EAGLE PLUS

2.4 GHz Wireless Video/Audio/Data Transmission System

Installation and Operating Instructions

Quick Start Guide

1• Verify proper operation of camera and monitor/event recorder using coaxial cable prior to installing wireless link.

2• Install transmitter and receiver units in desired location to 2 3/8" diameter steel pole per installation drawing. The pole *must be* securely mounted so that it does not move.

3• Install antennas above the enclosures and position as shown in Figure 2.

WARNING

USE EXTREME CARE WHEN INSTALLING ANTENNAS NEAR POWER LINES.

4• Slide heatshrink over antenna cable. Tighten antenna cable to receiver and transmitter. Heat up the heatshrink until it contracts around the connector junction..

5• Connect video, audio, power, alarm, PC interface cables as needed to units through flanges. Tighten flanges to allow small air gap at bottom of enclosure.

IMPORTANT NOTE:
Power adapter must be kept dry.

6• Verify that LEDs are lit up and transmitter and receiver are on same channel.

7• Tighten lid of enclosure down.

CAUTION

DO NOT APPLY POWER TO THE TRANSMITTER UNLESS THE ANTENNA IS CONNECTED. PERMANENT DAMAGE MAY RESULT.

Your Trango Wireless Video System

Congratulations on choosing Trango Systems, Inc. to fulfill your wireless video needs. Unpack your system carefully. If any items are missing, notify your sales representative. If an item appears to be damaged from shipment, replace it in its packing material and notify the shipper.

Save the packaging for further storage of the equipment.

Service:

If the unit ever needs repair service, contact Trango Systems customer service at (858) 653-3900 for return authorization and shipping instructions.

FCC Information:

Note: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy, and if not installed and used in accordance with these instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to correct the interference by one of more of the following measures:

1) Reorient the receiving antenna;
2) Increase the separation between the affected equipment and the receiver;
3) Connect the affected equipment to an outlet on a different circuit from that which the receiver is connected to;
4) Consult the dealer and/or experienced radio/TV technician for help.

VTX2400: # NCYVTX2500

<u>IMPORTANT NOTE:</u>
Intentional or unintentional changes or modifications not expressly approved by the party responsible for compliance must not be made. Any such modifications could void the user's authority to operate the equipment.

System Description:

The EAGLE PLUS Wireless Video System is a professional quality system designed for sending composite NTSC or PAL video, audio, and alarm signals using 2.4 GHz wireless technology. The system is ideal for permanent or temporary video links due to its portable nature and easy installation. It is *not* designed for operation while in motion.

• FIGURE 1 •

Figure 1 shows the most common connection diagram for setting up a wireless video link using the EAGLE PLUS.

NOTE: Make sure that your camera and monitor/recorder work properly hardwired before attempting to install the wireless link.

Installation:

The EAGLE PLUS system is factory-configured for operation on channel 1 with alarms operational and mono audio.

To obtain the best picture quality and transmission distance, the following rules of thumb should be followed:

1) Mount the transmitter and receiver antennas above human and mechanical traffic, the higher the better. A 10 foot steel mast on top of a building is typical. Make sure that the mast is well grounded to earth ground with an 8 AWG or larger wire. For maximum range, the transmit and receive antennas must be 15 to 20 feet above all obstacles in the line of sight.
2) Keep the transmission path as open as possible. Objects such as walls and metallic objects near the transmission path may reduce the transmission distance.
3) Do not add additional lengths of cable to connect the receiver to the antenna as significant losses in signal, and reduced transmission range will occur.
4) Keep the cable connecting the antenna to the receiver as short as possible.

The EAGLE PLUS transmitter and receiver units come pre-mounted in a NEMA-4X rated aluminum enclosure which allows mounting of the unit outdoors.

Transmitter Operation

Figure 2 shows the front panel of the VTX2500 transmitter and the functions of each control and input/output. Each control is described in greater detail below.

IMPORTANT NOTE: The transmitter uses a non-standard jack to connect to the transmitter antenna. Any modification to this jack may void the user's authority to operate the equipment and will void the manufacturer's warranty.

CAUTION

DO NOT APPLY POWER TO THE TRANSMITTER WITHOUT THE ANTENNA SECURELY ATTACHED. DO NOT APPLY VOLTAGE TO THE ALARM PINS. DAMAGE TO THE UNIT MAY RESULT.

