.

To install the lock box vertically:

1. Unlock the door with the key provided and remove it from the base of the lock box.

2. Slide the DVR out of the lock box by pulling on the two bracket tabs at the front of the DVR.

3. Detach the lid from the lock box by removing the two retaining screws on either side of the lid near the front of the lock box.

4. Determine whether the power and camera cables will enter the lock box on the left or the right side. If necessary, swap the cable grommet and the hole plug.

5. Use 3 of the enclosed #10 × ¾" sheet metal screws or the #10 × 1" self-drilling screws to attach the lock box to the floor. See Figure 2-2.

6. To prevent excess vibration, use the remaining #10 × ¾" sheet metal screw or the #10 × 1" self-drilling screw to secure the lock box to a vertical surface.

7. Reattach the lock box lid using the two screws removed earlier.
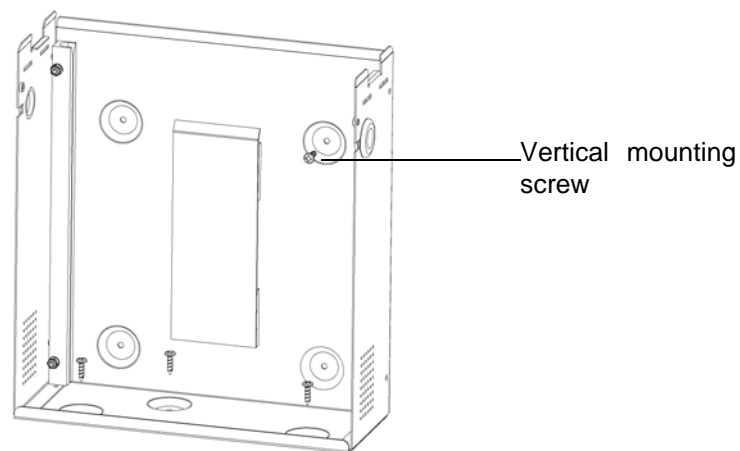
Figure 2-2 Lock box vertical installation

2.3. Step 2: Installing the DVR in the Lock Box

The DVR has two brackets attached to the sides that allow the DVR to slide easily in and out of the lock box. The brackets also enable easy top-up orientation of the DVR when the unit is installed on the floor or under a seat.

The rear of each bracket has two plastic retainers that allow cables to easily slip in between to ensure they do not get pinched at the back of the lock box when the DVR slides in.

2.3.1. Connecting to the DVR Back Panel

Figure 2-3 shows the back panel of the TR4 Plus DVR which provides the connectors for the cameras, power input harness, alarm input harness, video in and out, audio in and out, speed harness, GPS input, signals harness, and AUX power.
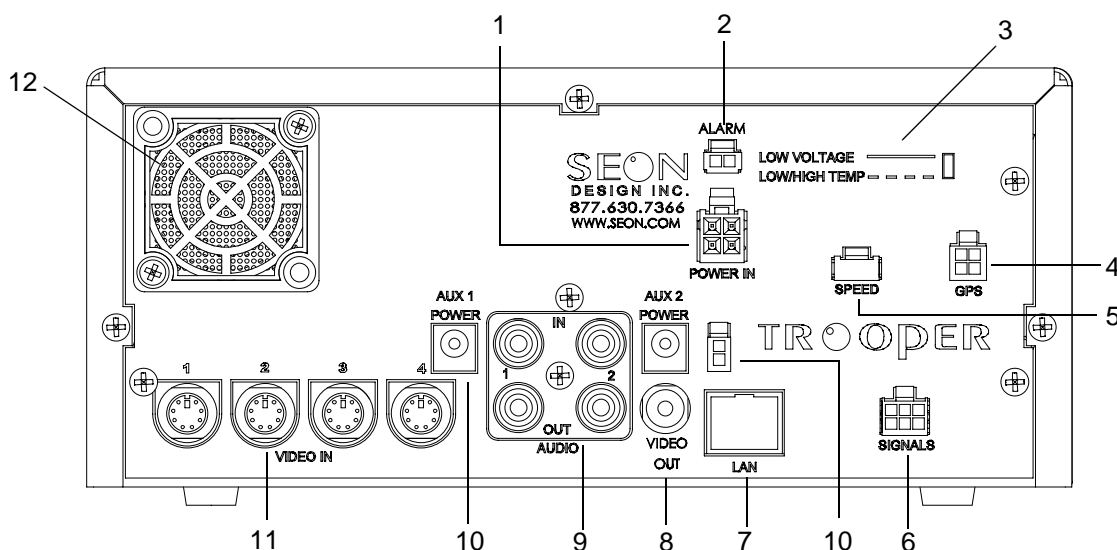
Figure 2-3 Back panel

Table 2-1 Back panel features

Item	Feature	Description
1	POWER IN	Power and ignition harness connector: 4-pin
2	ALARM IN	Alarm input connector: 2-pin
3	LOW VOLTAGE LOW/HIGH TEMP	Low voltage and Low/High temperature indicator (red)
4	GPS	GPS input connector: 4-pin
5	SPEED	Speed input connector: 3-pin
6	SIGNALS	Signals input connector: 6-pin (5 used)

Table 2-1 Back panel features

Item	Feature	Description
7	LAN	Ethernet LAN connector
8	VIDEO OUT	Video output jack: Yellow RCA style
9	AUDIO IN 1, 2 AUDIO OUT 1, 2	Audio input jacks: White RCA style Audio output jacks: Red RCA style
10	AUX POWER 1, 2	Auxiliary Power jacks: 2.1 mm barrels or 2-pin connector
11	VIDEO OUT	Camera input connectors: 4 × 6-pin mini-DIN
12	FAN	Fan with filter and removable cover

2.4. Step 3: Installing the Camera

If you have purchased a camera from Seon Design, install the camera according to the documentation that shipped with the product.

To connect the camera (and the optional external microphone) to the DVR:

1. Plug the 6-pin mini-DIN connector from the camera into the mating connector on the back of the DVR. See Figure 2-3.

2. If an optional external microphone is being used, plug the power connection into either AUX POWER 1 or AUX POWER 2. Plug the RCA connector into the AUDIO IN 1 or AUDIO IN 2 jack. See "Checking the Camera Cable Connections" on page 2–6 about disconnecting the audio from a camera when using the external microphone.

If you have a camera already installed, see "Checking the Camera Cable Connections".

2.4.1. Checking the Camera Cable Connections

The TR4 Plus System uses an integrated mini-DIN connector for the camera signal. The cable comes prewired into the camera, but in the event that the cable becomes disconnected, reattach into the terminal blocks inside the camera as shown in Figure 2-4. The cable colors for correct wiring to the terminals are described in Table 2-2. For complete camera information, see the product insert for the camera (for example, *SA Series Wedge Camera Setup Guide* document part number 700-0004*).*
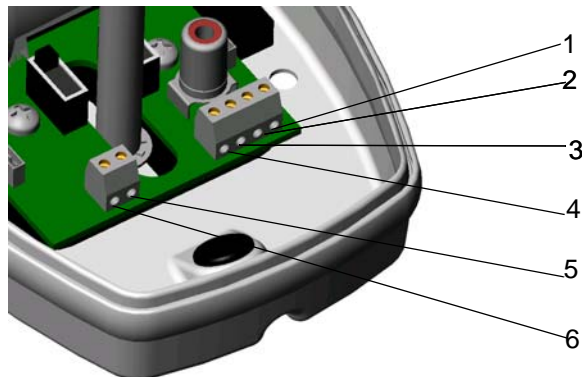
Figure 2-4 Terminal blocks in the camera

Table 2-2 Camera cable wiring

Item	Color	Description
1	Red	Power positive (+)
2	Black (and silver)	Power ground (–)
3	Green	Audio positive (+). Disconnect on the camera if using the remote microphone.
4	White	Audio ground (–). Disconnect on the camera if using the remote microphone.
5	Yellow or orange	Video positive (+)
6	Blue or brown	Video ground (–)

The camera cable should be long enough to reach from a camera mounted to the header or ceiling of a bus down to the DVR lock box. Different cable lengths can be obtained by contacting Seon Design.

The camera cable can be surface run or concealed.

Surface run Installation

If the installation is surface run, ensure that the camera cable is secured at multiple points and is protected from sharp corners.

Concealed Installation

If the cable is concealed, it can be pulled from either end. Pulling from the connector end will require larger holes in panels. Pulling from the wire end will require the cable to be disconnected from the camera.

Feed the cable through the large cable grommet on the DVR lock box. The connectors can be fed through the grommet one at a time, or the grommet can be cut at the top and the cables can be simply slid into the grommet. Leave enough cable in the DVR lock box to allow the DVR to slide all the way back.

2.5. Step 4: Connecting the Power and Ignition Harness, Fuses, and Fuse Holders

The power and ignition harness uses a pair of 16 AWG power wires to connect to the vehicle battery and a 22 AWG yellow wire to connect to an ignition-switched circuit. See Figure 2-5.

The supplied in-line automotive fuse holders are for protecting the red positive (+) battery wire and the yellow ignition wire. The 5 A fuse and in-line fuse holder are supplied for the red positive (+) battery power wire. The 1 A fuse and in-line fuse holder are supplied for the yellow ignition trigger wire.

Yellow ignition trigger wire

Black battery wire–Battery negative

Red battery wire–Battery positive
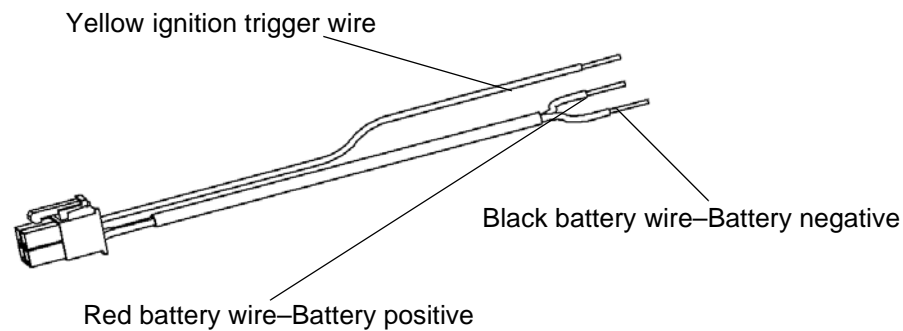
Figure 2-5 Power and ignition harness wires

To connect the power and ignition harness to the battery:

1. Connect the battery power wires as close to the battery as possible.

Important: Connecting the power farther from the battery will result in a larger voltage drop (reduced voltage from the battery to the DVR). If the voltage drop is too large, then the DVR will detect the low voltage and stop recording to protect itself. If the voltage stays low for too long, the DVR will interpret this as meaning the vehicle battery is drained and the DVR will shut down completely.

The battery acts as a very good filter for transients and surges on the vehicle power lines. Also, the cables from the battery have a voltage drop across them because of the current drawn by the lights, blowers, and A/C units, for example.

2. Connect the black negative (–) battery power wire to the battery's negative (–) terminal. If there is a master battery switch in the battery compartment connected to the battery's negative (–) terminal, connect the black negative (–) battery power wire after the battery switch.

3. The in-line fuse holder consists of a black plastic piece with an attached cap that simply pulls apart. Install the appropriate fuse and push the holder back together.

