


**AVALON RF**  **Wireless Solutions**  
**For Audio & Video Links**



# **TX518/TX523/TX530 L-Band Video Transmitters**

## **User's Guide & Operating Manual**

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<http://www.avalonrf.com/>

Avalon RF, Inc. • 344 Coogan Way • El Cajon, CA 92020  
Phone: (619) 401-1967 • Fax: (619) 401-1971 • Email: [sales@avalonrf.com](mailto:sales@avalonrf.com)

## **RF EXPOSURE INFORMATION**

### **Maximum Permissible Exposure**

Any Wireless Equipment can pose health hazards if precaution is not exercised in its use/operation, especially its proximity to the human body. Excessive absorption of RF energy in the body is known to cause Cancer and/or other diseases. The FCC has issued guidelines to determine the safe distance of a transmitting antenna from the human body, to limit absorption to safe levels. Please follow the instructions given in this manual.

**WARNING:** Refer to Table 4 in Section 3 (*Operating the transmitter*) to determine the MINIMUM DISTANCE the Transmitter with Antenna mounted, or the Antenna itself (if connected via coax to the transmitter), must be placed away from the body to minimize the health hazard. Also, note the Warning for TX530 after Table 4.

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## 1. General

The TX500 series rugged transmitters are intended for use in military, homeland security, mobile security, broadcasting and motion picture production.

The TX500 Series is an FM modulated transmitter with a tuning range that is model dependent. See table below for frequency ranges.

Model	Frequency Range
TX5XX-00	900-1100 MHz
TX5XX-01	1100-1300 MHz
TX5XX-02	1300-1600 MHz
TX5XX-03	1600-1900 MHz
TX5XX-04	1900-2200 MHz

The following table details the RF output power of the various models:

Model	Output Power
TX518	70mW
TX523	200mW
TX530	900mW

**Table 1 – Model/Output Power**

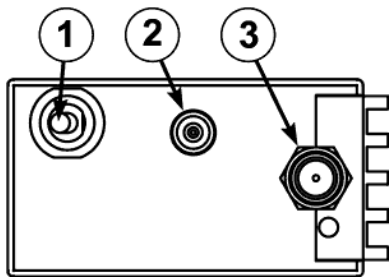
The Transmitter connector is a high density DB-15.

All transmitters offer the following features:

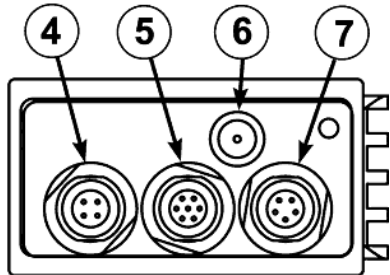
- A single broadcast quality video channel with no delay.
- One/Two (optional) broadcast quality audio channel/s

Optional features (each ordered individually).

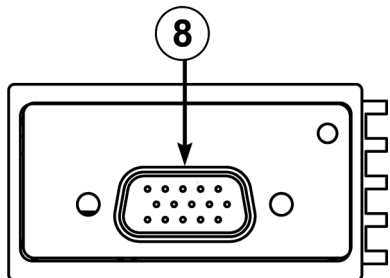
- Two-way Wireless Data Link (WDL) to a DX series receiver.
- Talk back audio channel.
- Alarm/Motion sensor interface.
- Telemetry inputs.



