Before You Begin

Purpose of This Guide

The *Cylink AirPro S-Band Radio Installation Guide* provides the information you need to unpack, install, configure, and operate the Cylink AirPro S-Band radio system.

This Installation Guide is directed to persons who must perform or coordinate the tasks associated with the process of installing wireless communication devices, and planning individual communications network applications.

Prior Knowledge

This Installation Guide assumes that you are knowledgeable about basic digital data communications concepts and practices. If you are not familiar with the concepts and practices involved in these disciplines, familiarize yourself with them before proceeding.

This Installation Guide does not attempt to provide any detailed system planning or installation information on radio frequency (RF) antenna assemblies or path analysis. Refer to the Cylink *Site Planning Guide*.

How This Guide is Organized

This Installation Guide is organized in chapters and appendix material in the following manner:

- Introductory Material:
  - Chapter 1 - provides a product overview.
  - Chapter 2 - tells you how to set up a benchtop "practice" network before you install the equipment in the field.
  - Chapter 3 - provides procedures for setting up a point-to-point and point-to-multipoint networks.
  - Chapter 4 - provides information on setting up repeater and hub networks.

- Operational Material:

  - Chapter 5 - Introduces the Command Line Interface (CLI).

  - Chapter 6 - provides instructions on how to operate the Cylink AirPro S-Band radio, retrieve status and performance information, perform diagnostics, understand alarms and the alarm log.

- Theory of Operation Material:

  - Chapter 7 - tells you about DTE interface settings and clock modes

  - Chapter 8 - tells you about RF link configurations

  - Chapter 9 - discusses burst synchronization

  - Chapter 10 - tells you how to use a telephone modem

  - Chapter 11 - lists troubleshooting information

- Appendix Material:

  - Appendix A - tells you what the CLI commands are and how they are used when you want to set/reset parameters or get system status and performance information.

  - Appendix B - tells you what alarm messages are and what they mean.

  - Appendix C - lists Cylink AirPro S-Band radio specifications and provides compliance information.

  - Appendix D - provides configuration worksheets that you can copy down and keep your configuration settings.

  - Appendix E - provides a Glossary of acronyms and terms specific to the Cylink AirPro S-Band radio network applications.

How to Use This Guide

Before beginning the installation process, read the introductions to all of the chapters so that you have a sense of what each chapter provides. Verify that you have selected the proper installation procedure to meet site-specific needs.

Skim through an entire procedure before you begin performing the step-by-step instructions. By doing this, you will be prepared with the appropriate information, equipment, or tools.

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Product Overview

The Cylink AirPro™ S-Band fractional-rate digital microwave radios operate in the 2400 to 2483.5 MHz Industrial, Scientific and Medical (ISM) frequency band[1]. These radios use direct sequence spread spectrum transmission to create high quality point-to-point and point-to-multipoint wireless digital links. Bit error rate performance is better than one error in 10^{10} bits (one error per ten billion bits)—comparable to fiber and far superior to copper. The range of each link can extend to 50 km (30 miles) depending on path characteristics. Range can be extended further and obstacles can be circumvented using a pair of radios at an intermediate location (a repeater site).

Figure 1-1 Cylink AirPro S-Band Radio

Since lower data rate models occupy less RF bandwidth, more links can share the ISM band. Since they are also less expensive, they are adequate for applications like remote control and compressed voice transmission. Higher data rate models support the higher capacity requirements of multiplexed voice channels, combined voice and data, LAN traffic, and video. RF transmission characteristics of each radio are optimized to minimize the amount of RF spectrum occupied.

The Cylink AirPro S-Band radio series consists of four models:

- Cylink AirPro 19SR - synchronous and asynchronous full-duplex data transmission to 19.2 kbps

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1. By convention, S-band refers to the entire 2 GHz to 4 GHz region.