4. Strip the red wire end appropriately. A butt splice connector is supplied to connect the fuse holder to the red battery power wire. Connect the other end of the fuse holder directly to the battery's positive (+) terminal.

5. Strip the yellow wire end appropriately. A butt splice connector is supplied to connect the fuse holder to the yellow wire. Connect the other end of the fuse holder to an ignition-switched circuit.

6. The connector on the power and ignition harness is plugged into the Power In Connector on the back of the DVR.

⚠️ **CAUTION: Power and ignition harness connection**

To ensure proper performance, connect the red and black power wires to points as close to the battery as possible. Never connect the ground wire (black wire) to the vehicle chassis by drilling a hole into a panel and using a sheet metal screw. The ground connection will be corroded very quickly and the performance will be compromised.

Important: The supplied in-line automotive fuse holders are for protecting the red battery positive wire and the yellow ignition trigger wire. Butt-splice connectors are supplied to connect the fuse holders to their respective wires. The battery positive fuse holder uses the 5 A automotive blade fuse, and the ignition trigger fuse holder uses the 1 A automotive blade fuse.

2.6. Step 5: Connecting the Alarm Input Harness and Alarm Switch

The TR4 Plus DVR allows for easy searching of events in the recorded video. An alarm event can be used to set a search point in the digital video and can be triggered from a number of different sources, including a driver-activated switch.

The alarm input harness shown in Figure 2-6 is used to connect to the alarm input connector.

To connect the alarm input harness:

1. Connect the red and black wires from the alarm input harness together to activate the alarm input.

   OR

   Connect the red wire to electrical ground to activate the alarm input.

2. Connect the alarm input connector on the back of the DVR.
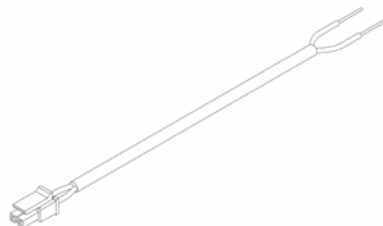
Figure 2-6 Alarm input harness

A red push button alarm switch shown in Figure 2-7 is also provided.

To connect the alarm switch:

1. Mount the switch into a ½" hole and attach to the alarm input harness using the butt spice connectors.

2. Attach the black wire of the alarm switch to the black wire of the alarm input harness.

3. Attach the blue wire of the alarm switch to the red wire in the alarm input harness.

Figure 2-7 Alarm switch

2.7. Step 6: Connecting the Signal Harness

The 5-conductor signal harness shown in Figure 2-8 connects to the various signals in the vehicle, including turn signals, stop-arm, brake lights, and warning lights, for example. If the signals are not being used with the TR4 Plus System, then the signal harness does not have to be installed.

Always connect through a fuse-protected circuit. The signals can be activated from 12 VDC (Active HIGH) or 0 VDC (Active LOW). See "Using the Signals/ Speed/GPS Menu" on page 3–16.
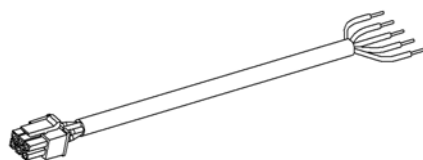
Figure 2-8 Signal harness

The wire colors for wiring to the indicators and default text are described in Table 2-3. The indicators can be connected to any signal as the text for each indicator can be easily reprogrammed.

Table 2-3 Signal harness wiring

Wire Color	Indicators and Default Text
Black	Indicator 1 – LT (Left Turn Signal)
Green	Indicator 2 – STP (Stop-Arm)
Red	Indicator 3 – BRK (Brakes)
Brown	Indicator 4 – WRN (Warning Lights)
White	Indicator 5 – RT (Right Turn Signal)

To connect the signal harness connector to the DVR:

• Connect the signal harness connector to the SIGNALS connector on the DVR.

2.8. Step 7: Connecting the Speed Harness

The 3-conductor speed sensor harness shown in Figure 2-9 is for connecting to a to an optional speed signal sensor or to a transmission control module (TCM).
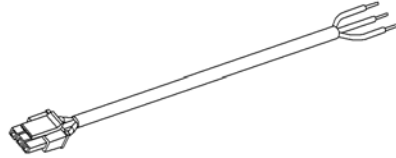
Figure 2-9 Speed harness

Connecting to a Speed Signal Sensor   The wire colors for correct wiring to the signals are described in Table 2-3. The green speed pulse signal is designed to interface to speed sensors that output a pulse signal of up to 20 VDC, 20 VAC$_{p-p}$ or speed sensors that use open-collector style outputs. Contact Seon Design for recommended speed sensors to use with the TR4 Plus DVR.

Table 2-4 Speed harness wiring

Wire Color	Signals
Black	Signal ground (0 V)
Green	Speed pulse signal
Red	Speed sensor power (7.5 VDC)

All of the wires in the speed sensor harness are protected against short circuits and transients. Refer to the speed sensor product documentation for more information on connecting to an external speed sensor.

Connecting to a Transmission Control Module (TCM)   The TR4 Plus DVR is able to interface directly to some types of TCM in vehicles. Contact Seon Design for more information about interfacing to different TCMs.

To connect the speed signal harness to the DVR:

1. Connect the speed harness connector into the SPEED connector on the DVR.

2. Push the cables into the cable retainers on the back of the DVR brackets and slide the DVR into the lock box.

Important: Do not pinch or bind any cables when sliding the DVR into the lock box.

2.9. Step 8: Installing the GPS Receiver

If you have not purchased a GPS receiver or if you wish to install the GPS receiver at a later time, please proceed to "Step 8: Hardware Installation Final Checklist".

Seon Design provides several models of GPS receivers designed to work with the TR4 Plus DVR. Contact your sales representative at Seon Design for the GPS receiver best suited for your application.

2.10. Step 8: Hardware Installation Final Checklist

Harnesses (Camera, recorder, and accessories)

- Check for proper slack.
- Check that the cables and harnesses are properly secured.
- Check that sharp metal edges are not touching the cables or harnesses.
- Check that all the cables and harnesses are neat and tidy.
- Check that the connections are solid (no shorts).

Camera

- Check for tight mount.
- Check the internal harness connection.
- Check that the lid is properly seated on the gasket and secured tightly.
- Check the camera's field of view.

DVR

- Check for tight mounting of hardware (lock box).
- Confirm that the cable grommet is properly installed.
- Check that all connections are tight.

System

- Install the fuses.
- Plug the video monitor into the DVR.
- Power up the system.
- Confirm that all the camera and audio sources are operating properly.
- Confirm that all the status indicators react properly.
    - Hard drive power indicator
    - Hard drive (lock and access)
    - Voltage, temperature or system alarms
- Switch to temporary power by pressing the front panel Temporary Power button with vehicle ignition turned OFF.
- Test the audio/video record.
- Test the audio/video playback.
- Configure the menus per the required end-user specifications.

2.11. EZN Decoy System

The EZN decoy system uses a live camera that does not have to be changed from bus to bus, only the DVR must be removed. For decoy systems, the lock box and all the harness and cables are installed the same as for a live system.

Configuring the DVR

This chapter provides information and procedures for configuring the DVR.

3.1. Configuring the DVR

The TR4 Plus DVR uses on-screen configuring for easy setup of all the functions and controls. During live viewing and recording, the information displayed on the screen can include the items shown in Figure 3-1.

Press the **DISPLAY** button for on-screen information such as camera title, main title, voltage, date, and time. If the GPS display is turned on, the vehicle latitude, longitude, and speed are also displayed. (See "Using the Signals/Speed/GPS Menu" on page 3–16.)

Additional information is provided in a small screen for disk size (DISK), operating status (OPER), record position (R. POS) and recording speed (SPEED).

Press the **DISPLAY** button several times to choose the desired on-screen information. The default displays shows the camera title, main title, voltage, date, and time.

Figure 3-1 On-screen display during live viewing and recording

Table 3-1 On-screen display information

Feature	Description
Camera titles	Identifies the cameras.
GPS information	• LAT (Latitude) • LONG (Longitude) • SPD (Speed)
Main title	Identifies the system with a unique title.
Voltage	Indicates the system voltage. See "Voltage Display" on page 4–11.
Date and Time	Indicates the date and time.
DISK	Indicates the formatted size of the installed hard drive, measured in GB (gigabytes).

Table 3-1 On-screen display information

Feature	Description
OPER	Indicates the operation status of the DVR. The options are: • RECORD (Normal recording) • LIVE (Live images are viewed when the DVR is not recording) • PLAY (Playback of video, forward or reverse)
R. POS (Record Position)	Indicates how much of the hard drive has been recorded.
SPEED	Indicates the recording speed in IPS (images per second)

3.2. TR4 Plus DVR Main Menu

The TR4 Plus DVR main menu lets you set the time and date, create titles, and customize other menu items. All menus are displayed on a black background with white text.

To view the main menu:

1. If the DVR is recording or playing, press the **STOP** button on the front of the DVR.

   OR

2. Power up the DVR by pressing the Temporary Power button located on the front panel for three seconds.

   The DVR takes approximately 20 seconds to perform a self-test upon startup.

3. Press the **MENU** button to display the main menu. Figure 3-2 appears.

4. Press the CH3/Up arrow or CH4/Down arrow button to highlight the setting you want to change.

Figure 3-2 Main menu

5. Press the ENTER button.

   A sub-menu appears.

To change a setting on the sub-menu:

1. Press the CH3/Up arrow or CH4/Down arrow button to highlight the setting you want to change.

2. Press the CH1/Left or CH2/Right arrow button to change the value. Or turn the JOG wheel clockwise or counterclockwise to change the value of a menu item.

3. To exit the menu, press the **MENU** button.

3.2.1. Software Version

The software version in the DVR is displayed at the bottom of the main menu. When contacting Seon Design about any service or operational issues, please have the software version available for Customer Service. In Figure 3-2, for example, the software version is 1.09.

3.2.2. Using the Set Time/Date Menu

Use the Set Time/Date menu to set the time, date, and the auto daylight saving time options.

To view the Set Time/Date/Title menu:

1. On the main menu, press the CH3/Up arrow or CH4/Down arrow button to highlight Set Time/Date.

2. Press the **ENTER** button.

   The Set Time/Date menu appears as shown in Figure 3-3.

Figure 3-3 Set Time/Date menu

To change a setting on the sub-menu:

1. Press the CH3/Up arrow or CH4/Down arrow button to highlight the setting you want to change.

2. Press the CH1/Left or CH2/Right arrow button to change the value. Or turn the JOG wheel clockwise or counterclockwise to change the value.