• FIGURE 2•

2.4GHz Transmitter Inputs & Controls:

VIDEO INPUT

Designed to mate to a standard BNC male connector, this input accepts 1 Volt peak-to-peak video in both NTSC and PAL formats. This input is terminated with 75 Ω. RCA to BNC adapters are available for use with some cameras and VCRs.

AUDIO INPUT

Designed to mate to a standard RCA male connector, this input accepts 1 Volt peak-to-peak audio input and is terminated with 600 Ω unbalanced configuration. It is designed to be interfaced to "lineout" audio sources. A preamplifier must be used to connect a microphone to this input.

DATA INTERFACE

When connected to a personal computer via the optional CBLDAT-1 interface cable, this input accepts serial commands that control settings in the transmitter not available on the front panel. See the Trangolink software program help for more information.

POWER INPUT

Accepts a 6-12 Vdc power source such as the standard 7 Vdc adapter (Trango part number PT07800-1), or an optional battery. The nominal current draw is 150 milliamperes. If using an adapter from a third party, use a well-regulated 200 mA minimum output supply. **Do not use the PT07800-1 to power a camera.**

ALARM INPUTS

These inputs are used to send alarm signals to the receiver. They sense an open or closed state and reflect that state to the receiver whenever it changes. The alarm inputs operate independently of each other.

CAUTION

DO NOT APPLY EXTERNAL VOLTAGES TO THE ALARM INPUTS AS PERMANENT DAMAGE TO THE UNIT MAY RESULT.

2.4GHz Transmitter Operation:

Changing Channels:

To change channels, simply depress the Toggle/Standby switch momentarily until the LED for the desired channel pattern is lit up. Remember to change the receiver channel as well, since it is not automatically changed when the transmitter channel is changed. For increased isolation from nearby systems operating on different channels and multiple systems transmitting along the same path, the system can be operated using right hand polarization on channels 1 and 3, and left hand polarization on channels 2 and 4 (Additional equipment may be required).

Standby Mode:

This mode of operation does the following:

1) Places the transmitter into a low power mode.
2) Stops transmitting the RF signal.
3) Continues to monitor the alarm inputs that have been armed (Factory default -- both inputs are armed).
4) Monitors the data port for control signals from the TrangoLink software.

While in Standby mode, if an alarm state change occurs, the transmitter will come out of Standby mode instantly, begin transmitting the video signal, and change the receiver alarm output state to reflect the changed state on the transmitter. The unit will not return to standby mode unless the user holds the toggle button down or commands the unit via Trangolink.

ENTERING STANDBY MODE

To enter the Standby mode, the user must hold down the Toggle/Standby switch for 2 seconds. The status LED will blink once per second for about 1 minute to allow the operator to leave the area. During this time the alarms will be disarmed. After 1 minute, the alarms will be armed, and the active channel LED will then blink at a rate of about once every 2 seconds to indicate that the unit is in Standby mode, and waiting for an alarm state change to occur.

EXITING STANDBY MODE

To exit Standby mode, the user must simply depress the Toggle/Standby switch momentarily. After exiting Standby mode, the active channel LED will be on solid to indicate that the video signal is being transmitted normally. Alarms will still be armed unless the are turned off via the Trangolink software.

LOW BATTERY

If the input voltage drops below 6V, the active channel LED will blink twice per second. A low battery indication is also sent to the receiver and can be viewed using the TrangoLink software or the receiver. No alarm is generated.

Receiver Operation

Figure 3 shows the front panel of the VRX2500 receiver and the functions of each control and input/output.

• FIGURE 3 •

2.4GHz Receiver Inputs/Outputs & Controls:

VIDEO OUTPUT

Designed to mate to a standard BNC male connector, this provides a 1 Volt peak-to-peak video signal output. This must be terminated with 75 Ω. RCA to BNC adapters are available for use with some monitors and VCR inputs.

AUDIO OUTPUT

Designed to mate to a standard BNC male connector, this provides a 1 Volt peak-to-peak audio output and should be terminated in a 600 Ω load, as is found in most "line in" audio inputs. RCA to BNC adapters are available for use with some monitors and VCR inputs.

