Tel-Link Radio Modems User Guide.

MicroScan Wireless Data Links with Tel-Link Radio Modems.

Features.

The Tel-Link radios are based around the MaxStream radio modules. The following is a list of the basic features of these modules.

- **Transparent operation supports existing software & systems**
- **Simple configuration using software & standard AT commands**
- **Retries & acknowledgements for guaranteed packet delivery**
- **Peer-to-peer, point-to-point & point-to-multipoint networks**
- **Up to 65,000 network addresses available**
- **Allows up to 7 Frequency Hopping Spread Spectrum independent pairs (networks) to operate in close proximity**
- **Host interface baud rates from 1200 bps to 57600 bps**
- **Signal strength reporting for link quality monitoring & debugging**
- **Support for multiple data formats (7/8 bits, Even/Odd/No Parity)**

Description.

The Tel-Link range of Radio data modems are designed to allow short to medium range communication of serial data “over the air”. The Tel-Link radios use the “ISM” (Industrial Scientific and Medical) frequency bands. The “ISM” frequency bands are available for use free with the equipment being “type approved”. All Tel-Link radios are fully approved for use in many countries. Two frequencies are available for the Tel-Link Radios, 900Mhz and 2.4Ghz. The 900Mhz units have longer range, are more expensive, have larger antenna and are only allowable in certain countries., The 2.4Ghz units have about ¼ to ½ the range but are cheaper, have smaller antenna and can be used almost world wide. For exact details about what units may be used in which country refer to the web site—www.trutrack.com/intech/tel-link.html The Tel-Link Radios are available in a number of configurations.

Ordering Information.

TL- ☐ **-24** Tel-Link Radio Modem 2.4Ghz
Code

TL- ☐ **-9** Tel-Link Radio Modem 900Mhz
Code

Comms	Site	Code
RS232	Outdoor	232O
RS232	Indoor	232I
USB	Outdoor	USBO
USB	Indoor	USBI
RS485/422	Outdoor	485O
RS 485/422	Indoor	485I

Tel-Link Radio Modem Specifications.

General Radio		
Frequency	902-928 MHz (USA,Canada) 915-928 MHz (NZ,Australia)	2.4000-2.4835 GHz
Spreading Spectrum Type	Frequency hopping, direct FM	Frequency hopping, direct FM
Network Topology	Point to multipoint, point-to-point, multi-drop transparent	Point to multipoint, point-to-point, multi-drop transparent
Channel Capacity	7 hop sequences share 25 frequencies	7 hop sequences share 25 frequencies
I/O data rate	1200-57600 bps	1200-57600 bps
Antenna		
Connector indoor	Reverse-polarity SMA	Reverse-polarity SMA
Connector Outdoor	Reverse-polarity TNC	Reverse-polarity TNC
Impedance	50 ohms unbalanced	50 ohms unbalanced
Certification		
FCC Part 15.247	OUR9XSTREAM	OUR-24XSTREAM
Industry Canada	4214A-9XSTREAM	4214A 12008
Europe	N/A (not usable)	ETSI
New Zealand / Australia	FCC Part 15.247	EN 300 328
Performance		
Indoor/ Urban	Up to 450m	Up to 180m
Outdoor LOS Range	Up to 10km with dipole Up to 30km with high gain antenna	Up to 5km with dipole Up to 15km with high gain antenna
Serial Data Throughput	19.2kbps	19.2kbps
RF Baud Rate	20,000bps	20,000bps
Transmit Power Output	140mW	50mW
Receiver Sensitivity	-107dBm	-102dBm

Placement Considerations.

The transmitter's role in wireless communications is to feed a signal to an antenna for transmission. Its internal components code a signal into RF energy with enough strength to project the signal to its intended target.

The receiver in a wireless communication system receives and decodes data that comes through the receiving antenna. The receiver performs the task of accepting designated RF signals while rejecting unwanted ones. The space between the transmitter and receiver is the system's environment.

Environment.

Physical obstructions can enter into the environment and limit the system's ability to get information from one place to another. Range-reducing elements are commonly introduced into simple wireless communications systems in the form of walls, vehicles, trees, wind, etc.

Visual vs. RF Line-of-Sight.

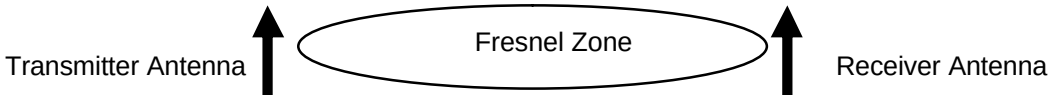
Attaining RF Line-of-Sight (LOS) between the sending and receiving antennas is essential in achieving optimum range in wireless communication systems. There are two types of LOS that are generally used to describe an environment:

Visual LOS is the ability to see from one site to the other. It requires only a straight linear path between two points.

RF LOS requires not only visual LOS, but also a football-shaped path free of obstacles for data to optimally travel from one point to another.

Fresnel Zone.

The Fresnel Zone can be thought of as a football-shaped tunnel between two sites that provides a path for RF signals. In order to achieve the greatest range, the football-shaped path in which radio waves travel must be free of obstructions. Buildings, trees or any other obstacles in the path will decrease the communication range. If the antennas are mounted just barely off the ground, over half of the Fresnel zone ends up being obstructed by the earth resulting in significant reduction in range. To avoid this problem, the antennas should be mounted high enough off of the ground so that the earth does not interfere with the central diameter of the Fresnel zone.



It is also important to understand that the environment may change over time due to growing vegetation, building construction, etc.

How far above the ground and other obstacles the antennas need to be is determined by the diameter of the Fresnel zone. The diameter of the Fresnel zone depends upon the frequency and distances between the two radios.