3. To exit the menu, press the **MENU** button.

4. Repeat these steps to set the Time, Date, and Auto Daylight Saving options. See Table 3-2.

Table 3-2 Set Time/Date/Title configuration items

Menu Item	Description	Values	Default
Time 12-hour	Set the time for the DVR.	12:00:00 AM to 11:59:59 PM	Not applicable
Date	Set the date for the DVR. The day of the week is automatically determined from the month, day, and year settings, for example, 05-17-2007 TUE. DST (Daylight saving time) is automatically determined from the time and date.	2-digit month, 2-digit day of the year, 4-digit year	MM/DD/YYYY
Auto Daylight Saving	Setting the Auto Daylight Saving option to ON automatically adjusts the internal clock to daylight saving time. Beginning in 2007, on the second Sunday in March, the time will spring forward from 02:00A to 03:00A. On the first Sunday in November, the time will fall back to Standard Time by changing from 02:00A to 01:00A. The times and dates can be adjusted as required. Setting the Auto Daylight Saving option to OFF disables this feature.	ON, OFF	ON
Start On	Set the month and week of the month for daylight saving to start. For example MAR 2nd SU.	• JAN, FEB, MAR, APR, MAY, JUN, JUL, AUG, SEP, OCT, NOV, DEC • 1st, 2nd, 3rd, 4th, last • SUN, MON, TUE, WED, THU, FRI, SAT	MAR 2nd SUN
From	Set the time for daylight saving to start.	02:00A to 03:00A	02:00A TO 03:00A
End On	Set the month and week of the month for daylight saving to end, for example, NOV 1st SU.	• JAN, FEB, MAR, APR, MAY, JUN, JUL, AUG, SEP, OCT, NOV, DEC • 1st, 2nd, 3rd, 4th, last • SUN, MON, TUE, WED, THU, FRI, SAT	NOV 1st SUN
From	Set the time for daylight saving to end.	02:00A TO 01:00A	02:00A TO 01:00A

3.2.3. Using the Titles/Display Menu

To view the Titles/Display menu:

1. On the main menu, press the CH3/Up arrow or CH4/Down arrow button to highlight Titles/Display.

2. Press the **ENTER** button.

    The Set Titles/Display menu appears as shown in Figure 3-4.

Figure 3-4 Set Titles/Display menu

To change a setting on the sub-menu:

1. Press the CH3/Up arrow or CH4/Down arrow button to highlight the setting you want to change.

2. Press the CH1/Left or CH2/Right arrow button to change the value. Or turn the JOG wheel clockwise or counterclockwise to change the value.

3. To exit the menu, press the **MENU** button.

4. Repeat these steps to set the Main Title, Camera 1 to 4, and Display Voltage options. See Table 3-3.

Table 3-3 Set Titles/Display menu

Menu Item	Description	Values	Default
Main Title	Display a title for the system up to 28 characters.	• A to Z • 0 to 9 • ( ) . , + – / _	Not applicable
Camera 1 Camera 2 Camera 3 Camera 4	Display a title for each camera in the system up to 12 characters.	• A to Z • 0 to 9 • ( ) . , + – / _	1 2 3 4
Display Voltage	Displays the system input voltage for diagnosing any potential problems.	• ON • OFF	ON

3.2.4. Using the Record Mode/Schedule Menu

Use the Record/Schedule menu to set the camera speed in images per second (IPS), the picture quality, the Delay-On and Delay-Off times, and other general recording options.

To view the Record Mode/Schedule menu:

1. On the main menu, press the CH3/Up arrow or CH4/Down arrow button to highlight Record Mode/Schedule.

2. Press the **ENTER** button.

   The Record Mode/Schedule menu appears as shown in Figure 3-5.

Figure 3-5 Record Mode/Schedule menu

To change a setting on the sub-menu:

1. Press the CH3/Up arrow or CH4/Down arrow button to highlight the setting you want to change.

2. Press the CH1/Left or CH2/Right arrow button to change the value. Or turn the JOG wheel clockwise or counterclockwise to change the value.

3. To exit the menu, press the **MENU** button.

4. Repeat these steps to set the Record Speed, Picture Quality, Repeat Record, Record Audio 1 and 2, Delay-On Time, Delay-Off Time, Timers, and Alarm Recording. See Table 3-4.

Table 3-4 Record Mode/Schedule items

Menu Item	Description	Values	Default
Record Speed	The camera speed can be set to record at different image rates, ranging from the fastest rate of 60 IPS (60 images per second) to 0.1 IPS (one image every ten seconds). Lower image rates result in longer recording times for a given size of hard drive. Record speed is the total speed of all cameras combined. For example, if the Record Speed is set to 60 IPS and there is only 1 camera, the camera records at 60 IPS. If there are four cameras, then each camera records at 15 IPS. A record speed of 5 IPS (10 IPS for 2 cameras, 15 IPS for 3 cameras, 20 IPS for 4 cameras) is sufficient for most requirements. (At slower rates, the motion becomes increasingly jerky, as in a time-lapse VCR system.)	60 IPS, 30 IPS, 20 IPS, 10 IPS, 15 IPS, 5 IPS, 2 IPS, 1.5 IPS, 1 IPS, 0.5 IPS, 0.2 IPS, 0.1 IPS	15 IPS
Picture Quality	The TR4 Plus DVR uses M-JPEG video compression to extend the recording time on the hard drive. Picture Quality lets you choose the amount a picture is compressed versus the amount of memory the picture takes up on the hard drive. See "Recording Capacity" on page 3–13.	Picture Quality • 1 (standard) • 2 • 3 • 4 • 5 • 6 (high)	4
Repeat Record	Setting Repeat Record to ON lets you choose to start recording again and overwrite the information on the hard drive. Setting Repeat Record to OFF lets you choose to stop recording and retain all the information on the hard drive.	ON, OFF Note: If Repeat Record is OFF and the hard drive has been filled, the DVR can be made to start recording again by pressing the **REC** button on the DVR front panel for five seconds.	ON
Record Audio1, 2	TR4 Plus DVR has two audio inputs and two audio outputs. By setting Record Audio 1 and/or 2 to OFF, no signal is recorded from the audio inputs. This feature is useful if no microphones are being used as hard drive memory space is not used to record unnecessary audio channels. At slow record speeds, this saves memory space on the hard drive.	ON, OFF	ON

Table 3-4 Record Mode/Schedule items

Menu Item	Description	Values	Default
Delay-On Time	Delay-On Time determines when the system will start up. For example, if Delay-On is set to 0, the system will start up as soon as the vehicle ignition is turned on. If Delay-On is set to 30 SEC, the system will not power up for the first 30 seconds. After power up, the DVR may take up to 20 seconds to start recording as it performs a thorough self-test. The Delay-On option uses Smart-Start™ which protects the DVR from transients and voltage swings during vehicle startup.	0, 15 SEC, 30 SEC, 1 MIN, 2 MIN, 3 MIN, 4 MIN, 5 MIN, 10 MIN, 15 MIN, 20 MIN, 30 MIN, 45 MIN, and 60 MIN.	30 SEC
Delay-Off Time	Delay-Off Time enables the DVR to continue recording for a select amount of time after the driver has turned off the vehicle ignition.	0 (disables Delay-off), 15 SEC, 30 SEC, 1 MIN, 2 MIN, 3 MIN, 4 MIN, 5 MIN, 10 MIN, 15 MIN, 20 MIN, 30 MIN, 45 MIN, and 60 MIN.	30 SEC
Timers	For more information, see "Using the Timers Menu" on page 3–10.		
Alarm Recording	For more information, see "Using the Alarm Recording Menu" on page 3–12.		

3.2.4.1. Using the Timers Menu

Use the Timers menu to change the timer schedules to meet the requirements of different bus routes. The menu lets you configure up to twelve different timer schedules.

To view the Timers menu:

1. On the Record Mode/Schedule menu, press the CH3/Up arrow or CH4/Down arrow button to highlight Timers.

2. Press the **ENTER** button.

   The Timers menu appears as shown in Figure 3-6.

Figure 3-6 Timers menu

To change a setting on the sub-menu:

1. Press the CH3/Up arrow or CH4/Down arrow button to highlight the setting you want to change.

2. Press the CH1/Left or CH2/Right arrow button to change the value. Or turn the JOG wheel clockwise or counterclockwise to change the value.

3. To exit the menu, press the **MENU** button.

4. Repeat these steps to set the Enable Timers, Day, Start, Stop, Speed, Quality, and Set options. See Table 3-5.

Table 3-5 Timers configuration items

Menu Item	Description	Values	Default
Enable Timers	Setting Enable Timers to ON lets you record at preset times during the day. The vehicle ignition must be turned on for the timers to work. If Enable Timers is set to ON and all of the individual timers are set to OFF, the DVR will not start recording. Either set an individual timer to ON or set Enable Timers to OFF. The Delay-On settings are overridden by the timers, except for the first 30 seconds. If the system is recording during a Timer interval, then the Delay-Off settings will override the timer once the vehicle ignition is turned off.	ON, OFF	OFF
Day	Set the timer to record for a specific day of the week, daily, every weekday, or only on the weekend.	• SUN (Sunday) • MON (Monday) • TUE (Tuesday) • WED (Wednesday) • THU (Thursday) • FRI (Friday) • SAT (Saturday) • WDAY (Weekday) • WKEND (Weekend) • DLY (Daily)	SUN
Start	Set the time in 12-hour format in the TIME/DATE menu. Avoid overlapping the Start and End time.	12:00A to 11:59P	12:00A
Stop	Set the time in 12-hour format.	12:00A to 11:59P	12:00A
Speed	The camera speed can be set to record at different image rates, ranging from the full speed video rate of 60 IPS (60 images per second) to 0.1 IPS (one image every ten seconds).	60 IPS, 30 IPS, 20 IPS, 15 IPS, 10 IPS, 5 IPS, 2 IPS, 1.5 IPS, 1 IPS, 0.5 IPS, 0.2 IPS, 0.1 IPS	15 IPS
Set	Set the individual timer to ON or OFF.	ON, OFF	OFF

3.2.4.2. Using the Alarm Recording Menu

The TR4 Plus DVR can interface to an external device that can trigger an Alarm event. If an Alarm occurs, the event is marked in the video recording for easy searching during playback. Also, the Recording Speed and Recording Quality can be changed during an external Alarm event. Figure 3-7 shows the options available.
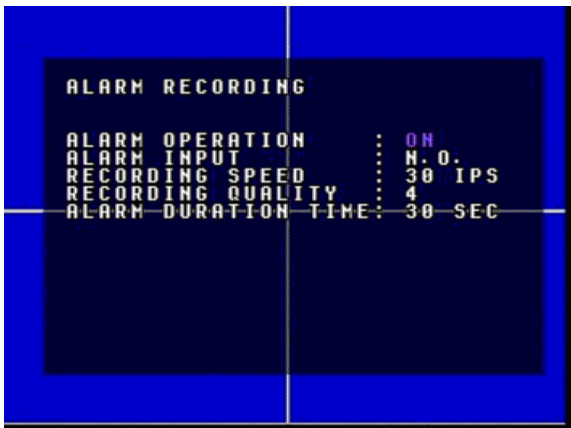
Figure 3-7 Alarm Recording configuration menu

Table 3-6 Alarm Recording configuration items

Menu Item	Description	Values	Default
Alarm Operation	Setting the Alarm Operation to OFF disables the Alarm Input. Setting the Alarm Operation to ON enables the Alarm Input.	ON, OFF	ON
Alarm Input	Alarm input option refers to the type of contact closure required to activate an alarm. All of the alarm inputs are activated by a change reference to signal ground.	• N.O. (normally open) activates an alarm when connected to ground. • N.C. (normally closed) is normally connected to ground and opened to trigger an alarm.	N.O.
Recording Speed	The Recording Speed can be set from 60 IPS TO 0.1 IPS.	60 IPS, 30 IPS, 20 IPS, 15 IPS, 10 IPS, 5 IPS, 2 IPS, 1.5 IPS, 1 IPS, 0.5 IPS, 0.2 IPS, 0.1 IPS	30 IPS

Table 3-6 Alarm Recording configuration items

Menu Item	Description	Values	Default
Recording Quality	The Recording Quality can also be set for the duration of the Alarm Event. For example, changing the quality to 6 (HIGH) would provide a clearer picture during the Alarm. Because the Alarm Events are typically short in duration, increasing the Recording Quality does not have a significant impact on the overall recording time available on the hard drive.	• 1 (Standard) • 2 • 3 • 4 • 5 • 6 (High)	4
Alarm Duration Time	Sets the length of time that the Recording Speed and Recording Quality settings are active. (NON-STOP means that once an Alarm Event has been triggered, the DVR does not exit Alarm Mode until the DVR has been turned off, or you have pressed the STOP button on the front panel (or remote control).	5 SEC, 10 SEC, 30 SEC, 1 MIN, 5 MIN, 10 MIN, 30 MIN, 60 MIN and NON-STOP	30 SEC

3.2.4.3. Recording Capacity

The TR4 Plus DVR uses M-JPEG video compression to extend the recording time on the hard drive. The recording time varies, depending on the settings for images per second (speed) and picture quality.