DATA INTERFACE

When connected to a personal computer via the optional CBLDAT-1 interface cable, this input accepts serial commands that control settings in the receiver not available via the front panel. See the Trangolink software program help for more information.

POWER INPUT

Accepts a 12 Vdc power source such as the standard 12 Vdc adapter (Trango part number PT12500-1), or an optional battery. The nominal current draw is 350 milliamperes. If using an adapter from a third party, use a well-regulated 12Vdc/500mA output supply.

ALARM OUTPUT

This is a relay output which can sink 1 ampere at 40 V AC/DC. When a valid alarm condition is received from the transmitter, this output will close to ground. This output can be used to turn on peripheral devices such as video recorders and audible alarms.

ALARM CLEAR INPUT

This input allows the operator to clear an alarm which has been received. This input is normally open, and will clear the alarm upon closure to ground.

CAUTION

DO NOT APPLY EXTERNAL VOLTAGES TO THE ALARM OUTPUT OR ALARM CLEAR PINS. PERMANENT DAMAGE TO THE UNIT MAY RESULT.

2.4GHz Receiver Operation:

Changing Channels:

To change channels, simply depress the Toggle/Standby switch momentarily until the LED for the desired channel pattern is lit up. Remember to change the receiver channel as well, since it is not automatically changed when the transmitter channel is changed. For best performance, multiple systems transmitting along the same path should be operated using horizontal polarization on channels 1 and 3, and vertical polarization on channels 2 and 4.

Alarm Conditions:

When the VRX2400 receives an alarm condition from the transmitter, the active channel LED will begin blinking.

If Alarm 1 is activated, then the active channel LED blinks **once** between pauses.
If Alarm 2 is activated, then the active channel LED blinks **twice** between pauses.
If both alarms have been activated, then the active channel LED blinks **three** times between pauses.
The active channel LED will stop blinking when the alarm condition is cleared.

RSSI Mode:

To ease alignment of the receiver antenna, the received signal strength may be viewed by placing the unit in RSSI mode. The LEDs will then act as a bar-graph indicator, with more LEDs lit for a stronger signal.

To enter RSSI mode, hold down the Toggle/RSSI button for 2 seconds. To exit, depress the button momentarily. The number of LEDs lit is a relative indication of signal strength to be used only to find the best antenna position. Viewing the received picture quality should be used in conjuction with this mode.

Troubleshooting the 2.4GHz System

INTERFERENCE

If interference such as lines in the pictures is observed, changing the transmission channel may cure the problem.

Also, AC generators in close proximity to the transmitter or receiver may cause lines in the picture. Move the unit away from the source of the interference.

NO PICTURE

Check that the transmit and receive channels are set the same, and make sure the transmitter is not in Standby mode (slow, blinking LED), or that the battery is not low (fast, blinking LED).

Verify all connectors are tight.

POOR PICTURE QUALITY

Raise transmitter and receiver antennas above ground and away from obstacles and traffic, including foot traffic.

Use an optional high-gain dish antenna on the receiver. Verify all connectors are tight. Shorten the receiver antenna feed cable.

VIDEO TOO DARK

Make sure that any monitors/peripheral equipment connected to the video source are set to high impedance termination since the VTX2400 has a built-in 75 Ω termination.

VIDEO TOO BRIGHT

Make sure that the receiver video output line is terminated with 75 Ω.

CAN'T COMMUNICATE WITH TRANSMITTER OR RECEIVER USING TRANGOLINK

Perform a system reset by holding toggle switch down while applying power. All memory locations will be erased and the system will be reinitialized. All LEDs will light up to indicate a successful reset. Release the toggle switch.

TrangoLink Software with the EAGLE System

Overview:

TrangoLink™ allows you to configure and monitor your EAGLE, FALCON, or PTZ-900 transmitters and receivers. On the EAGLE and FALCON transmitters, you can change the active channel, operating mode, and alarm triggering. On the EAGLE and FALCON receivers, you can change the active channel and monitor the signal strength, transmitter battery status, video loss, and alarm status. On the PTZ-900 transmitter and receiver, you can configure the hopping sequence, the data rate, the mode, and the address as well as monitor the signal strength.

PC Requirements & Installation:

In order to run TrangoLink, you will need Windows 95 or higher, 400 kB of free disk space, and one free serial port.