- Cylink AirPro 64SR - synchronous full-duplex data transmission to 64 kbps; asynchronous to 19.2 kbps

- Cylink AirPro 128SR - synchronous full-duplex data transmission to 128 kbps; asynchronous to 32 kbps

- Cylink AirPro 256SR - synchronous full-duplex data transmission to 256 kbps; asynchronous to 64 kbps

This chapter describes the Cylink AirPro S-Band series of digital microwave radios and includes:

- Features and Benefits
- System Compatibility
- Hardware Components

Features and Benefits

The Cylink Airpro S-Band series radios provide solutions for voice and data applications between two locations up to 50 km (30 miles) apart. These links are ideal for public and private networks. Advanced network management helps large network providers administer and maintain networks for maximum service levels.

Wireless networks that can be built with the Cylink AirPro S-Band radios include...

- A simple point-to-point link connecting two sites up to 50 km apart

- A point-to-multipoint network where a central node polls multiple outlying devices, like terminals or traffic signal controllers

- A high capacity point-to-multipoint network distributing voice services or data services (or both) to many outlying sites from a fiber node, central office, or satellite terminal using multiple point-to-point links radiating from the central node in a hub-and-spoke arrangement

- A complex point-to-multipoint, multiple signal hop, long range network implementing a backbone and local feeders, perhaps in combination with the Cylink AirPro T1/E1 C-Band 5.8 GHz radio

These networks can transport digital information, or any information that can be digitized—voice, video, control instructions, LAN traffic, etc. Because the radios do not implement a network layer protocol, the wireless network is transparent to higher layer protocols and can be used in a wide variety of network environments ranging from no network protocol to IP to SS7.

Table 1-1 lists the features and benefits of the Cylink AirPro S-Band radios.

Table 1-1　Cylink AirPro S-Band Radio Features and Benefits

Features	Benefits
Software configurable	Reduced technician time; lower installation costs
Remote control of far end unit	Increased accessibility, reduced maintenance time
Built-in Test Equipment (BITE)	Enhanced diagnostics; lower installation costs
Continuous performance monitoring	Lower cost, pro-active maintenance
Hub 100 links to one tower	More subscribers served from single tower location
Range up to 50 km (30 miles)	Reaches more destinations without repeaters
Rack mounted	Provides more indoor installations
3-year warranty	Field-proven product: robust performance

System Compatibility

Cylink produces the Cylink AirLink™ family of unmanaged digital microwave radios, and the Cylink AirPro family of managed of radios. Compatibility among product families and among models within a family requires direct communication between radios, co-location or shared location of radios (as at a hub), and wide area spectrum management.

- Direct Communication—Pairs of Cylink AirPro S-band radios (or groups of radios if using multipoint polling capability) can communicate directly with each other so long as they are of the same data rate. In addition, the Cylink AirPro 64S radio will communicate directly with the Cylink AirPro 64SR radio. However, Cylink AirPro radios will not communicate with Cylink AirLink radios, even of the same data rate, because each radio uses different transmission protocols.

- Co-Location—Cylink AirPro and AirLink S-band radios, even of different data rates, can coexist at a site in a hub-and-spoke arrangement to implement a high capacity point-to-multipoint network. The features that enable co-location are transmission burst synchronization (burst sync) compatibility and RF channel plan compatibility.

  - The burst sync system is compatible across both product families, including the following models:

    Cylink AirLink 64S, 128S, 256S,
    Cylink AirPro 64S,

Cylink AirPro 19SR, 64SR, 128SR, and 256SR

- Several channel plans are available for each model to enable channel selection with no or minimal overlap of existing Cylink AirPro or AirLink channels already in use at a site. For example, three channel plans are available with the Cylink AirPro 128SR radio to most readily work in a hub already populated with Cylink AirLink 64S or 128S radios, or Cylink AirPro 64S radios.

- Spectrum Management—As with co-location, the issue of wide area spectrum management where a large number of Cylink radios are already in use is addressed with the multiple channel plans available for each model. These channel plans ensure minimal channel overlap with existing users at other locations within radio range.