The picture quality option lets you determine the amount a picture is compressed versus the amount of memory the picture takes up on the hard drive. Table 3-7 shows the range for the picture quality settings where setting 1 is the standard quality and setting 6 provides the highest picture quality. A higher picture quality (6) means lower compression and a higher memory requirement. A lower picture quality (1) means higher compression and a lower memory requirement.

Table 3-7 Picture quality settings

Setting	Picture quality	Compression	Memory requirement
1-STD	Standard	Higher	Lower
2			
3			
4			
5			
6-HIGH	Highest	Lower	Higher

The TR4 Plus DVR can record for extended periods of time, depending on the images rate (IPS) and the picture quality. The following tables provide estimated recording time in hours for 40 GB, 80 GB, 120 GB, and 160 GB hard drives.

Important: The amount of memory the hard drive uses is dependent on the scene content and the lighting conditions. Your actual recording times may vary.

Table 3-8 Estimated recording time in hours with 40 GB hard drive

Images per second (IPS)	Picture Quality					
	1	2	3	4	5	6
60	12 hours	9 hours	7 hours	6 hours	5 hours	4.5 hours
30	24	18	14	12	10	9
20	36	27	21	18	15	13.5
10	72	54	42	36	30	27
5	144	108	84	72	60	54
2	360	270	210	180	150	135
1.5	480	360	280	240	200	180
1	720	540	420	360	300	270
0.5	1440	1080	840	720	600	540
0.2	3600	2700	2100	1800	1500	1350
0.1	7200	5400	4200	3600	3000	2700

Table 3-9 Estimated recording times in hours with 80 GB hard drive

Images per second (IPS)	Picture Quality					
	1	2	3	4	5	6
60	24 hours	18 hours	14 hours	12 hours	10 hours	9 hours
30	48	36	28	24	20	18
20	72	54	42	36	30	27
10	144	108	84	72	60	54
5	288	216	168	144	120	108
2	720	540	420	360	300	270
1.5	960	720	560	480	400	360
1	1440	1080	840	720	600	540
0.5	2880	2160	1680	1440	1200	1080
0.2	7200	5400	4200	3600	3000	2700
0.1	14400	10800	8400	7200	6000	5400

Table 3-10 Estimated recording times in hours with 120 GB hard drive

Images per second (IPS)	Picture Quality					
	1	**2**	**3**	**4**	**5**	**6**
60	36 hours	27 hours	21 hours	18 hours	15 hours	13.5 hours
30	72	54	42	36	30	27
20	108	81	63	54	45	40.5
10	216	162	126	108	90	81
5	432	324	252	216	180	162
2	1080	810	630	540	450	405
1.5	1440	1080	840	720	600	540
1	2160	1620	1260	1080	900	810
0.5	4320	3240	2520	2160	1800	1620
0.2	10800	8100	6300	5400	4500	4050
0.1	21600	16200	12600	10800	9000	8100

Table 3-11 Estimated recording time in hours with 160 GB hard drive

Images per second (IPS)	Picture Quality					
	1	**2**	**3**	**4**	**5**	**6**
60	48 hours	36 hours	28 hours	24 hours	20 hours	18 hours
30	96	72	56	48	40	36
20	144	108	84	72	60	54
10	288	216	168	144	120	108
5	576	432	336	288	240	216
2	1440	1080	840	720	600	540
1.5	1920	1440	1120	960	800	720
1	2880	2160	1680	1440	1200	1080
0.5	5760	4320	3360	2880	2400	2160
0.2	14400	10800	8400	7200	6000	5400
0.1	28800	21600	16800	14400	12000	10800

3.2.5. Using the Signals/Speed/GPS Menu

The TR4 Plus DVR has the ability to record various signals, vehicle speed, GPS, and other information from the vehicle. For example, when the brakes are applied, the text BRK can be recorded on the camera picture.

To view the Signals/Speed/GPS menu:

1. On the main menu, press the CH3/Up arrow or CH4/Down arrow button to highlight Signals/Speed.

2. Press the **ENTER** button.

    The Signals/Speed menu appears as shown in Figure 3-8.
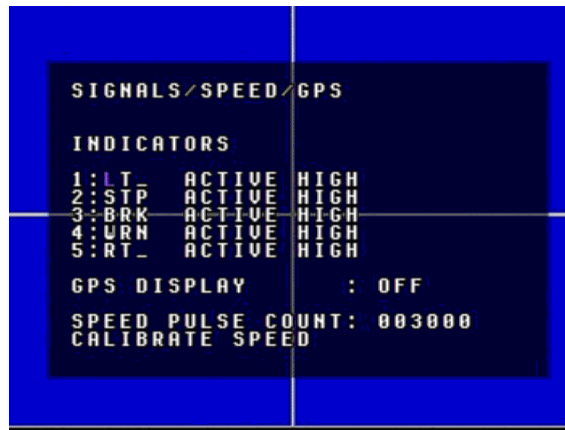
Figure 3-8 Signals menu

To change a setting on the sub-menu:

1. Press the CH3/Up arrow or CH4/Down arrow button to highlight the setting you want to change.

2. Press the CH1/left or CH2/right arrow button to change the value. Or turn the JOG wheel clockwise or counterclockwise to change the value.

3. To exit the menu, press the **MENU** button.

4. Repeat these steps to set the five different signals. See Table 3-12.

Table 3-12 Signal/Speed configuration items

Menu Item	Description	Values	Default
1: LT (Left)	Active High and Active Low indicates the activation level for the signal. If ACTIVE HIGH is selected, then 12 VDC applied to a signal causes the text to be displayed on the screen. If ACTIVE LOW is selected, then 0 VDC applied to a signal causes the text to be displayed on the screen.	ACTIVE HIGH, ACTIVE LOW	LT
2: STP (Stop)			STP
3: BRK (Brake)			BRK
4: WRN (Warning lights)			WRN
5: RT (Right)			RT

Table 3-12 Signal/Speed configuration items

Menu Item	Description	Values	Default
GPS Display	The TR4 Plus DVR can display and record GPS data from an optional external GPS receiver. If the GPS Display option is set to ON, the latitude and longitude of the vehicle location and the vehicle speed are displayed on the screen (see Figure 3-1 on page 3–2). The speed from the GPS will override the settings from the speed pulse count input.	ON OFF	OFF
Speed Pulse Count	The TR4 Plus DVR can record vehicle speed by counting the number of pulses received either from a vehicle speed sensor or a vehicle Transmission Control Module (TCM). The DVR must first be calibrated to the vehicle's speed signal by driving for one mile (kilometer) in Calibration Mode.	2500 to 150,000	003000
Calibrate Speed	For more information, see "Calibrating Speed".		

3.2.5.1. Calibrating Speed

When calibrating speed, it is best to use known road markers to determine a mile as reading the odometer may introduce errors.

To calibrate speed:

1. Press the CH4/down arrow button to select the Calibrate Speed option and press the **ENTER** button.

   Figure 3-9 appears.

Figure 3-9 Calibrate Speed menu

2. Press the Temporary Power button only once to begin calibration.

   Wait approximately two seconds for the system to be ready to start calibration. Figure 3-10 appears.

   To cancel calibration, press the **MENU** button.

   After driving one mile, the SPEED PULSE COUNT may be anywhere from 2500 to 150,000, depending on the type of vehicle speed sensor being used.

Figure 3-10 Calibration in progress menu

3. Press the Temporary Power button again to save the calibration value.

   The DVR will return to the Signals/Speed menu and the new calibrated speed pulse count will be shown.

Important: You can change the speed pulse count to either fine tune the speed display, or to set a known value from a similar vehicle. This is useful if a fleet consists of several models of the same bus. By calibrating one bus, the speed pulse count can then be entered into the DVRs for all of the similar buses. However, if a DVR is moved from one bus to another, the speed may have to be recalibrated due to differences in transmissions, tires, and other factors.

3.2.6. Using the Network Settings Menu

The TR4 Plus DVR has a built-in network interface for connecting to an office network or to certain peripheral devices.

To view the Network Settings menu:

1. On the main menu, press the CH3/Up arrow or CH4/Down arrow button to highlight the setting you want to change.

2. Press the **ENTER** button. Figure 3-11 appears.
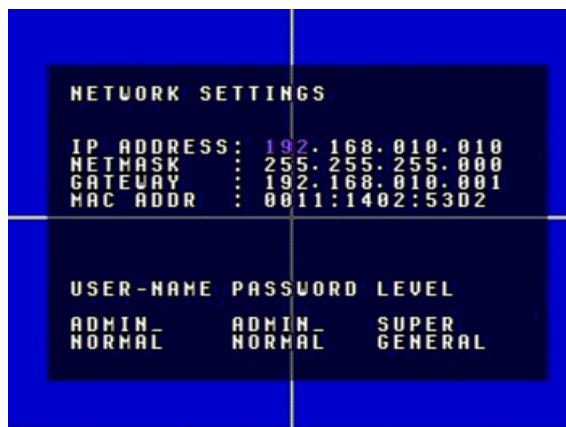
Figure 3-11 Network Settings menu

Table 3-13 Network setting configuration items

Menu Item	Description	Values	Default
IP ADDRESS	For the IP address, enter a static IP address for the DVR. Make sure this address is not used by any other device on the network. If there is a DHCP server on the network, make sure the DVR IP address is not in the IP address range assigned by the DCHC server.		192.168.010.010
NETMASK	Enter the subnet mask for the network (usually 255.255.255.0).		255.255.255.0
GATEWAY	Enter the IP address of the router or gateway on the LAN.		192.168.010.001
MAC ADDR	The MAC address is fixed in the DVR and corresponds to the unique ID of the internal Ethernet controller.		Not configurable

Table 3-13 Network setting configuration items

Menu Item	Description	Values	Default
USER-NAME PASSWORD LEVEL	Two different users can be assigned access to the DVR over a network. The user names are configurable, as are the user passwords. There are three levels of network access for the DVR. • GUEST level only lets a user see what the DVR is recording. • GENERAL level allows a user to review recorded video on the DVR. • SUPER level allows a user to set specific operating parameters of the DVR.	SUPER • Name • Password GENERAL • Name • Password	Admin Admin Normal Normal

3.2.7. Using the System/Defaults Menu

The System/Defaults menu allows controls of system level settings and functions that should only be accessed by authorized individuals.