Top View	
1	Power Switch
2	WDL Antenna
3	Main Antenna

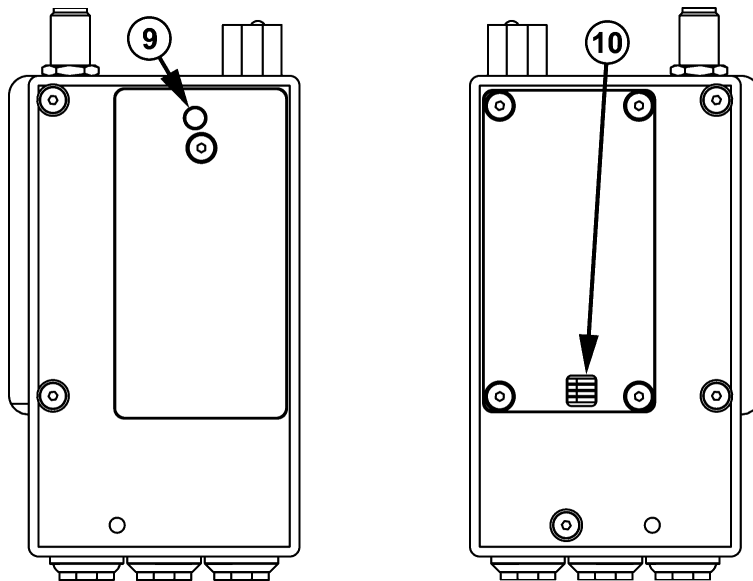


Bottom View – <b>Broadcast</b>	
4	Power/Video Input – see Figure C
5	Data Input – see Figures F
6	Video Input – see Figure D
7	Audio Input – see Figure E



Bottom View – <b>Security</b>	
8	Power/Video Input – see Figure B

Side Views	
9	Power LED Indicator
10	Channel Select Dip Switch



**Figure A – TX500 Series Controls and Connectors**

## **1.1 Video.**

The video input is buffered, combined with the audio subcarrier/s, then DC level restored, limited by a white level clipping circuit, pre-emphasized and FM modulates the transmitter RF carrier.

Avalon RF offers the following video indices of modulation:

- Industry standard frequency deviation of 2MHz. Compatible to GMS, L3 and others.
- Wide frequency deviation of 4MHz.

## **1.2 Audio.**

The audio input/s are buffered and FM modulated on subcarrier/s. The factory preset subcarrier frequency is 6.5MHz but can be factory programmed to any frequency from 5MHz to 7.5MHz. The subcarrier/s is synthesized.

## **1.3 Talk Back Audio Channel (optional).**

The talk back audio channel allows the camera operator (on the transmit side) to receive instructions from the operator at the receiver's side. It drives an earpiece.

## **1.4 Two Way Wireless Digital Link (WDL) (optional).**

The WDL serves as a Pan-Tilt-Zoom (PTZ) / general-purpose two-way RS422/RS485 digital link.

## **1.5 RF Outputs.**

The transmitters have two RF outputs (Only 1 for a standard unit, without WDL or Talk Back Audio Option). A female SMA connector for the main transmitter and a MCX for the WDL.

Both outputs feed antennas, either directly or through a cable.

## 2. Specifications

### 2.1 User Interface.

a) On/Off Switch.

The TX500 series transmitter has an on/off switch. This shuts off power to the entire transmitter.

b) Power on LED.

This LED has the following states:

- i) **Green** when power in on (only applicable for WDL).
- ii) **Red** when the transmitter is on air.

c) Hands Free Back Channel (optional).

This option allows the receiver operator to communicate with the transmitter operator via a headset that includes an earpiece and a microphone, when the transmitter is on air.

### 2.2 Setup.

The TX500 series transmitters have the following setups:

- a) Video/Main RF carrier frequency (0.9GHz to 2.2GHz(\*)).
- b) Audio 1 sub-carrier frequency (5MHz to 6MHz).
- c) Audio 2 sub-carrier frequency (6MHz to 7.5MHz).

(\*) Model dependent



## 2.3 Electrical Interface.

The transmitter has the following interfaces:

### 2.3.1 Power Input

- a) The transmitters operate off a 9Vdc-16Vdc unregulated voltage source.

This input is switched and protected against reverse polarity.

- a) Typical power input current consumption for the basic configuration is (with video present):

Model	Input Current
TX518	<200mA
TX523	350mA
TX530	450mA

**Table 2 – Current Consumption**

'Video Presence' detection circuitry will turn off the power amplifier if no video is detected. This conserves power considerably and reduces the RF output by more than 30 dB (1000 times less), if no video is present.

