# Eagle Plus Series

2.4GHz Wireless Video/Audio/Alarm/Data
Transmission System

## Installation and
## Operating Instructions

**Trango
Systems, Inc.**
*THE LEADER IN WIRELESS VIDEO*

# Quick-Start Guide

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

2 Install transmitter (VTX2500) and receiver (VRX2500) units in desired location to a steel pole per installation drawing. The pole must be securely mounted so that it does not move, and may be from 1.5″ to 3″ in diameter.

3 Install antennas above the enclosures.

⚡ *Use extreme care when installing antennas near power lines.*

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

5 Connect video, audio, power, alarm, PC interface cables as needed to units through flanges. Tighten flanges around cables. Apply a small amount of silicone to the flange openings to make a leakproof connection.

*Important! 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.

8 To help protect against potential lightning damage, use a lightning surge arrestor in line with all cabling entering a structure.

⚠ *Do not apply power to the transmitter unless the antenna is connected. Permanent damage may result.*

*M-Eagle2_C.pm6*
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Please note that, throughout this manual,
⚡ alerts the reader to potential danger to one's person and
⚠ alerts the reader to potential harm to the equipment.

# 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 your authorized Trango reseller or Trango Systems, Inc., for return authorization and shipping instructions.

## FCC Information

ID numbers for the VTX2500: NCYVTX2500, Canada 29451021688A

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   Re-orient 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 or an experienced radio/TV technician for help.

**Important!** 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 and will void the manufacturer's warranty.

## 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 2.4GHz wireless technology. The typical Eagle Plus system consists of a VTX2500 transmitter and antenna, VRX2500 receiver and antenna, and power adapters. 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.
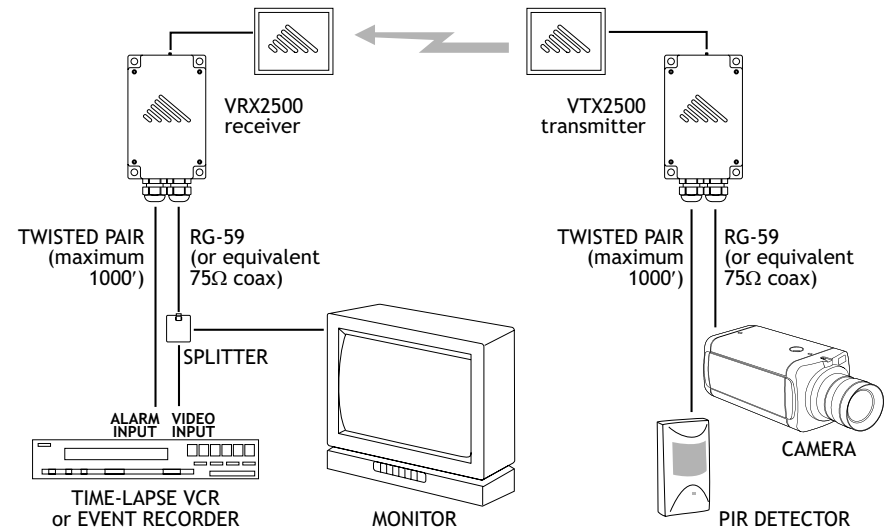


*Make sure that your camera, monitor, and recorder are working and are properly hard-wired before attempting to install the wireless link.*

*A typical connection diagram for setting up a wireless video link using the Eagle Plus. Audio and power connections are not shown.*

## Installation

The Eagle Plus system is factory-configured for operation on channel 1 with right and left audio operational.