To view the System/Defaults menu:

1. On the main menu, press the CH3/Up arrow or CH4/Down arrow button to highlight the setting you want to change.

2. Press the **ENTER** button.

The System/Defaults menu appears as shown in Figure 3-12.

Figure 3-12 System/Defaults menu

To change a setting on the sub-menu:

1. Press the CH3/Up arrow or CH4/Down arrow button to highlight the setting you want to change.

2. Press the CH1/Left or CH2/Right arrow button to change the value. Or turn the JOG wheel clockwise or counterclockwise to change the value.

3. To exit the menu, press the **MENU** button.

4. Repeat these steps to set the Alarm Buzzer, Format Disk, System Update, Load Defaults, Format CF Card, and Password options. See Table 3-14.

Table 3-14 System/Defaults configuration items

Menu Item	Description	Values	Default
Alarm Buzzer • Alarm-in • Disk Full • Video Loss	See "Enabling the Alarm Buzzer, Alarm-in, Disk Full, and Video Loss" on page 3–22.	ON, OFF	OFF
Format Disk	See "Formatting Disk (Hard Drive)" on page 3–23.	• NO • YES - will erase all information.	NO

Table 3-14 System/Defaults configuration items

Menu Item	Description	Values	Default
System Update	See "Installing a Software Update" on page 3–24.	NO, YES	NO
Load Defaults	See "Loading the Default Settings" on page 3–25.	NO, YES	Not applicable
Format CF Card	See "Formatting the CompactFlash Card" on page 3–25.	NO, YES	NO
Password	See "Enabling Password Protection" on page 3–26.	• ON, OFF • default password	• OFF • 888888

3.2.7.1. Enabling the Alarm Buzzer, Alarm-in, Disk Full, and Video Loss

The DVR has a built-in alarm buzzer that can be activated under certain warning or alarm conditions. See Figure 3-13.

Figure 3-13 Alarm Buzzer menu

To enable the alarm buzzer:

1. Set the Buzzer Enable to ON to enable the alarm buzzer.

   Buzzer Enable controls the function of Alarm-in, Disk Full, and Video Loss. For example, if both Buzzer Enable and Alarm-in are set to ON, the buzzer sounds when an external alarm is received.

2. To turn the Alarm buzzer off, press any button on the DVR front panel.

To disable the alarm buzzer:

• Set the Buzzer Enable to OFF to disable the alarm buzzer.

   Alarm-in, Disk Full, and Video Loss are also disabled even though one of the three functions may be set to ON.

To enable/disable Alarm-in:

• Set both Alarm-in and Buzzer Enable to ON to sound the alarm buzzer if an external Alarm Input is initiated. The buzzer sounds for the duration of the alarm.

• Set the Alarm-In to OFF to disable this feature.

To enable/disable Disk Full:

• Set both Disk Full and Buzzer Enable to ON to sound the alarm buzzer if the Repeat Record option is ON, and the hard drive has been filled with information.

• Set Disk Full to OFF disable this feature.

To enable/disable Video Loss:

• Set both Video Loss and Buzzer Enable to ON to sound the alarm buzzer if the video input to the DVR is not present. Possible causes include a broken harness, an unplugged connector, or, very rarely, a damaged camera. The buzzer will not turn off unless the video signal is restored, or the Buzzer Enable is OFF in the menu.

• Set Video Loss to OFF to disable this feature.

3.2.7.2. Formatting Disk (Hard Drive)

Formatting the disk will erase all the information on the hard drive and set up the proprietary file structure that the system uses to store information. When a new hard drive is used in the DVR for the first time, it is important to format the disk. See Figure 3-14.

Figure 3-14 Formatting disk

To format the disk:

1. Use the CH3/Up or CH4/Down arrow button to select YES- WILL ERASE ALL INFORMATION.

2. Press the **ENTER** button.

   The screen displays "formatting."

After the hard disk has been formatted, the menu goes back to the System/ Defaults menu and "SUCCESS" will be displayed beside the Format Disk option.

- Choose NO to not format the disk.

3.2.7.3. Installing a Software Update

Important: The software update must be obtained from Seon Design. Attempting to load other software will not work.

The software inside the TR4 Plus DVR can be upgraded in the field as new features are added. The DVR reads the new software from the CompactFlash memory card and reprograms itself.

To install a software update:

1. Insert the CF card into the slot on the on the front of the DVR.
2. Select YES in the System Update menu.

   The screen displays "LOADING FILE..." as it reads the information from the CF card.

   The screen displays "PROGRAMMING" as the DVR reprograms itself.

   After the DVR has reprogrammed itself, the menu goes back to the System/ Defaults menu and "SUCCESS" will be displayed beside the System Update option.

3. Power the DVR off and restart it to finish loading the new software.
4. Load the default settings for the DVR to ensure that all of the new functions have been completely initialized.

Figure 3-15 System Update menu

3.2.7.4. Loading the Default Settings

The default values for all of the DVR options can be loaded at once using the Load Defaults option.

Important: Loading the default settings will erase all of the user-programmed settings including the Title, Delay-On and Delay-Off times and the Timer settings.

To load the default settings:

1. Select YES in the Load Defaults menu.

   The screen displays "LOADING" as the system loads the new default values.

   After the defaults have been successfully loaded, the display returns to the System/Defaults menu and displays "SUCCESS" beside the Load Defaults option.
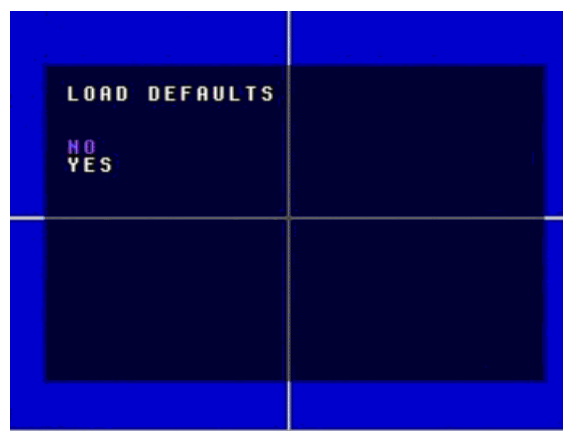
Figure 3-16 Load Defaults menu

3.2.7.5. Formatting the CompactFlash Card

⚠️ **CAUTION: Equipment damage**

The CF Card can only be inserted into the slot one way. The correct orientation is for the top of the card to face to the right of the slot. **Do not** force the CF Card into the slot as the internal connection will be damaged.

To copy information from the DVR onto a CF card, the card must first be formatted using the DVR's proprietary file system.

To format the CF card:

1. Slowly insert the card in the correct orientation into the CF card slot until the connector engages. The card should feel snug in the slot.

2. Select YES in the Format CF Card menu to format the CF card to the proprietary file system. See Figure 3-17.

Figure 3-17 Format CF Card menu

For complete information on the CF Card Reader, see the *TR-CFR Compact Flash Reader and Conversion Software Installation and User's Guide* (document part number 700-0021).

3.2.7.6. Enabling Password Protection

The TR4 Plus DVR can provide password protection that will disable the use of the front panel buttons. When Password Enable is ON, recording cannot be stopped and access to the main menu is blocked unless the password is entered.

To enable password protection:

1. Set the Password Enable option to ON.

    The default password is 888888.

2. Select a 6 digit password using the numbers 1 to 8.

3. Press the CH1/left or CH2/right arrow buttons to change the value or turn the JOG wheel.

4. Press the CH3/Up and CH4/Down arrow buttons to move between characters.

Figure 3-18 Password menu

Operating the DVR

This chapter provides information and procedures for operating the DVR.

4.1. Operating and Monitoring the DVR

The TR4 Plus DVR front panel provides several features which are used to operate and monitor the status of the DVR: the DVR buttons, Temporary Power button, various status indicator lights, and the SHUTTLE/JOG wheel.

This section describes how to use the DVR buttons to operate the DVR. An overview of the all the front panel features is provided in Chapter 1, "Introduction". For more information, see page 1–3 for an illustration of the front panel and Table 1-1 on page 1–3 for a description of the functional features.

4.1.1. Using the DVR Buttons

Some of the DVR buttons are multi-function buttons. When a DVR button is activated, the red LED in the centre of the button is illuminated.

Use the DVR buttons to:

- Enter the menu mode to configure the DVR.
- Play back, stop or pause the video.
- Search for desired information.
- Copy information to a CompactFlash card.

Front panel DVR buttons
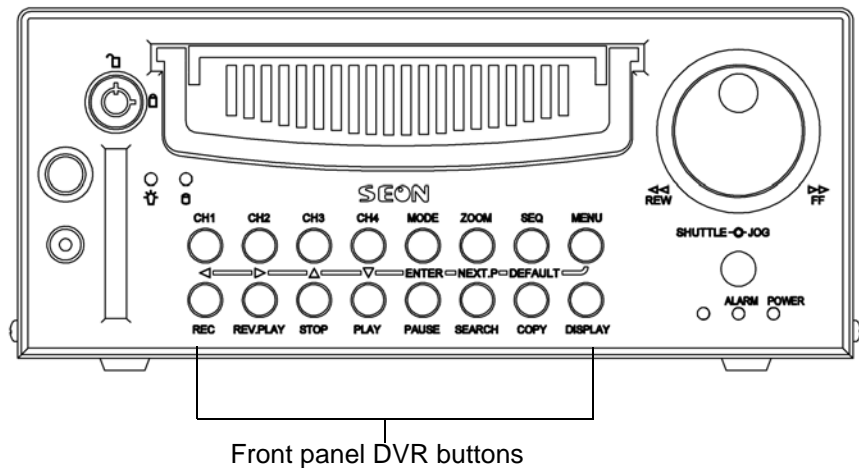
Figure 4-1 Front panel DVR buttons

Table 4-1 Using the DVR buttons

Button	Description
CH1/LEFT ARROW	Press the **CH1/Left arrow** button to: • Display camera 1 on the monitor. • Decrease the value of menu items in the menu system.
CH2/RIGHT ARROW	Press the **CH2/Right arrow** button to: • Display camera 2 on the monitor. • Increase the value of menu items in the menu system.