Addition of option 11 (WDL) will increase the current draw by about 200mA.

### 2.3.2 Video Input.

- a) The video input accepts RS170, CCIR, NTSC or PAL signals.  
b) Input voltage is 1Vp.p with a negative sync tip of 0.3V.  
c) The input impedance is 75  $\Omega$  (ohm).

### 2.3.3 Audio 1 and Audio 2 Inputs.

The audio inputs accept signals of 1Vp.p. and have an input impedance of 600  $\Omega$  (ohm).

#### 2.3.4 "Talk back" audio channel to the transmitter operator (optional).

The "talk back" output drives an electromagnetic earpiece.

#### 2.3.5 Two Way Wireless Digital Link (WDL) (Option 11)

The WDL is a 9.6KBaud (standard, other Baud rates upto 56K are supported) Half-Duplex RS485 compatible serial interface.

#### 2.3.6 Main RF output to antenna.

a) The main RF output connector is a 50  $\Omega$  (ohm) female SMA receptacle.

b) The RF output power is as follows:

Model	Output Power
TX518	70mW at VSWR of 1.5:1
TX523	200mW at VSWR of 1.5:1
TX530	900mW at VSWR of 1.5:1

Table 3 – Power Output

#### 2.3.8 Wireless Digital Link (WDL) RF output.

The WDL RF output is via a 50  $\Omega$  (ohm) MCX connector. Maximum output power is +24 dBm.

The main RF and the WDL RF outputs are identical on all the transmitter versions.

#### 2.3.9 Alarm/Motion Sensor input (optional – Security Type Only).

The Alarm/Motion Sensor input is an interface to a dry contact relay. Whenever the relay circuit is closed, the transmitter goes on air.

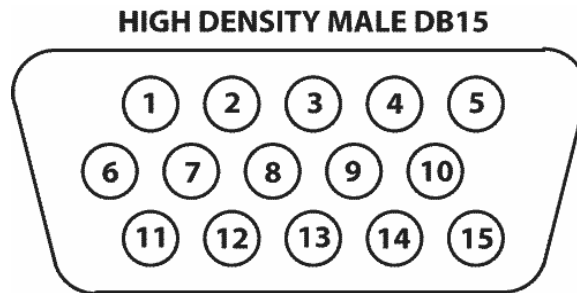
#### 2.3.10 Telemetry inputs (optional).

These analog inputs (maximum of 3) have a  $1\text{M}\ \Omega$  (ohm) input impedance and a sampling rate of 500Hz. Resolution is 8 bit.

## 2.4 Interconnecting.

All interfaces to/from the transmitter are available on the connector.

### 2.4.1 Security Type - DB15P connector with the following pin-out:



**Figure B – DB15**

Pin #	Function	Pin #	Function
1	Power Input (+9Vdc to +16Vdc)	9	Signal Ground
2	Video Input	10	Telemetry 1 Input
3	Video Return Ground	11	Alarm/Motion Sensor Input
4	Audio 1 Input	12	RS-485 I/O 'A'
5	Microphone Input	13	RS-485 I/O 'B'
6	Microphone Bias	14	Telemetry 2 Input
7	Earpiece Output	15	Telemetry 3 Input
8	Power Return Ground		

**NOTE:** This connector option allows for one audio input only, Audio 1 at 6.5 MHz (default factory set).

## 2.5 Mechanical

### 2.5.1 Mounting.

Mounting can be done in one of the following methods:

#### a) Clamping.

Clamping (or hard mounting) is the only method of mounting in all fixed installations.

Clamping is the preferred method of mounting in all mobile installations where most electrical interfaces are used. This is due to the heat sinking needed and the weight of the connector's and the cable's.

#### b) Clip on.

Avalon RF offers a clip on kit. This method is recommended when only one or two interfaces are in use. Not practical for TX523 and TX530.