Hardware Components

The Cylink Airpro S-Band series radios contain the following hardware components:

- 650 milliwatt (28 dBm) multichannel 2.4 GHz spread spectrum transmitter

- highly sensitive double conversion 2.4 GHz spread spectrum receiver

- gate array circuitry that controls over-the-air transmission protocol and fail-safe transmission burst synchronization of co-located radios

- universal Data Terminal Interface that carries user payload data using V.11/V.35, RS-232, or EIA-530 protocols

- telephone modem interface for dial-in control and automatic dial-out on alarm condition

- built-in universal AC power supply (100-250VAC @ 50/60 Hz) or DC power supply (24/48VDC)

- front, center, or rear mount hardware for 19 inch or 23 inch rack cabinet

- microcomputer that supports a command line user interface (command processor) accessible from an ASCII terminal or PC

- built-in test equipment (BITE) that continuously monitors performance of the radio and link and helps localize faults

- front and rear panels that provide LED indicators of status and performance, and connectors for accessories and external equipment.

Internal hardware components are not accessible.

Front Panel

The Cylink AirPro S-Band radio front panel (see Figure 1-2) provides LED indicators and a 9-pin male DIN connector for a terminal or PC. Four LED indicators function like a "breakout box," providing visual status of the payload data channel. The remaining indicators show the status of radio operation and the RF link.

Figure 1-2 Cylink AirPro S-Band Radio Front Panel

Table 1-2 lists the front panel LEDs and their functions. For a full explanation of the LEDs, see Appendix C.

Table 1-2 Front Panel Indicators

	Label	Name	Color	Indication
Breakout Box Indicators	DCD	Data Carrier Detect	Green	Data communications channel is active
	RTS	Request-to-Send	Green	Request-To-Send is active
	TD	Transmit Data	Green	Normally will flicker when a "1" data bit is being transmitted.
	RD	Receive Data	Green	Normally will flicker when a "1" data bit is being received.
Radio and RF Link Indicators	MAJ ALM	Major Alarm	Red	Major alarm condition exists or existed but is not yet cleared
	MIN ALM	Minor Alarm	Yellow	Minor alarm condition exists or existed but is not yet cleared
	RF SYNC	RF Sync Signal	Green	Radio is receiving RF signal from the far end
	BRST SRCE	Burst Source	Green	Radio is the burst sync electrical signal source for the site (if burst sync is used, as at a hub site)
	PWR	Power	Green	Power switch is on and power is applied to the unit

Rear Panel

The Cylink AirPro S-Band radio rear panel (see Figure 1-3) provides a full duplicate set of front panel LEDs, and connectors for external equipment cables and network management features.
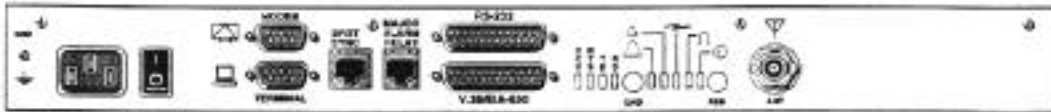

Figure 1-3 Cylink AirPro S-Band Radio Rear Panel

Table 1-3 lists the rear-panel connectors and describes their functions.

Table 1-3   Rear Panel Connectors

Label	Type	Function
GND	Threaded stud Ground connection	System grounding stud
	3-pin male 110-250 VAC @ 50/60 Hz AC power cord receptacle	AC power cord connection
I/O	AC Power On/Off rocker switch	Turns on AC power to unit
MODEM	Network Management Modem port DB-9 male connector	Direct connection to telephone modem
TERMINAL	Network Management Terminal port DB-9 female connector	Direct connection to ASCII terminal
BRST SYNC	Burst Sync signal RJ45 female jack	Primary and secondary burst sync signals for synchronization of co-located transmitters
MAJOR ALARM RELAY	Major Alarm relay RJ11 female jack	Normally-open and normally-closed relay contacts that signal Major Alarm condition.
RS-232	DB-25 female DTE connector	RS-232 format DTE payload signals
V.35/EIA-530	DB-25 female DTE connector	V.35/V.11 or EIA-530 format DTE port payload signals
ANT	N-type female antenna connector	Antenna connection