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 ten-foot 2⅜″ diameter steel mast on top of a building is typical. Make sure that the mast is well grounded to earth ground with a wire of 8 AWG or larger. For maximum range, the transmit and receive antennas must be fifteen to twenty 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 reflect signals and 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. Keep the cable connecting the antenna to the receiver as short as possible.
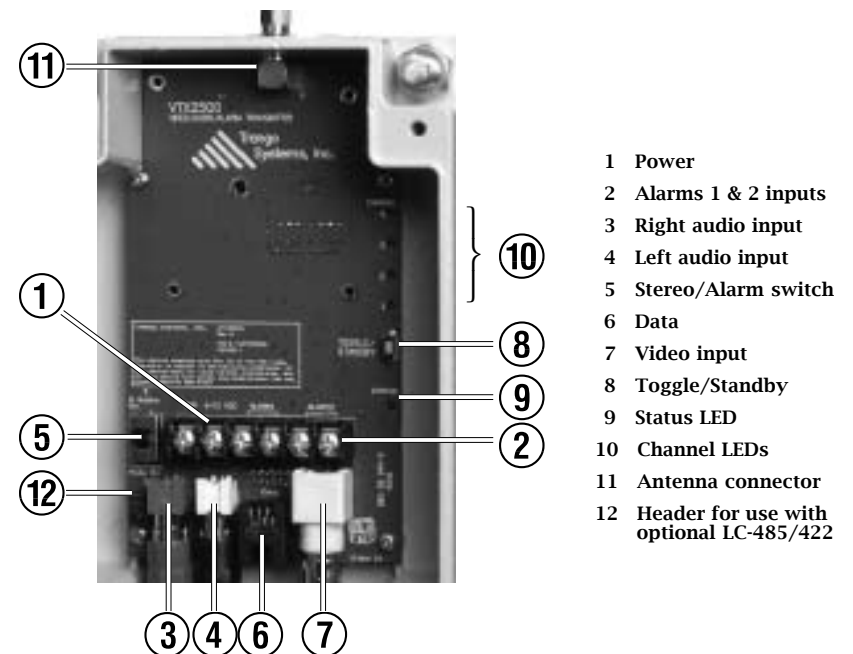
The VTX2500 transmitter and VRX2500 receiver units come premounted in a NEMA-4X rated aluminum enclosure which allows mounting of the unit outdoors.

# Transmitter Operation

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.

(!) *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.*

The photo shows the interior of the VTX2500 transmitter and the functions of each control and input/output. Each control is described in greater detail below. This card is encased in a NEMA-4X rated aluminum/ powdercoat enclosure. Do not remove the card from the enclosure.

| 1 | Power |
|---|---|
| 2 | Alarms 1 & 2 inputs |
| 3 | Right audio input |
| 4 | Left audio input |
| 5 | Stereo/Alarm switch |
| 6 | Data |
| 7 | Video input |
| 8 | Toggle/Standby |
| 9 | Status LED |
| 10 | Channel LEDs |
| 11 | Antenna connector |
| 12 | Header for use with optional LC-485/422 |

## 2.4GHz Transmitter Inputs & Controls

**1   Power Input.**   Accepts a power source between 6 volts and 12 volts DC, such as the standard 7vDC adapter (Trango part number PT07800-1), or an optional battery. The nominal current draw is 145 milliamperes. If using an adapter from a third party, use a well-regulated 200mA minimum output supply. *Do not use the PT07800-1 to power a camera or video distortion may occur.*

**2   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. The transmitter is capable of sending either alarms or stereo audio, selectable via the Stereo/Alarm switch.

(!) *Do not apply external voltages to the alarm inputs, as permanent damage to the unit may result. Use only dry contacts with these inputs.*

**3 and 4   Audio Inputs, Right and Left.**   Designed to mate to standard RCA connectors, each input accepts 1 Vpp audio input and is terminated with 600Ω unbalanced configuration. It is designed to interface to "line out" audio sources. A preamplifier must be used to connect a microphone to this input.

**5   Stereo/Alarm Switch.**   When this switch is in the "R Audio On" position, stereo audio transmission is enabled. This permits the transmission of stereo audio with no data or alarms. When it is in the "Alm/Data Mode On" position, right-channel audio is disabled. In its place, either alarms or user data (data pass-through mode) are transmitted.

**6   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 transmitters not available on the front panel. See the TrangoLink software section and program help for more information. This is also the input for the RS-232 user data to be sent in data pass-through mode.

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

**8   Toggle/Standby.**   Depressing this switch momentarily changes the transmitter channel. Remember to change the receiver channel as well, since it is not automatically changed when the transmitter channel is changed. Holding the button down for two seconds places the transmitter in standby mode.

**9 and 10   Status LED and Channel LED.**   These LEDs display the transmitter status and current transmitter channel. LED functions are described below.

## 2.4GHz Transmitter Operation

**Changing Channels.**   To change channels, simply depress the Toggle/Standby switch momentarily until the LED for the desired channel 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 antennas may be required.)

**Standby Mode – Secure Standby Mode.**   In this mode of operation the transmitter (1) stops transmitting over the air completely by shutting down the majority of its circuitry to save power, and (2) waits to be returned to normal mode by either a change in either alarm input, the Toggle/Standby switch, or the TrangoLink software.