Various data points are given below**.**

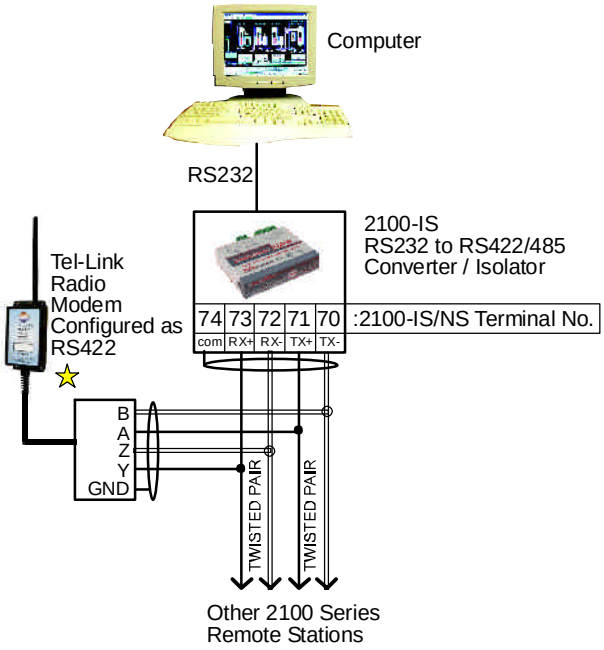
Range Distance	900 MHz Radios	2.4 GHz Radios
300 m	7 m	5.4m
1.6 km	12m	8.4m
8 km	23 m	15.2 m
16 km	31 m	20.2 m

To have ground clearance, the combined antenna height should be equal to the diameter of the Fresnel zone. These are the ideal numbers. Most installations will not be able to provide sufficient clearance and this will reduce the range available between the Tel-Link Units.

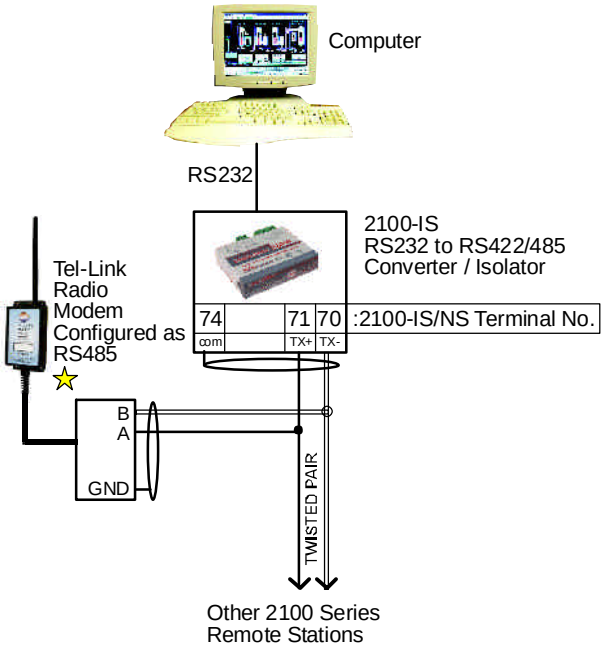
Intech INSTRUMENTS LTD

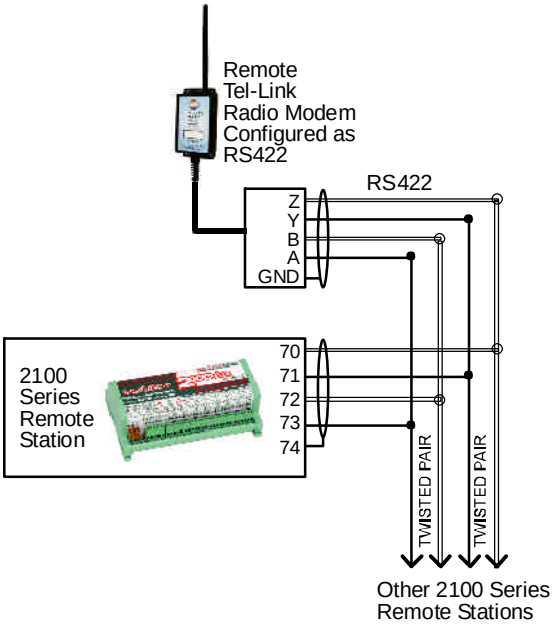
Tel-Link Radio Modems RS422 & RS485 Serial Connections

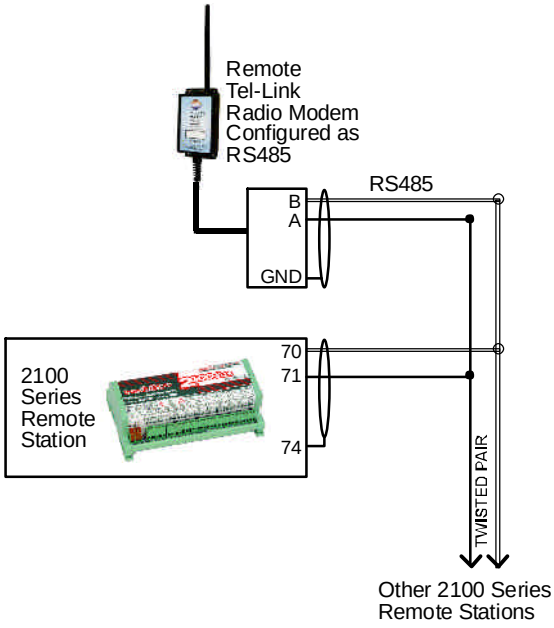
4-Wire RS422 Serial Connections



2-Wire RS485 Serial Connections







Refer to the Intech comms hook-up guide for all other comms connections.

☆ These Radios are able to communicate with remote radios configured in either RS422 or RS485.