Table 4-1 Using the DVR buttons

Button	Description
CH3/UP ARROW	Press the **CH3/Up arrow** button to: • Display camera 3 on the monitor. • Scroll up one line of text or move to the next field in the menu system.
CH4/DOWN ARROW	Press the **CH4/Down** arrow button to: • Display camera 4 on the monitor. • Scroll down one line of text or move to the next field in the menu system.
MODE/ENTER	Press the **MODE** button to change the display from quad mode (all four cameras displayed) to PIP (picture-in -picture) mode. • In PIP mode, press the CH1 button to change which camera is in large image and which is the small PIP image. • In quad mode, press any of the camera channel buttons to see that image full screen.
ZOOM/NEXT.P	• Press the **ZOOM** button during recording or playback to magnify the image on the screen 2×. Use the CH1/Left, CH2/Right, CH3/Up, CH4/Down arrow buttons to move the position of the image on the screen. • Press **ZOOM** again to exit Zoom mode.
SEQ/DEFAULT	• Press the **SEQ** button during recording or playback to cycle the display between quad image mode and individual camera views. The cycle time for each view is 3 seconds. • Press **SEQ** button again to exit **SEQ** mode.
MENU	Press the **MENU** button to enter and exit the main menu of the DVR.
REC	Press the **REC** button to start the DVR recording if the DVR is not playing video or in the menus. When the DVR is recording, the **REC** button is illuminated.
REV.PLAY	During playback or when the video is stopped, press the **REV.PLAY** button to start playing the video in reverse.
STOP	Press the **STOP** button to stop the DVR from recording or playing.
PLAY	If the DVR is not recording, press the **PLAY** button to start playing the recorded video and audio.
PAUSE	Press the **PAUSE** button to pause the video playback and provide a still frame video image.
SEARCH	• Press the **SEARCH** button to provide a Search menu for quickly finding the desired information. • Exit the Search menu by pressing the **MENU** button. See "Using the Search Function" on page 4–4.
COPY	Press the **COPY** button to provide a menu for backing up information to a CompactFlash card. See "Using the COPY Button" on page 4–8.
DISPLAY	• Press the **DISPLAY** button for on-screen information such as the recording speed, current time, date, system voltage, hard drive, and recording status. • Press the **DISPLAY** button several times to choose the desired the on-screen information. If the GPS display is turned on, the current vehicle latitude, longitude, and speed are displayed on-screen.

4.2. Playing Back Recorded Video

To playback video:

1. If the DVR is not recording, press the **PLAY** button to start playback of the recorded video and audio.

2. During playback or when the video is stopped, press the **REV.PLAY** button to start playing the video in reverse.

4.2.1. Using the SHUTTLE/JOG Wheel to Adjust the Playback Speed

During video playback, the **SHUTTLE** (outer) wheel and **JOG** (inner) wheel can be used to speed up or slow down the reviewing process. The play-speed is displayed on the screen.

To speed up the playback process:

- Press the **PLAY** button and turn the **SHUTTLE** wheel clockwise to speed the play forward from 1× to 2×, 4×, 6×, 8×, 16×, 32×, and 600× the normal speed.

- Press the **REV.PLAY** button and turn the **SHUTTLE** wheel counter clockwise to speed the play backward from 1× to 2×, 4×, 6×, 8×, 16×, 32×, and 600× the normal speed.

To slow down the playback process:

- Press the **PAUSE** button during playback and turn the **JOG** wheel clockwise or counter clockwise to move the images one frame at a time.

- Press the **PAUSE** button during playback and turn the **SHUTTLE** wheel clockwise or counter clockwise to reduce the play to a very slow rate.

    This feature can be very useful when trying to identify the exact image where an incident occurs.

4.3. Using the Search Function

The TR4 Plus DVR includes a powerful search function that lets you quickly find recorded information by segment list, alarm list, or by date/time.

To view the Search menu:

1. If the DVR is recording, press the **STOP** button on the front panel of the DVR.

2. Press the **SEARCH** button.

    The Search menu appears as shown in Figure 4-2.

Figure 4-2 Search menu

To change a setting on the sub-menu:

1. Press the CH3/Up arrow or CH4/Down arrow button to highlight the setting you want to change.

2. Press to advance through the fields.

3. Press the **ENTER** button to enter the sub-menu for the desired option.

4. To exit the sub-menu, press the **MENU** button.

4.3.1. Searching for Recorded Information By Segment List

Searching by segment list lets you choose between video clip segments. The start date and time for each segment is displayed in a list. See Figure 4-3. A segment size depends on the recorded image rate (IPS) and the picture quality.

To search by segment list:

1. In the Segment Search menu, use the CH3/Up and CH4/Down arrow buttons to move to the desired segment list.

2. Turn the JOG (inner) wheel clockwise or counter clockwise to navigate to the previous page or next page.

3. Press the **ENTER** button to begin playing the desired segment.

4. Press the **MENU** button to return to the Search menu.

Figure 4-3 Segment search

4.3.2. Searching for Recorded Information By Alarm List

Searching by alarm list lets you quickly identify any problems that the driver may have indicated by pressing the Alarm Input Switch.

To search by alarm list:

1. In the Alarm Search menu, use the CH3/Up and CH4/Down arrow buttons to move to the desired alarm list. See Figure 4-4.

    The alarm list shows the date, time, and the alarm type. See Table 4-2.

Table 4-2 Alarm types

Type of Alarm	Description
A1	External Alarm Input
V1	Video Input is not detected (Video Loss).
VA	All video signals are disconnected.
PL	Power disconnected while DVR was recording (Power Loss).

2. Turn the JOG (inner) wheel clockwise or counter clockwise to navigate to the previous page or next page.

3. Press the **ENTER** button to start the DVR playing the selected alarm.

    If the chosen alarm event was a Video Loss (V1) or Power Loss (PL), then the DVR starts playing immediately after the video or power returned.

4. Press the **REV.PLAY** button to play the video backwards to the time before the event occurred.

5. Press the **MENU** button to return to the Search menu.
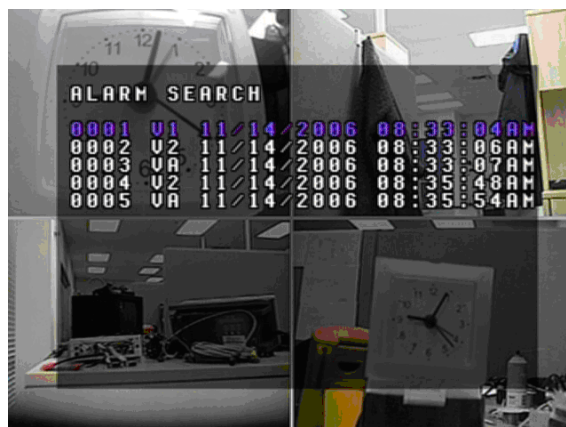
Figure 4-4 Alarm search menu

4.3.3. Searching for Recorded Information By Date/Time

Searching by Date/Time lets you search by the date and time that the alarm event occurred, as shown in Figure 4-5.

To search by date/time:

1. In the Date/Time Search menu, choose the desired date and time by using the CH1/Left and CH2/Right arrow buttons to change a field.

2. Use the CH3/Up and CH4/Down arrow buttons to move between fields.

3. When the desired date and time are selected, press the **ENTER** button. The DVR starts playing the segment from the chosen time.

4. Press the **MENU** button to return to the Search menu.

Figure 4-5 Date/Time search menu

4.3.3.1. Search Menu Configuration Items

Table 4-3 Search menu configuration items

Menu Item	Description	Values	Default
DATE	Set the date.	MM-DD-YYYY • 01 to 12 for the month • 01 to 31 for the day • 2000 to 2099 for the year	Not applicable
TIME	Set the time in 12 hour format.	HH-MM-SS • 12 AM to 11 PM for the hour • 00 to 59 for the minute • 00 to 59 for the second	Not applicable

4.4. Using the COPY Button

The TR4 Plus DVR can save information to a CF card. To review the video stored on the CF card, a special program is required to convert the proprietary format files to a format that can be played on a standard PC. See the *TR-CFR Compact Flash Reader and Conversion Software Installation and User's Guide* (Document part number 700-0021).

You can save individual images or video sequences to the CF card.

To save a single image:

1. Playback the video until you find the desired image.

2. Press the **PAUSE** button to freeze the image.

3. Turn the **JOG** wheel clockwise or counter clockwise to move forward or backward through the images until you find the desired image.

4. Press the **COPY** button to save the image to the CF card.

   "Success" is displayed on screen.

To save video sequences (and audio) to a CF Card:

1. Press the **COPY** button.

   Backup Images to CF Card menu appears as shown in Figure 4-6.

2. Press the CH3/Up arrow or CH4/Down arrow button to highlight the setting you want to change.

3. Press the CH1/Left or CH2/Right arrow button to change the value. Or turn the **JOG** wheel clockwise or counterclockwise to change the value of a menu item.

4. Press the **ENTER** button to copy the video to the CF card.

5. Press the **MENU** button to return to the previous display.

Important: To copy video, there must be information recorded at the START time and END time. If there is no video, an error message is displayed. Use the Playback and Search functions to confirm START and END times.

Figure 4-6 Backup Images to CF Card menu

Table 4-4 Backup images to CF Card menu items

Menu Item	Description	Values	Default
START	Set the start date and time in 12-hour format. Adjusting the month when the day is invalid, for example, February when the day field is "30" will cause the day to be set to "01."	MM-DD-YYYY • 01 to 12 for the month • 01 to 31 for the day • 2000 to 2099 for the year HH-MM-SS • 12 AM to 11 PM for the hour • 00 to 59 for the minute • 00 to 59 for the second	Not applicable
END	Set the end date and time in 12-hour format.	MM-DD-YYYY • 01 to 12 for the month • 01 to 31 for the day • 2000 to 2099 for the year HH-MM-SS • 12 AM to 11 PM for the hour • 00 to 59 for the minute • 00 to 59 for the second	Not applicable

4.5. Using the LOCK Button

The front keypad on the DVR can be manually locked or unlocked by using the **LOCK** button or by changing the Password Enable settings in the System menu. See "Using the System/Defaults Menu" on page 3–21.

If the Password Enable option is set to ON (enabled), the front keypad will be locked out and pressing the **LOCK** button will have no effect. This will work in Live mode, Record mode or Alarm Record mode.

To lock out the front panel keypad if the Password Enable option is OFF:

1. Press the **LOCK** button for 3 seconds.

    The red LED on the **LOCK** button will be illuminated.

2. To disable the lock, enter the password while pressing the **FULL** button.

    The red LED on the **LOCK** button will not be illuminated.

4.6. Turning the Alarm Buzzer to OFF/ON

The DVR has a built-in alarm buzzer that can be activated under certain warning or alarm conditions. The alarm buzzer settings can be configured in the System/ Defaults menu. For more information, see "Enabling the Alarm Buzzer, Alarm-in, Disk Full, and Video Loss" on page 3–22.

To turn the alarm buzzer OFF/ON:

1. Press the **BUZZER** button when the buzzer is illuminated and sounding to turn the alarm buzzer OFF.

    This has the same effect as turning the Alarm Buzzer Enable feature in the System/Defaults menu to OFF.

2. Press the **BUZZER** button again to enable the buzzer operation.

3. Check your settings in the System/Defaults menu to see which buzzer settings have been set to ON.

4.7. Replacing the Hard Drive

The TR4 Plus DVR has a removable hard drive that is contained in a hard drive tray. The hard drive has a lock which secures the hard drive during operation. Use the hard drive key to lock and unlock the hard drive.

4.7.1. Removing the Hard Drive

Important: While the hard drive is hot-swappable, (the hard drive can be removed when the DVR is powered up), do not remove the hard drive while the DVR is recording as the video segment may not be recorded. Press the **STOP** button before unlocking and removing the hard drive.