To enter secure standby mode, press and hold the Toggle/Standby switch for two seconds or use the TrangoLink software (See the TrangoLink section of this manual for more information). The Status LED will blink for about one minute to allow the operator to leave the area. During this time the alarms will not be sent to the receiver. After one minute, the alarm inputs will be active and the status LED will then blink to indicate that the unit is in secure standby mode.

To exit secure standby mode, momentarily press the Toggle/Standby switch or use the TrangoLink software. After exiting secure standby mode, the active channel LED will be on solid to indicate that the transmitter is now continuously transmitting again.

**Standby Mode – Power-Save Standby Mode.**   In power-save standby mode, the transmitter will awaken (enter normal mode) for a user-selectable amount of time if an alarm is received over the Alarm 1 input. After this time has expired, the transmitter will reenter standby mode. The amount of time after which the transmitter will reenter standby mode can be set to any value between one and 255 minutes using the TrangoLink software. If zero is entered, the transmitter will be in secure standby mode, and will not reenter standby mode after awakening. More information can be found in the TrangoLink section of this manual.

When the transmitter has been placed in power-save standby mode, the Alarm 1 input is treated as normally closed. An open condition on this input will awaken the transmitter for the preset amount of time. The state of the Alarm 2 input does not affect the transmitter in power-save standby mode.

In power-save standby mode the transmitter (1) stops transmitting over the air by shutting down the majority of its circuitry to save power, (2) periodically and momentarily powers up and transmits over the air, and (3) waits to be returned to normal mode by either an open condition on the Alarm 1 input, the Toggle/Standby switch, or the TrangoLink software.

To exit power-save standby mode, momentarily press the Toggle/Standby switch, or use the TrangoLink software. After exiting power-save standby mode, the active channel LED will be on solid to indicate that the transmitter is now continuously transmitting again. If the power-save timer is still enabled, the radio will go back to power-save standby when it times out again.

**Data Pass-Through Mode.**   The transmitter and receiver can be used to pass data at rates from 1200 to 9600 bps. For optimum data transmission without loss, both the transmitter and receiver should be configured to pass or accept data at the same rate. The data rate and parity are configured using the TrangoLink software.

To enter data pass-through mode, the switch marked ⑤ in the photograph on page 7 should be placed in "Alm/Data Mode On." Then, from the TrangoLink software, select "pass-through mode." Make sure both the VTX2500 and the VRX2500 have been configured for data pass-through mode. The right audio channel will be disabled in this mode

while the left audio channel can still transmit monaural audio. Alarms and link verification cannot be transmitted when in data pass-through mode. *Do not use CBLDAT-1 to send or receive data: it contains extra wires not used for normal data transmission.*

To pass simplex (one-way) RS-485 or RS-422 serial data, use the LC-485/422 available from your dealer. If using the LC-485/422 converter, the data connector must not be connected to any cabling.

**Low Battery.**   If the input voltage drops below six volts, the status 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.
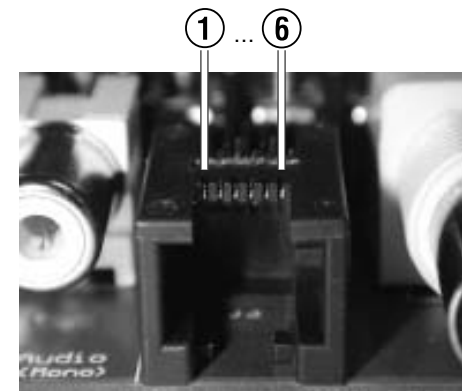


| PIN | DESCRIPTION |
|---|---|
| 1 | Reserved *(Do not use.)* |
| 2 | RS-232 Serial Data In to Radio (RD) |
| 3 | GND |
| 4 | Reserved *(Do not use.)* |
| 5 | RS-232 Serial Data Out to PC (TD) |
| 6 | Reserved *(Do not use.)* |

*RJ11 data connector pinouts for RS-232 data pass-through.*

# Receiver Operation

The photo shows the front panel of the VRX2500 receiver and the functions of each control and input/output. This card is encased in a NEMA-4X rated aluminum/powdercoat enclosure. Do not remove the card from the enclosure.