#### c) Velcro<sup>®</sup> to a flat surface.

Using Velcro<sup>®</sup> to secure the transmitter is recommended when only a few interfaces are in use. Not practical for TX523 and TX530.

#### d) Drop-in.

The transmitter can be dropped into a bucket mounted on the side of the video camera, like the ones usually found in ENG service. This can be done for the TX523 or TX530 only if adequate ventilation (for cooling) is available in the bucket and care is taken with other cables/equipment not being damaged from the transmitter heat.



## 2.6 Environmental Conditions.

The TX600 Series is designed to meet the following environmental conditions:

- 2.6.1 Operating temperature -4° to 122° F  
-20° to 50° C
- 2.6.2 Storage temperature -13° to 150° F  
-25° to 65° C
- 2.6.3 Vibration 1.5G, from 10Hz to 2KHz, sine wave, 3 axis
- 2.6.4 Shock 15G, 25msec, half sine wave, three axis
- 2.6.5 Humidity 5 to 95%, non-condensing
- 2.6.6 Inclination Any
- 2.6.7 Altitude -1500 feet to 15,000 feet  
-450 meter to 4,500 meters

### 3. Operating the transmitter.

Before applying power, make sure all connectors and all antennas are hooked up.

#### **NOTE**

**The transmitter will not transmit unless it has an antenna.**

3.1 The transmitter has two operator controls and one indicator:

a) Channel select.

Units that have a manual synthesizer have a 4-position dip switch that selects a channel number (from 1 to 16). The preset channel numbers are defined by a label on the side wall of the transmitter.

The user is advised to select a channel within the permissible frequency range to begin with, and if any interference is observed, switch over to another channel.

b) On/Off switch.

3.2 The wireless data link is a secondary/utility link that is used to transfer data/voice in the reverse direction and some alarms/telemetry data in the forward direction. It is a narrow band UHF link operating at 492 MHz (but can be placed anywhere between 450-900 MHz if the user has a licensed frequency).

Following are the characteristics:

a) VOICE: Voice is transmitted from the receiver (DX side) to the Transmitter side (TX side). It is implemented as a VOX (voice operated transmit) and only the headset microphone is used on the DX side & only the earpiece is used on the TX side. The microphone is an electret mic.

b) DATA: The data rate is 9.6KBaud fixed (other data rates upto 56K supported) on a RS485 interface.

c) TELEMETRY/ALARMS: This data is sent about 5-6 times a second.



### 3.3 General Guidelines

The choice of a Transmitter and the Antenna to be used is dictated by power consumption, required distance of operation of the link, if it is a fixed or a mobile environment, the space constraints, the location itself (indoors or outdoors, presence of nearby objects like trees, bridges, etc.) and etc. Avalon RF will work with you to determine the right combination. Placement/positioning of the transmitter antenna is important for proper operation of the wireless video link. The antenna shipped with the unit is omni-directional, which means it will radiate in all directions and when upright (vertical) will be vertically polarized. The receiver side antenna's then, must also be mounted vertically. While the above method would be the usual / most common way, certain applications need a different placement. As an example, to transmit between floors in a high rise building, the transmit & receive antennas can be small, directional, high gain panel antennas, mounted horizontally, directly 'looking' at each other. Circular polarized antennas are more expensive, but give a far better performance, especially in mobile applications.

For proper operation of the wireless link, the transmitter antenna should be kept clear of metal objects, trees, buildings, etc. If the transmitter is mobile such as on a video camera, ensure the antenna is sufficiently clear of the operator's body, especially the head. The L-band link is a line-of-sight communication, which means the receive antennas should 'see' the transmit antenna.

Another very important aspect relates to health hazards from RF energy absorption in the body. To minimize the risk, we ask that the user ENSURE the minimum distance of the transmitting antenna from the human body per Table 4. These values have been calculated per FCC Bulletin OET65, Supplement C & related documents.