To remove the hard drive:

1. Press the **STOP** button.

2. Use the hard drive key to unlock the hard drive on the front panel.

3. Insert the hard drive key, turn counter clockwise by ¼ turn until the drive lock is in the unlocked position.

    The Hard Drive power indicator (green) will turn off.

4. Lift up on the hard drive tray handle and gently pull out the hard drive.

4.7.2. Installing the Hard Drive

To install the hard drive:

1. Slide in a hard drive tray until the tray seats inside the front panel.

2. Ensure the handle is lying down against the tray.

3. Insert the hard drive key, turn clockwise by ¼ turn until the drive lock is in the locked position.

   The Hard Drive power indicator (green) will illuminate.

4.8. Downloading Video to a Personal Computer

Downloading video to a PC is described in the *HD Reader User's Guide* (document part number 700-0036). Please refer to this user guide which is available online at **www.seon.com**.

4.9. Voltage Display

The TR4 Plus System displays and records the input voltage of the vehicle on-screen, as shown in Figure 4-7. To change the ON/OFF settings for voltage display, see "Using the Titles/Display Menu" on page 3–6.

Figure 4-7 On-screen display of voltage and other information

Monitoring the status of the input voltage lets you know if problems are encountered with low voltage from the vehicle power supplies. If the voltage to the DVR is too low, the quality of the video signal from the camera will be very poor, resulting in a poor recording.

4.10. LOW VOLTAGE/LOW/HIGH TEMP Indicator

In addition to the on-screen voltage display, the TR4 Plus DVR has a red LOW VOLTAGE/LOW/HIGH TEMP indicator on the back of the DVR. The indicator illuminates when the voltage level to the DVR is too low, as shown in Table 4-5.

Table 4-5 LOW VOLTAGE/LOW/HIGH TEMP indicator

Voltage level to the DVR	LOW VOLTAGE/LOW/HIGH TEMP indicator will …	Status of the DVR
Below 10.5 VDC	Illuminate	The DVR will stop recording and begin to shut down as the voltage is too low to operate the camera properly.
Rises to 11 VDC	Turn off	DVR operation will return to normal.

The LOW VOLTAGE/LOW/HIGH TEMP indicator also illuminates according to the temperature inside the DVR. The settings are described in "Advanced Smart-Temp".

4.11. Advanced Smart-Temp

The TR4 Plus System incorporates several advanced features such as the Advanced Smart-Temp™. Advanced Smart-Temp and the built-in heater ensure safe operation of the DVR over a wide temperature range by monitoring the temperature inside the DVR to ensure the hard drive operates in a safe environment. In many areas, the temperature drops well below 40°F (4°C) and quite often below 32°F (0°C). Most computer hard drives are designed to work from about 40°F (4°C) to about 120°F (49°C).

Table 4-6 Advanced Smart-Temp features

Temperature inside DVR	Advanced Smart-Temp…	LOW/HIGH TEMP Indicator status
Below 40°F (5°C)	Turns on the internal heater and pulses the system fan to circulate the warm air.	Flashes to indicate that the temperature is too low.
Below 5°F (–15°C)	Will not power the DVR at all, although the hard drive can still be removed from the DVR.	Flashes to indicate that the temperature is too low.
Above 113°F (45°C)	Turns on the system fan.	Flashes to indicate that the temperature is too high.
Above 140°F (60°C)	Shuts down the DVR to protect the hard drive from damage. The system fan will continue to operate.	Flashes to indicate that the temperature is too high.

Maintenance and Returning Product for Service

This chapter provides information and procedures for performing periodic maintenance on the TR4 Plus System and returning any part of the system for service.

5.1. Maintenance

5.1.1. Cleaning the Lock Box

The lock box is made from 18 gauge steel, coated with an outdoor powder paint and only requires periodic cleaning. To clean the lock box, use a damp cloth with a mild detergent. Do not allow water into the ventilation holes on the lock box.

5.1.2. Cleaning the Camera and Window

The camera has a powder painted stainless steel enclosure. To clean the camera enclosure, use a damp cloth with a mild detergent. To clean the camera window, use a soft, clean cloth to avoid scratching the window.

5.1.3. Replacing the Fan Filter

Depending on the operating environment, the fan filter on the back of the DVR enclosure may need to be changed occasionally. Check the filter monthly for excess dirt and replace the filter when it restricts airflow. Failure to replace a blocked filter may result in the DVR shutting down on a hot day due to inadequate air circulation.

If you need a new fan filter, contact your dealer or Seon Design to obtain a replacement.

To replace the fan filter:

1. Remove the filter cover by gently prying it off with a small flat screwdriver.
2. Discard the used filter and place a new filter back into the filter holder.
3. Push the filter cover back into the holder and snap it into place.
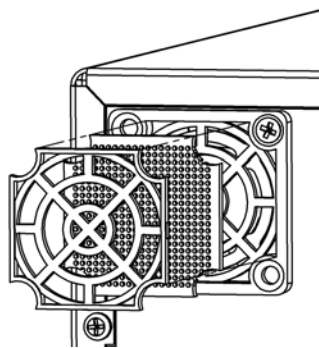
Figure 5-1 Replacing the fan filter

5.2. Returning Product for Service

If any part of the TR4 Plus System is to be returned to Seon Design Inc. for service, please contact Seon, provide the model and or serial number of your unit, and ask for a Return Authorization (RA) number. An RA number allows the service technicians to better track your product when it comes in for service. Please have the RA number clearly marked on the outside of the shipping box. **ANY PRODUCT SENT TO SEON DESIGN INC. WITHOUT AN RA NUMBER MAY BE REFUSED.**

The contact numbers for Seon Design Inc. are:

Toll Free Telephone	1.877.630.7366
Direct Telephone	604.941.0880

Please refer to the "SEON DESIGN® INC. PRODUCT WARRANTY" on page W–1 to review the terms of warranty service, contact and shipping information, as well as other important issues regarding the service and operation of your system.

Troubleshooting

This chapter provides information and procedures on troubleshooting the TR4 Plus System.

6.1. Troubleshooting the TR4 Plus System

The TR4 Plus System is designed for high reliability of operation. If, however, you have any problems with your system, read this Troubleshooting chapter. If you cannot resolve the issue, contact Customer Service at Seon Design.

Symptom	Possible Cause and Solution
All system problems.	Many system problems are caused by issues with the power supplied to the DVR. Check the following: • The voltage to the system may be too low. Check the LOW VOLTAGE/LOW/HIGH TEMP indicator on the back of the DVR. See page 1–6 for location of the LOW VOLTAGE/LOW/HIGH TEMP indicator. • The power harness from the DVR must be connected as close to the battery as possible. Check the wiring to the battery. See page 2–8. • Check the in-line fuses and fuse holders. If a fuse is blown, determine the cause before replacing it. See page 2–8.
The DVR does not power on.	• Is the internal temperature below 40°F (5°C)? Check the flashing LOW VOLTAGE/LOW/HIGH TEMP indicator on the back panel of the DVR. The DVR temperature must be above 40°F to operate. The DVR internal heater can help to quickly raise the internal temperature of the DVR. • Is the power and ignition harness plugged into the DVR securely?
The DVR powers on and the green power indicator is illuminated on the front panel, but the unit does not start recording.	• Check the ignition wiring from the power input harness. Is the yellow wire connected to an ignition switched circuit? • Is the hard drive installed properly with the key in the locked position on the front panel? • Is the temperature below 40°F (5°C)? Check the flashing LOW VOLTAGE/LOW/HIGH TEMP indicator on the back of the DVR. Wait for the DVR to warm up and start recording. • Is the temperature above 122°F (50°C)? Check the flashing LOW VOLTAGE/LOW/HIGH TEMP indicator on the back of the DVR. Check the fan filter on the back panel for any blockage. If necessary, replace the fan filter. See page 5–2. • Check the battery voltage. • Check the Delay-On Time settings in the Record menu. See page 3–7. • Are the Timers on? See page 3–10. • Check the setting for Repeat Record? Go to temporary power and set the Repeat Record to ON.
No Voltage level, Speed or Signals displayed on playback.	• Check Display Voltage is turned ON. For more information, see "Using the Titles/Display Menu" on page 3–6. • Check the Signals/Speed menu to confirm the selected menu items are configured properly.
Incorrect speed levels displayed.	• Check the calibration settings in the Signals setup menu to make sure that the speed level is calibrated correctly. See page 3–16.

Symptom	Possible Cause and Solution
The DVR power indicator is illuminated, but there is no picture on the video monitor output.	• Check the connections inside the camera and to the DVR lock box. • Is the LOW VOLTAGE/LOW/HIGH TEMP indicator on the back panel illuminated? • Check for harness damage. • Check that you are connected to the right output for video out.
The live camera picture is snowy, fuzzy, or grainy.	• Check all the connections inside the camera. • Is the camera cable damaged? • Check the connections inside the DVR lock box. • Is the DVR power harness connected directly to the bus battery?
The playback picture is snowy, fuzzy, or grainy.	• Is the power input harness connected to the battery? • Check the video monitor cable attached to the front or back of the DVR.
Very low or no audio on playback with camera microphone.	• Is the sensitivity adjustment on the audio module in the camera turned down too low? See the product documentation for the camera to adjust the setting. • Is the camera cable wired correctly to the terminal blocks inside the camera? • Is the camera connector damaged or not plugged into the DVR securely? • Is the record audio feature disabled?
Very low or no audio on playback with remote microphone.	• Is the audio sensitivity adjustment in the remote microphone turned down too low? See the product documentation for the camera to adjust the setting. • Is the harness wired correctly to the terminal blocks inside the camera? • Is the remote microphone audio or power connector damaged or not correctly plugged into the DVR?
The alarm buzzer is sounding.	• Press the **BUZZER** button on the front panel of the DVR to turn off the alarm buzzer. Check the settings in the "Using the System/Defaults Menu" on page 3–21 to determine what caused the alarm buzzer to sound and clear the problem.
No Temporary Power.	• Turn the vehicle ignition off. The temporary power feature will not work while the vehicle ignition is on.

Specifications

This appendix provides the product specifications for the Trooper TR4 Plus Mobile Digital Video Recording (DVR) System.

Note: Specifications are subject to change without notice.

A.1. TR4 Plus DVR

Video Input/Output	75 Ohm NTSC video
Video Resolution	720 × 480 pixels
Video Compression	M-JPEG (Motion JPEG)
Hard Drive File Format	Proprietary
Hard Drive Style	2.5" Mobile
Hard Drive Size	40 GB, 80 GB, 120 GB, or 160 GB
Hard Drive Removal	Hot swappable, locking key-secured
Camera Input Connectors	4 × 6-pin mini DIN connector
Audio Input Level	–8 dBm
Audio Output Level	–6 dBm, 10 kOhm
Operating Temperature	40°F to 122°F (5°C to 50°C)
Operating Humidity	0 – 90% relative humidity, non-condensing
Operating Voltage	8 to 18 VDC[1]
Transient Protection	400 W
Temperature Protection	Advanced Smart-Temp (High Temperature, Low Temperature, and Extreme Low Temperature)
Power Harness Connector	4-pin Molex® Mini-fit Jr™, High cycle
Alarm Input Connector	2-pin Molex Micro-fit, Gold plated
Signals Input Connector	6-pin Molex Micro-fit, Gold plated
Speed Input Connector	3-pin Molex Micro-fit, Gold plated
GPS Input Connector	4-pin Molex Micro-fit, Gold plated
LAN Connector	8-pin RJ-45 Ethernet
Dimensions (H × W × D)	3.75 × 8.5 × 12.5" (95 × 216 × 318 mm)
Weight	7 lb (3.2 kg)
Weight with SCT-LD brackets	8.5 lb (3.85 kg)
Power Circuit Fuse	5 A
Ignition Circuit Fuse	1 A

1.The DVR operates between 8 to 18 VDC; however, when the voltage is below 10.5 VDC, the system will start to shut down as the voltage is too low to operate the camera properly. See "LOW VOLTAGE/LOW/HIGH TEMP Indicator" on page 4–12.