| | |
|---|---|
| 1 | Power |
| 2 | Alarms 1 & 2 inputs |
| 3 | Right audio input |
| 4 | Left audio input |
| 5 | Stereo/Alarm switch |
| 6 | Data |
| 7 | Video input |
| 8 | Toggle/RSSI |
| 9 | Channel LEDs |
| 10 | Antenna connector |
| 11 | Header for use with optional LC-485/422 |
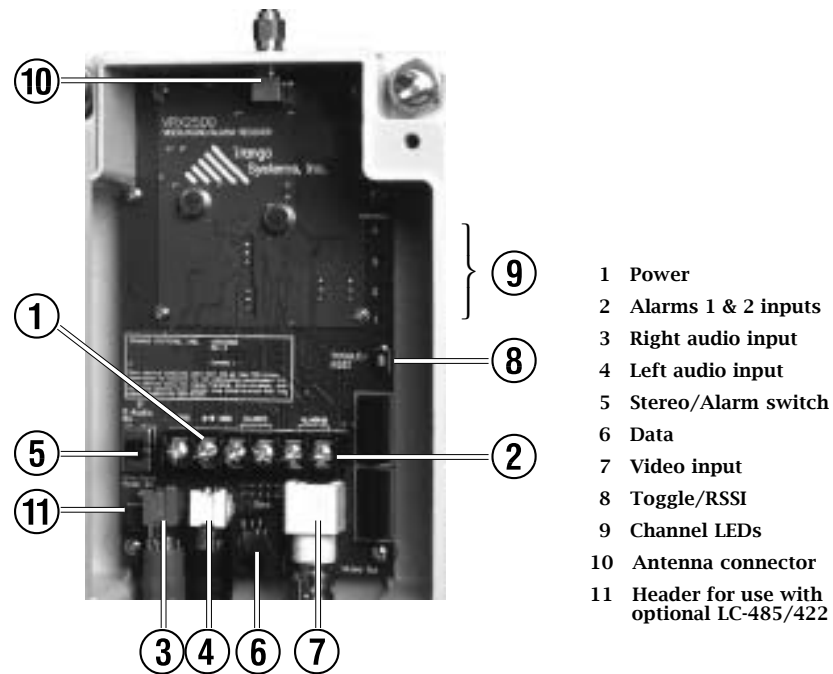
## 2.4GHz Receiver Inputs/Outputs & Controls

**1 Power Input.**   Accepts a power source between six and nine volts DC, such as the standard 7 Vdc adapter (Trango part number PT07800-1), or an optional battery. The nominal current draw is 400 milli-amperes. If using an adapter from a third party, use a well-regulated 6–9vDC/500mA output supply.

**2 Alarm Outputs.**   These are dry-contact relay outputs that can sink one ampere at forty volts DC. When the corresponding transmitter alarm input closes or opens, this output will close and open as well.

Consider these outputs mirrors of the transmitter alarm inputs. These outputs are independent and can be used to turn on peripheral devices such as video recorders and audible alarms.

**3 and 4  Audio Outputs, Right and Left.**   Designed to mate to a standard RCA male connector, this provides a 1.5-volt peak-to-peak audio output and should be terminated in a minimum 600Ω load, as is found in most "line in" audio inputs.

**5 Stereo/Alarm Switch.**   When this switch is in the "R Audio On" position, stereo audio transmission is enabled. This permits the transmission of stereo audio with no data or alarms. When it is in the "Alm/Data Mode On" position, alarm transmission is enabled. If data pass-through mode is enabled through the TrangoLink software, the switch must be set to the "Alm/Data Mode On" position.

**6 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. This port is also used for data pass-through mode for RS-232 signal levels.

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

**8 Toggle/RSSI.**   To change the receiver channel, depress this switch momentarily. Remember to change the transmitter channel as well since it is not automatically changed. To enter RSSI (received signal strength indicator) mode, hold down this button for two seconds. The number of channel LEDs lit is an indicator of signal strength, which can aid in finding the best antenna position.  RSSI can be used to check for 2.4 GHz interference.  Just turn off the transmitter and perform the same operation.

**9 Channel LEDs.**   These LEDs display the current receiver channel and act as a received signal strength indicator.

## 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 transmitter channel as well, since it is not automatically changed when the receiver 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 antennas may be required.)

**Alarm Outputs.** When the VRX2500 receives an alarm state change from the transmitter, it will close or open the corresponding alarm output. The state of the alarm outputs (open or closed) can be viewed using the TrangoLink software. If the transmitter is in standby mode or the transmitted signal is lost, the receiver will hold the last received valid state of the alarms. The alarm outputs are dry-contact relays.

