



Operational Description SafeTLink, FCC Number RXV-STL-4TE1

The SafeTLink is a point-to-point radio. The SafeTLink 4xT1 version transports 1, 2 or 4 T1 channels between the two endpoints. A link always consists of two ends, each end with an Outdoor Unit (ODU). Any link requires an "A" Outdoor Unit (A ODU) at one end and a "B" Outdoor Unit (B ODU) at the other end. Each ODU contains the radio and multiplexer equipment and may be equipped with an optional integrated antenna. Either or both ODUs may connect to an Indoor Unit (IDU) which contains indicator lights, alarm inputs and alarm relays as well as convenient places to terminate all cabling. Each ODU must either be equipped with an integrated antenna or be connected to an external antenna.

The "A" ODU transmit channel is selectable within the frequency band 4980-4990 MHz, its receive channel is within 4940-4950 MHz. The "B" ODU is opposite with its transmit channel selectable within the frequency band 4940-4950 MHz, its receive channel is within 4980-4990 MHz.

FCC regulations have divided the 4.9 GHz Public Safety Band into channels as shown in Figure 1, below:

Channel Number	Center Frequency (MHz)	Channel Bandwidth (MHz)
1	4940.5	1
2	4941.5	1
3	4942.5	1
4	4943.5	1
5	4944.5	1
6	4947.5	5
7	4952.5	5
8	4957.5	5
9	4962.5	5
10	4967.5	5
11	4972.5	5
12	4977.5	5
13	4982.5	5
14	4985.5	1
15	4986.5	1
16	4987.5	1
17	4988.5	1
18	4989.5	1

Figure 2 shows the overall band plan for the SafeTLink. There are two distinct passbands. Each end of a link transmits in one passband while simultaneously receiving in the other passband.

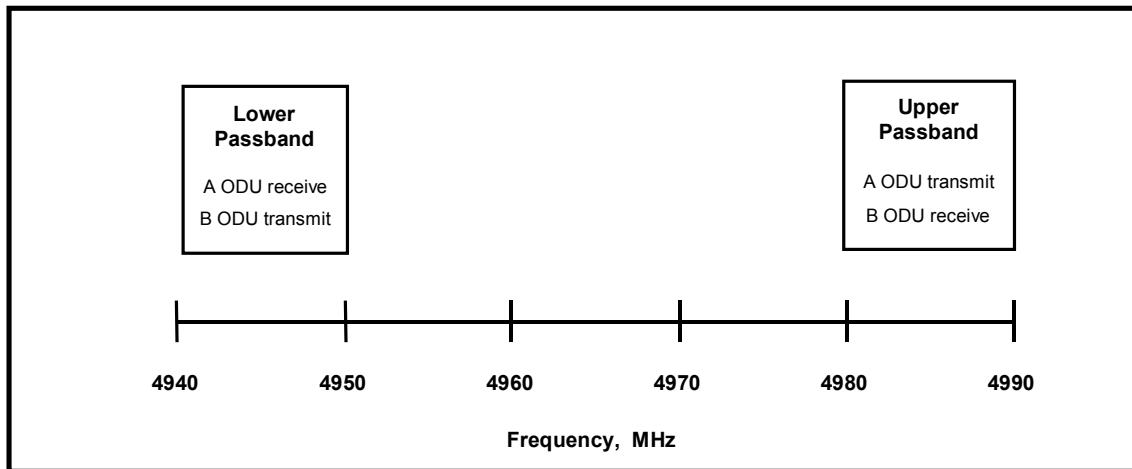


Figure 2
SafeTLink Frequency Plan

Channel assignment is an end-user configurable option and is dependent on the RF bandwidth desired for the link. Specific channel assignments are detailed in the following paragraphs. Note that with SafeTLink all channels are non-overlapping.

1 MHz Operation Channel Plan

The B ODU may be configured to transmit on any one of channels 1 through 5, or on channel 6. The A ODU may be configured to transmit on any one of channels 14 through 18, or on channel 13.

2 MHz Operation Channel Plan

The B ODU may be configured to transmit on any adjacent pair of channels 1 through 5. The choices are (1,2), (2,3), (3,4) or (4,5). The A ODU may be configured to transmit on any adjacent pair of channels 14 through 18. The choices are (14,15), (15,16), (16,17) or (17,18).

5 MHz Operation Channel Plan

The B ODU may be configured to transmit on combined channels 1-5 or channel 6. The A ODU may be configured to transmit on combined channels 14-18 or channel 13.



The 4xT1 SafeTLink system is a point-to-point radio link which can transport 1, 2 or 4 synchronous industry standard 1.544 Mbps T1 signals. The SafeTLink system uses frequency division duplex and requires two RF channels, one for each direction of transmission. The SafeTLink can be configured by the user to transmit a single T1 in a pair of 1 MHz RF channels, two T1s in a pair of 2 MHz RF channels or four T1s in a pair of 5 MHz RF channels. The number of T1 interfaces available in each bandwidth is shown in Figure 3, below:

RF Channel Width	Number of Available DS1 / T1 User Channels. Full Duplex:
1 MHz	1
2 MHz	2
5 MHz	4

1, 2, 4 x E1

The SafeTLink system can transport 1, 2 or 4 synchronous E1 (2048 kbps) framed user interfaces. This feature is not supported in standard US SafeTLink products.

System Components

The SafeTLink system consists of two ends. Each end requires an Outdoor Unit (ODU) which contains the radio and multiplexer equipment. Either or both ends may connect to an Indoor Unit (IDU) which contains indicator lights, alarm inputs and alarm relays as well as convenient places to terminate all cabling. The ODU comes either with an integrated antenna or with capability to connect to an external antenna.

ODU Description

The ODU is a weather-resistant housing containing all Radio Frequency (RF) and digital electronics. The ODU is connected to a directional antenna that communicates to a second ODU/antenna using RF energy. The SafeTLink ODU is available either with an integrated directional antenna or with capability to connect to an external antenna.

In the transmit direction, the ODU receives the T1 and Ethernet inputs (either from the IDU, if provided, or from the communications network if an IDU is not used), and multiplexes these signals into a single digital data stream. It then modulates the data onto a baseband carrier signal using 16 QAM digital modulation to achieve spectral efficiency and robust link performance. This baseband signal is upconverted, filtered and amplified for transmission to the antenna and the distant ODU.



Before transmission, the data stream is buffered, block-interleave coded, then Reed-Solomon forward error correction (FEC) coding bits are added. The entire data stream is modulated onto the RF carrier using 16 QAM mapping.

In the receive direction, the ODU receives the weak RF signals from the distant end equipment. First, the ODU amplifies and filters the faint signals. Then the ODU hardware demodulates the signal and demultiplexes the data stream into T1 and Ethernet signals. Interfering signals are rejected both in the RF and modem sections of the ODU. Transmission and reception are independent, and full duplex. The air interface is frequency division multiplex (FDM).

The T1 and Ethernet interfaces provide industry standard signal levels and formats. Both the T1 and Ethernet interfaces are protected against line surges or short circuits.

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