To install (see Fig. 4):

1. Start Win95 (or higher).
2. Click on **Start**, then **Run**.
3. Type **a:\setup**, then click **OK**.

To uninstall (see Fig. 5):

1. Click on **Start**, then **Settings**, then **Control Panel**.
2. Double click on **Add/Remove Programs**.
3. Select TrangoLink, and click **Add/Remove**.

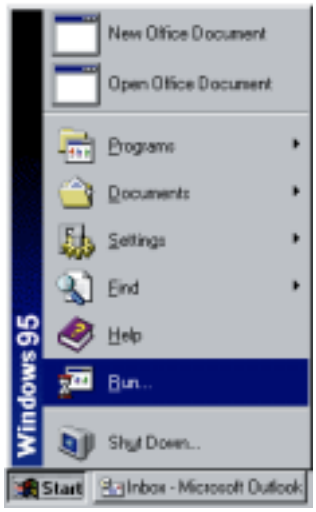


Fig. 4

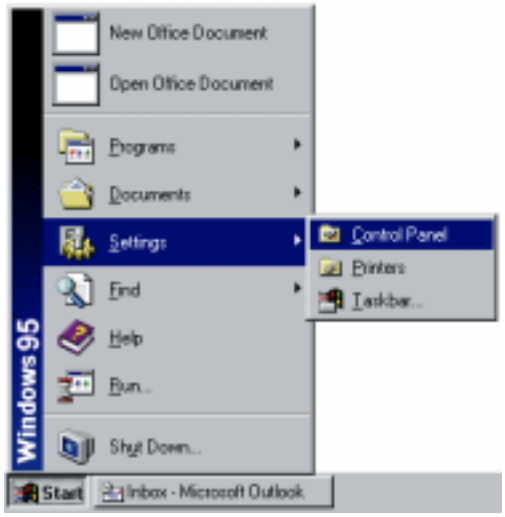


Fig. 5

TrangoLink with the EAGLE System:

The TrangoLink software allows the user to change the user settings on the EAGLE transmitters and receivers. The software runs under the Windows 95 or higher PC platform and connects from either COM1 or COM2 to the Data interface on the transmitter or receiver via the CBLDAT-1 interface cable.

To enter the program, the user must apply power to the connected unit and run the TrangoLink program by clicking on the TrangoLink icon.

After entering the program, a screen is displayed showing the current settings. The user may change the settings and then *must click "Save Changes and Exit"*. Upon exiting the program and cycling power to the unit, the settings will become effective.

Configuring the EAGLE Transmitter:

Via the TrangoLink interface panel for the VTX2400 transmitter, the user can configure the following settings:

Link Verification: This is a 32-bit code sent from the transmitter to the receiver to verify that the signal is being received from the proper location.

Active Channel: This must be the same on the transmitter and receiver in order for video to be transferred properly.

Standby Mode: When in standby mode, the transmitter shuts down the majority of its circuitry until it is awakened by an alarm. Via TrangoLink, the transmitter can be put into standby mode, or awakened from standby mode.

Alarm Arming and Polarity: Which of the alarms are active, and whether the alarms activate open or closed. Via TrangoLink, alarms can also be sent to the transmitters for testing and diagnostic purposes.

In Fig. 6, the TrangoLink interface screen shows that the transmitter is set to Channel 12, in Normal mode (not Standby), with both alarms Armed and set to alarm on closure.

Fig. 6

Configuring the EAGLE Receiver:

Via the TrangoLink interface panel for the VRX2400 receiver, the user can configure the following settings:

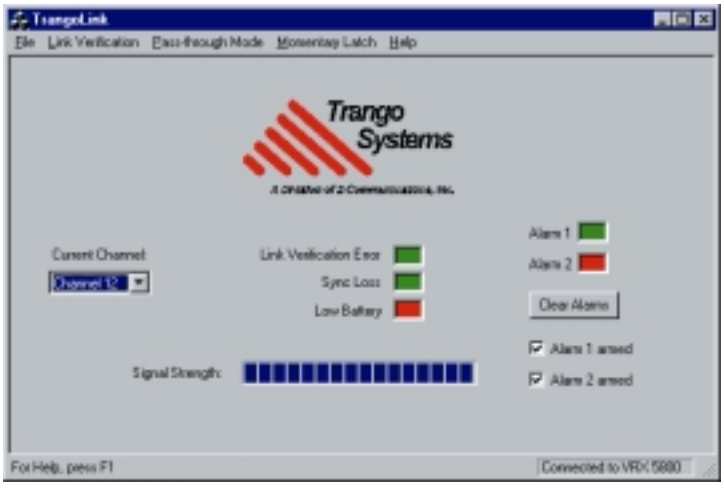
Link Verification: This is a 32-bit code sent from the transmitter to the receiver to verify that the signal is being received from the proper location.

Alarms and Alarm Log: Via TrangoLink, the alarm log can be viewed, printed, or saved to a file. You can also set which of the alarms are active, clear alarms, and whether the alarms activate open or closed.

Active Channel and Channel Switching: This must be the same on the transmitter and receiver in order for video to be transferred properly. Automatic channel switching can also be configured to monitor several transmitters at once. Channels can also be switched manually using TrangoLink.

RSSI: Used for receiver only to monitor the radio spectrum. Presents a histogram. Useful in troubleshooting to determine if any other signals are present in the frequency band.

Low Battery: Whether or not the battery is below voltage on the transmitter and is hence in danger of failing.



In Fig. 7, the TrangoLink interface screen shows that the receiver is set to Channel 12, and is showing an alarm condition in Alarm 2, and a low battery condition on the transmitter.

Fig. 7

2.4GHz Parametric Specifications

VTX2500 Transmitter: Electrical

RADIO SECTION:

Frequencies:	Channel 1:	2413 MHz
	Channel 2:	2432 MHz
	Channel 3:	2451 MHz
	Channel 4:	2470 MHz
RF Output Power:	Meets FCC Part 15.249 radiated field strength of 50 mV/m at 3 meters with CP omni or CP patch antenna provided with unit.	
Frequency Stability:	0.005% PLL Stabilized (50 ppm) over temperature range	
Frequency Plan:	Direct carrier modulation	
Modulated Bandwidth:	16 MHz (3 dB); 30 MHz (40 dB)	
Harmonic Attenuation:	> 20 dBc (2^{nd} harmonic)	
Spurious Attentuation:	> 50 dBc	

VIDEO SECTION:

Input Level:	1Vpp per NTSC/PAL standard
Input Impedance:	75Ω unbalanced
Modulation:	Narrowband direct FM (for composite signal)
Modulation Index:	1.0 at 6.5 MHz for composite A/V signal (±6.5 MHz deviation)
Pre-emphasis:	CCIR Rec 405-1

AUDIO SECTION:

Input Level:	1 Vpp Nominal
Input Impedance:	600 Ω
Bandwidth:	50 Hz – 15 kHz (3 dB)
Modulation:	Wideband FM
Subcarriers:	6.0 MHz (right) and 6.5 MHz (left-monaural)
Modulation Index:	1.0 at 75 kHz for audio (±75 kHz deviation)
Pre-emphasis:	75 uS

ALARM SECTION:

Input Level:	Normally open contact closure input on both Alarm 1 and Alarm 2. The current state of the input (open or closed) is transmitted to the receiver which reflects the transmitter alarm input states. DO NOT APPLY VOLTAGES TO THESE INPUTS AS DAMAGE TO THE UNIT WILL OCCUR.
Min. Alarm Duration:	1/2 second minimum to allow detection.
Max. Wire Length:	1000 ft from sensor to alarm input(s)

POWER SECTION:

Input Voltage:	7 Vdc nominal, 6-12 Vdc range
Current Consumption:	150 mA typical in normal mode, 10 mA in Standby mode
Max. Ripple Output:	2 Vpp
Low Battery Sens.:	< 6 Vdc

VTX2500 Transmitter: Mechanical & Environmental

GENERAL:

Material:	Cast aluminum NEMA 4X rated outdoor enclosure
Finish:	Off-white powdercoat
Size:	4.65” W x 8.8”L x 2.475”H without antenna
Weight:	2.65 lb

CONNECTORS & INDICATORS:

RF Output:	Custom connector in compliance with FCC rules part 15C, 15.203.
FCC Compliance:	The transmitter shall comply with FCC Part 15.249, FCC Part 15.207(a), FCC Part 15 Subpart B, Industry Canada Specifications
PC Interface:	6 position, 4 conductor RJ11 female right angle PCB mount
Video:	BNC female PCB mount
Audio:	Red RCA female PCB mount – R Audio White RCA female PCB mount – L Audio (Mono)
Alarm/Power:	6 post terminal block (+7 Vdc, GND, ALARM1, ALARM 2)
Controls:	Channel switch – momentary, toggles through modes/channels *Stereo/Alarm switch:* DPDT switch allows selection of data/alarms or right audio on 6.0 MHz subcarrier
Indicators:	4 channel LEDs that blink slowly in Standby mode and rapidly when battery is low

ENVIRONMENTAL:

Operating Temp.:	-20 to 70 ºC
Storage:	-30 to 85 ºC
Humidity:	100% (enclosure)
Shock:	Sustain 3-axis drop from 5’

VRX2500 Receiver: Electrical

RADIO SECTION:

LO Frequency:	1933-1990 MHz
Frequency Stability:	0.0025% PLL Stabilized (25 ppm) over temperature
Cascade P1dB Input:	> -18 dBm
Cascade IP3 Input:	> -5 dBm
IF Bandwidth:	16 MHz (3 dB)
Image Rejection:	> 60 dB
Channel Rejection:	> 20 dB between adjacent channels > 90 dB between channels 1 and 4 > 60 dB between channels 2 and 4, 1 and 3
FM Threshold:	-90 dBm
Cascade Noise Figure:	< 5 dB

VIDEO SECTION:

Video 3dB BW:	5.8 MHz (Conforms with NTSC/PAL standard)
Video Output S/N:	> 37 dB with –85 dBm RF input > 40 dB with –80 dBm RF input > 45 dB with –75 dBm RF input
Video Diff. Gain:	< 10%
Video Diff. Phase:	< 5 degrees
Chr. To Lum. Gain:	70% to 107%
Chr. To Lum. Delay:	±60 nS
Output Load Imp.:	75 Ω
DC Clamping:	Back Porch with .15 V typical DC offset

AUDIO SECTION:

Audio Bandwidth:	50 Hz to 15 kHz (3 dB)
Harmonic Distortion:	< 10% over 50 Hz to 15 kHz
Audio Output S/N:	> 15 dB with –80 dBm RF Input
Output Load Imp.:	600 Ω
Output Level:	.8 to 1.75 Vpp

ALARM SECTION:

Data Rate:	1200 bps
Coding Scheme:	32 bit command/address, 8 bit data with checksum
Output Level:	Reflects state of transmitter alarm inputs – updated twice per second

POWER SECTION:

Input Voltage Range:	7 Vdc nominal, 6-9 Vdc
Max. Ripple Input:	2 Vpp
Current Consumption:	390 mA nominal in receive mode and RSSI mode

VRX2500 Receiver: Mechanical & Environmental

GENERAL:

Material:	Cast aluminum NEMA 4X rated outdoor enclosure
Finish:	Off-white powdercoat
Size:	4.65” W x 8.8”L x 2.475”H without antenna
Weight:	2.65 lb

CONNECTORS & INDICATORS:

RF Input:	SMA female connector
FCC Compliance:	The transmitter shall comply with FCC Part 15.249, FCC Part 15.207(a), FCC Part 15 Subpart B, Industry Canada Specifications
PC Interface:	6 position, 4 conductor RJ11 female right angle PCB mount
Video:	BNC female PCB mount
Audio:	Red RCA female PCB mount – R Audio White RCA female PCB mount – L Audio (Mono)
Alarm/Power:	6 post terminal block (+7 Vdc, GND, ALARM1, ALARM 2)
Controls:	Channel switch – momentary, toggles through modes/channels *Stereo/Alarm switch:* DPDT switch allows selection of data/alarms or right audio on 6.0 MHz subcarrier
Indicators:	4 channel LEDs that blink slowly in Standby mode and rapidly when battery is low

ENVIRONMENTAL:

Operating Temp.:	-20 to 70 ºC
Storage:	-30 to 85 ºC
Humidity:	100% (enclosure)
Shock:	Sustain 3-axis drop from 5’