**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 two 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 conjunction with this mode. Same frequency interference can be detected with the RSSI operation. Turn all transmitters off and put receiver into RSSI mode. If LEDs are lighted, you have 2.4 GHz interference. Try each channel and see if you have any that are clear. If your signal strength from the transmitter is strong and the interference is weak it may have no affect.

**Data Pass-Through Mode.** The transmitter and receiver can be used to pass user data one-way from the VTX2500 to the VRX2500 at rates from 1200 to 9600 bps. (For optimum data transmission without loss, both the transmitter and receiver should be configured to pass or accept data at the same rate. The data rate can be configured using the TrangoLink software.) To enter data pass-through mode, the Stereo/ Alarm switch should be placed in "Alm/Data Mode On." Then, from the TrangoLink software, select "pass-through mode." Make sure both the VTX2500 and the VRX2500 have been configured for data pass-through

mode. The right audio channel will be disabled in this mode while the left audio channel can still transmit monaural audio. Alarms and link verification cannot be transmitted when in data pass-through mode. Please see the pinout diagram on page 11 for more information on wiring the data connector for RS-232.

# 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. See RSSI mode.

**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 that 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 VTX2500 has a built-in 75Ω termination.

**Video Too Bright.** Make sure that the receiver video output line is terminated with 75Ω.

**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.

Check the Technical Support section of our website at http:// www.trangosys.com/ for additional assistance.

# Installing the LC485/422 Daughterboard for RS485 or RS422 Data Modes

**The LC485/422 Daughterboard will be installed in the transmitter and receiver of the units used for passing data in RS485 or RS422 data mode. Place switch 5 in the down alm/data position and then program the units with Trangolink 3.02 software (obtain from website at www.trangosys.com under 'Support' and 'Downloads'). You will need the CBLDAT-1 serial programming cable. Program the units for data mode, baud rate and parity compatibility with equipment you are connecting to. After programming the units install the LC485/422 Daughterboard in the header labeled number 11 and 12 in the description in this manual. Remove the small screw on the lower left side of the circuit board and install the standoff. Insert the 4 pins on the LC485/422 Daughterboard and into the standoff. More detailed instructions and terminal strip connections can be followed on Configuration Note #8 attachment that came with the LC485/422 Daughterboard.**

# TrangoLink Software with the Eagle Plus System

## PC Requirements & Installation

In order to run TrangoLink, you will need Windows 95 or higher, 400kB of free disk space, and one free 9-pin serial port.

**To install.**   The TrangoLink program, which can be found at our website at www.trangosys.com/, is a self-installing file. To install Trango-Link on your PC, simply download the file and double-click on it.

**To uninstall.**   Click on Start, then Settings, then Control Panel. Double-click on Add/Remove Programs. Select TrangoLink, and click Add/Remove.

## TrangoLink with the Eagle Plus System

The TrangoLink software allows the user to change the user settings on the Eagle Plus transmitters and receivers. TrangoLink runs on the PC platform under Windows 95 or higher and connects to the transmitter or receiver via the CBLDAT-1 cable connected to to any serial port from COM1 through COM4.

To enter the program, the user must apply power to the connected unit and run the TrangoLink program by clicking on the TrangoLink icon in Start/Programs. After entering the program, a screen is displayed showing the current settings, which can be changed by the user.

## Configuring the Eagle Plus Transmitter

Via the TrangoLink interface panel for the VTX2500 transmitter, the user can configure the following settings:

**Menu Controls**

FILE: Choosing this pull-down menu brings up three options:

*Sound:* This toggles the PC sound on and off, so that the PC can beep (or not) if a change in any of the indicators is received.

*Select Port:* This selects the serial port through which the PC is connected to the transmitter or receiver. The cable required to connect may be purchased from your Trango Systems sales representative.

*Exit:* Exits TrangoLink.