Minimum Distance from Body (in Inches)						
Model ↓	Antenna Gain →	0 dBi	3 dBi	10 dBi	16 dBi	27 dBi
TX518	Distance	2"	3"	4"	8"	-
TX523		3"	4"	8"	16"	48"
TX530		6"	9"	16"	32"	84"

**Table 4 – Minimum Safe Distance**

**WARNING:**

An Antenna extender cable is shipped with the TX5XX, it is meant to hold the antenna at the minimum safe distance from the human body. This extender cable **MUST** be used whenever the Transmitter is operated in a mobile environment (such as on a camera) and the user should mount the transmitter in a way that does not defeat the purpose of this cable. If the transmitter is mounted in a manner other than intended with the extender cable, it **SHALL** be the user's responsibility to ensure the above minimum distance from 'any' human being. Avalon RF will help/advise you if necessary. If the antenna you received is not one of the above, use the next higher distance or call/e-mail Avalon RF.

Operating range will depend on the transmit and receive antennas used - a wide choice of antennas is available from Avalon RF. Please visit the website ([www.avalonrf.com](http://www.avalonrf.com)) for more details.

For fixed installations, power saving can be achieved by turning off the video camera or the video source. A 'video presence' detection circuitry will turn off the power amp when no video is detected - power will be restored when the video signal is restored. Besides power conservation, it also eliminates high power RF transmission by reducing the output by about 30 dB (1000 times less) when no video is present.

## **4. Ordering information**

### **4.1 Base Models**

TX518-XX	Model dependent Freq range, FM modulated, O/P of 70mW
TX523-XX	Model dependent Freq range, FM modulated, O/P of 200mW
TX530-XX	Model dependent Freq range, FM modulated, O/P of 900mW

All units come with the following standard accessories:

4.1.1 Omni directional whip antenna

4.1.2 A 3-foot power cord with flying leads, to be connected to a customer specific battery pack.

4.1.3 User guide and operating manual (this manual).

4.1.4 A heavy-duty reusable carton.

## **4.2 Options.**

- 4.2.1 Option 11 – Wireless Data Link (WDL)  
Includes an AX502 omni-directional whip antenna with MCX connector.
- 4.2.2 Option 31 – Talk back audio channel. Requires option 11.

### 4.3 Recommended accessories.

#### 4.3.1 Antennas

Overseas customers must check local regulations for compliance before ordering. The choice of a particular antenna is dictated by transmitter power consumption, the application environment, physical size constraints, governing local regulations, etc. As a rule, the higher the antenna gain, the larger it's size and narrower the beam width (the more directional the antenna).

### 4.3.2 Cables

The length of the cable between the transmitter and the antenna will have a bearing on the output power transmitted. It is not recommended to have more than 30 feet of cable, as the cable loss will become appreciable, even with a low loss cable. If a cable must be used, we recommend a low loss cable like the LMR240 or LMR400 or equivalent.

### 4.3.3 Battery packs

- a) BAT80 – 14.4V/80WH Li-Ion battery pack with charger and power cable to transmitter - will run a TX530 transmitter for approximately 9 hours.
- b) BAT92 – 14.4V/92WH Li-Ion battery pack with charger and power cable to transmitter - will run a TX530 transmitter for approximately 12 hours.
- c) BAT103 – 14.4V/103WH Li-Ion battery pack with charger and power cable to transmitter - will run a TX530 transmitter for approximately 15 hours.

## **Warranty**

The Avalon RF Warranty covers Mechanical and Electrical defects for each of the components in your Avalon RF equipment. We will repair or replace the defective part at our cost during the warranty period. Cost is defined as the cost of the component(s) plus our time to install and test the replacement part. Warranty covers parts and labor.

The warranty period is assumed to be 1 year, unless otherwise specified on invoice.

The warranty does not cover failure due to acts of God, failure caused by power outages by the power company, or failure caused by third party components. This includes, but not limited to, earthquakes, flood, electrical storms, power or transformer failure and other acts which are unforeseeable, any component supplied to Avalon RF by the customer or damaged caused to Avalon RF components by customer supplied components.