A.2. TR4 Plus DVR Functional Features

Time Format	12 hour mode
Date Format	MM/DD/YYYY
Daylight Saving Time	ON (Automatic) and OFF, Configurable Start and Stop
Main Title	28 characters
Camera Titles	12 characters per title
Repeat Record	User selectable ON/OFF
Delay-On	Off, 15 seconds to 60 minutes with Smart-Start
Delay-Off	Off, 15 seconds to 60 minutes
Daily Timers	12 with variable recording speed and image quality
Alarm Input	User selectable ON/OFF with variable recording speed, Image Quality and Alarm Duration
Signal Inputs	5, Configurable labels, Active High or Active Low
Speed Input	Optional harness, Pulse counting type
GPS Input	Latitude, longitude, and vehicle speed
Playback Search	Segment File, Alarm Event or Date Time
Playback Speed	Image-by-Image, 2×, 4×, 6×, 8×, 16×, 32×, 600×
Backup Devices	Analog Output, Digital Output to CompactFlash, Removable hard drive
CompactFlash Card	Type 1 only, SanDisk® Ultra® II or equivalent

A.3. Lock Box

Main Enclosure	18 gauge cold rolled steel (CRS)
Enclosure Brackets	18 gauge CRS
Coating	Outdoor polyester powder paint, black
Tray Slide Rails	Industrial UHMW-PE
Door Lock	Industrial cam lock, keyed alike. Different keying available.
Dimensions (H × W ×D)	$4.5 \times 12 \times 15$" ($114 \times 305 \times 380$ mm)
Weight	8 lb (3.6 kg)

SEON DESIGN® INC. PRODUCT WARRANTY

Seon Design Inc. (Seon) warrants the cameras and components listed below against defects in workmanship and materials provided that such defects appear or are discovered within the respective periods specified below and provided further that the purchaser of such products notifies Seon of such defects within thirty (30) days of the appearance or discovery of such defects:

• Five (5) years from date of purchase parts and labor on the SA Wedge Camera Series

• One (1) year from date of purchase parts and labor on the SA-IR Illuminator

• One (1) year parts and labor on the Trooper® Mobile DVR Systems

• One (1) year from date of purchase parts and labor on all other products and accessories

All service/replacement parts and repairs are warranted for a period of 90 days.

Subject to the terms and conditions listed below, during the relevant warranty period, Seon will repair, replace, or refund the purchase price for the defective product, whichever Seon considers to be appropriate in the circumstances, in Seon's sole and arbitrary opinion, free of charge, any defective products returned prepaid. In the event purchaser has a problem with any Seon product, please call and request a **RETURN AUTHORIZATION (RA) NUMBER** from the Service Department.

Please call 877-630-7366 or (604) 941-0880 and ask for the Service Department. Be sure to have the model number, serial number and the nature of the problem available for the customer service representative. Prior authorization **MUST** be obtained for all returns, exchanges, or credits. **ITEMS SHIPPED TO SEON WITHOUT A CLEARLY IDENTIFIED RA NUMBER MAY BE REFUSED.**

Products returned will be tested to verify the defect. Upon verification of the defect, the product will be repaired or exchanged, or the purchase price will be refunded or credited to the customer's account, at the sole option of Seon. In the event of replacement, the returned product will be credited to the customer's account and a new invoice issued for the replacement item. Seon reserves the right to refund the purchase price or to issue a credit only in lieu of replacement.

Seon may use new or refurbished replacement parts for repairing its products, at its sole and arbitrary discretion. Seon may replace an entire unit with an equivalent model, at its sole and arbitrary discretion. If a unit is exchanged, the returned product shall become the property of Seon and the exchange product becomes the property of the purchaser, and the remainder of the warranty that applied to the original unit purchased shall apply to the exchanged product. Exchange units may be new units or units that have been repaired to full factory specifications at Seon's discretion.

If the product is found to be in good working order or its inability to function properly is not covered by this warranty, the product will be returned in the same condition as received unless repair is possible and requested by the customer. Repairs of such nature will incur a charge for parts and labor and will proceed only by agreement with the customer to accept the charge.

This warranty shall not apply:

(a) to equipment not supplied by Seon;

(b) to equipment, including, any components, which shall have been operated in excess of rated capacity, subject to negligence, accident, or damage by circumstances beyond Seon's control, or to improper installation, operation, maintenance, servicing, alterations or storage, modification without Seon's written authorization, misuse, vandalism, fire, floods or acts of nature so as, in Seon's exclusive and arbitrary judgment, to affect the same adversely; or

(c) if the serial number for the product has been altered in any way.

(d) if the product has been operated outside of the specified Operating Environment specified in the Seon Users Manual for such product.

DISCLAIMER

THIS WARRANTY IS EXCLUSIVE AND IN LIEU OF ALL OTHER REPRESENTATIONS, WARRANTIES, GUARANTEES AND CONDITIONS, EXPRESS OR IMPLIED, STATUTORY OR OTHERWISE AND WITHOUT LIMITING THE GENERALITY OF THE FOREGOING, SEON EXPRESSLY DISCLAIMS AND EXCLUDES ANY IMPLIED WARRANTY OF MERCHANTABILITY, DURABILITY OR FITNESS FOR PURPOSE AND ANY WARRANTIES OR MODIFIED WARRANTIES ARISING FROM USAGE OF TRADE OR COURSE OF DEALING.

Any description of the goods or services, whether in writing or made orally by Seon or Seon's agents, specifications, samples, models, bulletins, drawings, diagrams, engineering sheets or similar materials used in connection with customer's order are for the sole purpose of identifying the goods and/or services and shall not be construed as an express warranty. Any suggestions by Seon or Seon's agents regarding use, applications or suitability of the goods and/or services shall not be construed as an express warranty unless confirmed to be such in writing by Seon. Purchaser assumes full responsibility for selecting products to achieve purchaser's intended purposes, for properly installing and using those products, and for verifying the results obtained therefrom.

PURCHASER'S EXCLUSIVE REMEDY AND SEON'S ENTIRE LIABILITY ARISING FROM OR IN CONNECTION WITH PURCHASER'S USE OF THE PRODUCTS AND/OR THIS AGREEMENT SHALL BE REPAIR OR REPLACEMENT OF DEFECTIVE PRODUCTS, OR REFUND OR CREDIT OF THE PURCHASE PRICE OF THE PRODUCTS AS SET FORTH ABOVE. SEON SHALL NOT BE SUBJECT TO AND DISCLAIMS: (A) ANY OTHER OBLIGATIONS OR LIABILITIES ARISING OUT OF BREACH OF CONTRACT OR OF WARRANTY, (B) ANY OBLIGATIONS WHATSOEVER ARISING FROM TORT CLAIMS (INCLUDING NEGLIGENCE, AND STRICT LIABILITY) OR ARISING UNDER OTHER THEORIES OF LAW WITH RESPECT TO GOODS SOLD OR SERVICES RENDERED BY SEON, OR ANY UNDERTAKINGS, ACTS OR OMISSIONS RELATING THERETO, AND (C) ALL CONSEQUENTIAL, INCIDENTAL, SPECIAL AND CONTINGENT DAMAGES WHATSOEVER, EVEN IF SEON HAS BEEN SPECIFICALLY ADVISED OF THE POSSIBILITY OF SUCH DAMAGES.

Without limiting the generality of the foregoing, Seon specifically disclaims any liability for property or personal injury damages, penalties, special or punitive damages, damages for lost profits or revenues, loss of use of goods or any associated equipment, cost of capital, cost of substitute goods, facilities or services, down-time, shut-down or slow-down costs, or for any other types of economic loss, and for claims of customer's customers or any third party for any such damages. Some jurisdictions do not allow limitation or exclusion of incidental or consequential damages, so this limitation or exclusion may not apply to purchaser. In no event shall Seon's total liability for any damages to purchaser or any other person in connection with the products or this agreement exceed the lower of the suggested list price or the actual price paid for the products, regardless of whether such liability arises from contract, tort, warranty or any other form of claim.

If any provision of this agreement is found to be void, invalid, or unenforceable, that finding shall not affect the remaining provisions, all of which shall be enforced to the full extent permitted by law. If any remedy hereunder is determined to have failed of its essential purpose, the limitations of liability and exclusion of damages set forth above shall remain in full force and effect. This agreement may be modified only in writing signed by a duly authorized representative of Seon.

Provisions Applicable to American Customers

For those customers whose mailing address is in the United States, Seon's offer and any agreement of sale resulting therefrom shall be governed by and construed in accordance with the internal and domestic laws of the State of WASHINGTON without giving effect to the conflict of laws rules thereof. The Superior Court of Washington for Whatcom County and U.S. District Court for the Western District of Washington ("the U.S. Closed Courts") shall have exclusive jurisdiction to entertain and determine all disputes and claims, whether for specific performance, injunction, declaration or otherwise arising out of or in any way connected with the construction, breach, or alleged, threatened or anticipated breach of the contract resulting from this offer and shall have jurisdiction to hear and determine all questions as to the validity, existence or enforceability thereof. Customer specifically consents to such Court's exercise of jurisdiction over it. The purchaser attorns to the exclusive jurisdictions of the jurisdiction of the U.S. Closed Courts, waives any obligation to venue in any action or proceeding regarding Seon Products and waives any objection that the U.S. Closed Courts are an inconvenient forum or do not have jurisdiction over the purchaser of Seon. The United Nations Convention On Contracts For The International Sale Of Goods shall not apply.

Provisions Applicable to Canadian Customers

For those customers whose mailing address is in Canada, Seon's offer and any agreement of sale resulting therefrom shall be governed by and construed in accordance with the internal and domestic laws of the Province of BRITISH COLUMBIA and the laws of Canada applicable therein without giving effect to the conflict of laws rules thereof. The courts of British Columbia (the "Canadian Closed Courts") shall have exclusive jurisdiction to entertain and determine all disputes and claims, whether for specific performance, injunction, declaration or otherwise arising out of or in any way connected with the construction, breach, or alleged, threatened or anticipated breach of the contract resulting from this offer and shall have jurisdiction to hear and determine all questions as to the validity, existence or enforceability thereof. The purchaser attorns to the exclusive jurisdictions of the jurisdiction of the Canadian Closed Courts, waives any obligation to venue in any action or proceeding regarding Seon Products and waives any objection that the Canadian Closed Courts are an inconvenient forum or do not have jurisdiction over the purchaser of Seon. The United Nations Convention On Contracts For The International Sale Of Goods shall not apply.

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