LINK VERIFICATION: This option brings up a dialog box by which the link verification code can be set. 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. The link verification codes on the transmitter and receiver must match for reception of alarms or low battery signals. If the codes do not match video will still be received, but the user will be notified that it is not coming from the proper location.
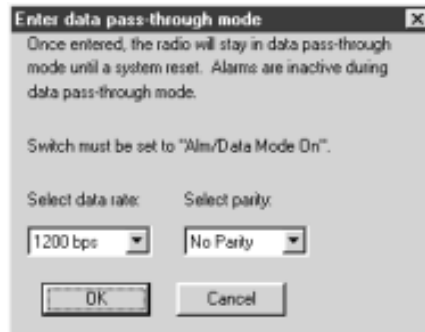
PASS-THROUGH MODE: Choosing this pull-down menu brings up the dialog box illustrated here, through which the data rate and parity can be chosen. To use this function, the Stereo/Alarm switch

on the transmitter and receiver must be set to "Alm/Data Mode On."

HELP: Choosing this pull-down menu brings up two options:

>*Help Topics:* This offers you an index of online help topics.
>
>*About:* This displays the copyright notice and version number of your copy of TrangoLink.

**Screen Controls**

CURRENT CHANNEL: This must be the same on the transmitter and receiver in order for video, alarms, and/or data to be transmitted properly.

SELECT MODE: The Normal button places the transmitter in normal mode or awakens it from standby mode. The Standby button places the transmitter in either secure standby or power-save standby, depending on the value entered in the Power Save Timer field.



POWER-SAVE TIMER: The Eagle Plus can reenter standby mode after a preset amount of time has passed, which can be entered in the Power-Save Timer field (power-save standby mode). If zero is entered, the transmitter will not reenter standby mode (secure standby mode). To enter a new value, type the desired number of minutes into the power-save standby field, and press the "Set new value" button.

*This TrangoLink interface screen shows that the transmitter is set to Channel 3, in normal mode (not standby), with the power-save timer set to 0 minutes (secure standby). In this configuration, the transmitter will not reenter standby mode after awakening.*

## Configuring the Eagle Plus Receiver

Via the TrangoLink interface panel for the VRX2500 receiver, the user can configure the following settings:

**Menu Controls**

FILE: Choosing this pull-down menu brings up three options:

>*Sound:* This toggles the PC sound on and off, so that the PC can beep (or not) if a change in any of the indicators is received.
>
>*Select Port:* This selects the serial port through which the PC is connected to the transmitter or receiver. The cable required to connect may be purchased from your Trango Systems sales representative.
>
>*Exit:* Exits TrangoLink.

LINK VERIFICATION: This option brings up a dialog box by which the link verification code can be set. 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. The link verification codes on the transmitter and receiver must match for reception of alarms or low-battery signals. If the codes do not match, video will still be received but the user will be notified that it is not coming from the proper location.
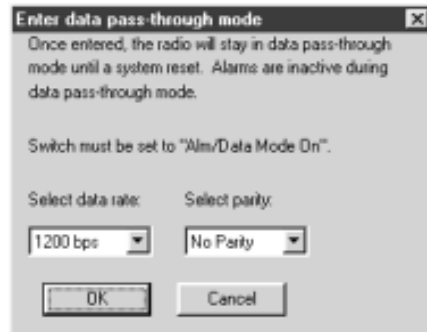
PASS-THROUGH MODE: Choosing this pull-down menu brings up the dialog box illustrated here, through which the data rate and parity can be chosen. To use this function, the Stereo/Alarm switch

on the transmitter and re-
ceiver must be set to "Alm/
Data Mode On."

HELP: Choosing this pull-
down menu brings up two
options:

> *Help Topics:* This offers
> you an index of online
> help topics.

> *About:* This displays the
> copyright notice and version number of your copy of
> TrangoLink.

## Screen Controls

CURRENT CHANNEL: This must be the same on the transmitter and re-
ceiver in order for video, alarms, and data to be transmitted properly.

LINK VERIFICATION ERROR: Green indicates that the receiver is receiv-
ing a matching link verification code from the transmitter. Red
indicates that it is not.

SYNC LOSS: Green indicates that the receiver detects a vertical sync
pulse on the received video signal. Red indicates that it does not,
and hence that no video is being transmitted.

LOW TRANSMITTER BATTERY: Red indicates that the transmitter has a
low power supply voltage (less than 6vDC). Green indicates that
power supply voltage is within acceptable limits.

ALARM 1 AND ALARM 2: "Open" indicates that contacts are open on
the receiver, "closed" that they are closed.

SIGNAL STRENGTH: Also called RSSI (received signal strength indica-
tor). Presents a bar graph proportional to the received signal. Use-
ful in troubleshooting to determine if any other signals are present
in the frequency band and to help align antennas.

*This TrangoLink interface screen shows that the receiver is set to Chan-
nel 3, both alarms are open, and a low battery condition exists on the
transmitter.*

# 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.

**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: 600Ω

Bandwidth: 50 Hz–15 kHz (3dB)
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 μsec

**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.*

**Power Section**

Input Voltage: 7vDC nominal,
   6–12vDC range
Current Consumption:
   145 mA typical in normal mode,
   30 mA in standby mode
Max. Ripple Input: 1 Vpp
Low Battery Sens.: < 6vDC

## VTX2500 Transmitter: Mechanical & Environmental

**General**

Material: cast aluminum
   NEMA-4x rated outdoor enclosure
Finish: off-white powdercoat
Size: 4.65″W × 8.8″L × 2.475″H
   without antenna
Weight: 2.65 lb

**Connectors and Indicators**

RF Output: custom connector complying with FCC Part 15C, 15.203
FCC Compliance:
   The transmitter complies with FCC Part 15.249, FCC Part 15 Subpart B, Industry Canada (RSS 210 Issue 2).
PC Interface: 6-position, 4-conductor RJ11 female right-angle PCB mount
Video: BNC female, PCB mount
Audio: female RCA, PCB mount
   R-Audio, red; L-Audio/monaural, white

Alarm/Power: 6-post terminal block
   (6–12vDC, GND, ALARM 1, ALARM 2)
Controls:
   Channel switch: momentary, toggles through modes/channels
   Stereo/Alarm switch: DPDT switch allows selection of data/alarms or right audio on 6.0MHz subcarrier
Indicators:
   4-channel LEDs displaying current channel,
   1 status LED blinking slowly in standby mode and rapidly when battery is low

**Environmental**

Operating temp.: –20˚ to +70˚C
Storage: –40˚ to +85˚C
Humidity: 100% (enclosure)
Shock: Sustain 3-axis drop from 5′

# VRX2500 Receiver: Electrical

**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: < 5%
Video Diff. Phase: < 5 degrees
Chr. To Lum. Gain: 70% to 107%
Chr. To Lum. Delay: ±60 nS
Output Load Imp.: 75Ω
DC Clamping: Back Porch,
   0 v typical DC offset

**Audio Section**

Audio Bandwidth: 50 Hz to 15 kHz (3 dB)
Harmonic Distortion: < 1%
   over 50 Hz to 15 kHz
Audio Output S/N: > 12 dB
   with –85dBm RF input
Output Load Imp.: 600Ω
Output Level: 1.5 Vpp typical

**Alarm Section**

Data Rate: 19,200 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: 6–9vDC, 7vDC nominal
Max. Ripple Input: 1 Vpp
Current: 400 mA nominal
   in receive mode and RSSI mode

**Data Pass-Through Mode**

(RS-422/485 interface available with optional daughterboard.)
Protocol: simplex 3-wire,
   RS-232 levels using serial port
Serial port settings: 1200, 2400, 4800, 9600 bps with adjustable parity (even, odd, none; 8,N,1 standard), configurable with TrangoLink software
Latency: < 15 mS end to end
BER: < $1E10^{-6}$
   at –80dBm input signal level

# VRX2500 Receiver: Mechanical & Environmental

**General**

Material: cast aluminum
   NEMA-4x rated outdoor enclosure
Finish: off-white powdercoat
Size: 4.65″W × 8.8″L × 2.475″H
   without antenna
Weight: 2.65 lb

**Connectors and Indicators**

RF Input: SMA female connector
FCC Compliance:
   The receiver complies with FCC Part 15.203, FCC Part 15.207(a), FCC Part 15 Subpart B, Industry Canada Specifications (RSS 210 Issue 2)
PC Interface: 6-position, 4-conductor RJ11 female right-angle PCB mount
Video: BNC female, PCB mount

Audio: female RCA, PCB mount
   R-Audio, red; L-Audio/monaural, white
Alarm/Power: 6-post terminal block
   (6–12vDC, GND, ALARM 1, ALARM 2)
Controls:
   Channel switch: momentary, toggles through modes/channels
   Stereo/Alarm switch: DPDT switch allows selection of data/alarms or right audio on 6.0MHz subcarrier
Indicators:
   4-channel LEDs displaying current channel

**Environmental**

Operating temp.: –20˚ to +70˚C
Storage: –40˚ to +85˚C
Humidity: 100% (enclosure)
Shock: Sustain 3-axis drop from 5′

**Notes:**