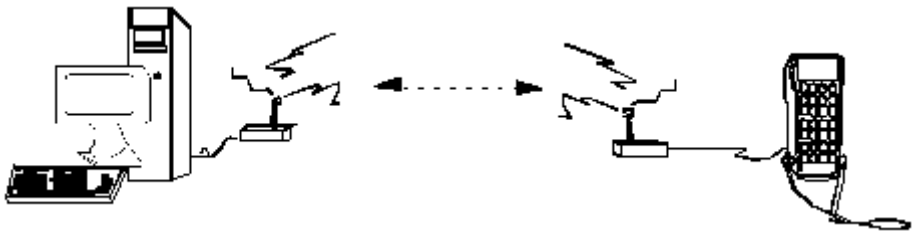
Table of Contents

Product Overview

Summary of Function and Use



The OS2400s are radios which have been designed to provide a wireless connection between any two devices which could otherwise be physically cabled together.

Spread spectrum: These radios transmit using a technique known as "spread spectrum, frequency hopping communications". Using the spread spectrum technique a narrow band signal is spread over a broader portion of the radio frequency band.

Frequency hopping: A radio which rapidly changes its operating frequency several times per second using following a pre -determined sequence of frequencies is described as “frequency hopping”. The receiving and transmitting radios are programmed to follow the same frequency hopping sequence.

The OverAir design takes advantage of these characteristics which are inherent to the spread spectrum technique:
increased immunity to noise. Radios are designed to detect specific radio frequencies. "Noise" is defined as an unwanted signal which h as been transmitted at the same frequency as the radio was designed to detect. There are many man -made and natural sources of "noise". The OS2400 operates more efficiently than a radio that operates using conventional technology.
more users can share the same frequency at the same time. Cell phone use is dependent upon spread spectrum transmission.

Under FCC rules, users of FCC certified spread spectrum products do not require their own license from the FCC. The manufacturers of the products are requi red to apply for and be granted an FCC license for the device. OverAir has been granted a license by the FCC for the use of its OS2400 radios.

FCC Rules

FCC Compliance Statement

FCC RULES

The statements contained in this section "FCC RULES" are requir ed. If the Locus Inc. OverAir Solutions OS2400 radio is used as a component of any device, these statements must be a component of that device's product documentation.

FCC COMPLIANCE STATEMENT

The Locus Inc. Overair Solutions OS2400 device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:
this device may not cause harmful interference, and
this device must accept any interference received, including interference that may cause undesired operation.

WARNING

Changes or modifications to this radio module not expressly approved by its manufacturer, Locus Inc., could void the user's authority to operate the equipment.

NOTE:

The Locus Inc. OverAir Solutions OS2400 module is labeled with an FCC ID number. If this label is not visible when installed in an end device, the outside of the device MUST also display a label referring to the enclosed OS2400. Wording on the label similar to the following should be used:
"Transmitter Module FCC ID: OQ7OS2400"
OR
"This device contains Transmitter Module FCC ID: OQ7OS2400."

Gain / User Proximity to Antenna

It is important to keep the radio's antenna a safe distance from the user. In order to meet the requirements of FCC part 2.1091 for radio frequency radiation exposure, this module must be used in such a way as to guarantee at least 20 cm between the antenna and the body. The FCC requires a minimum distance from the user of "Distance for 1mW cm^2 squared powe r density" or 20cm, which ever is the greater distance.

If a specific application requires a proximity of less than 20cm, the application must be approved through the FCC for compliance to part 2.1093.

At the time of this printing, the antennas listed be low were the only antennas approved for use with the OS2400 Radio Modem. Use of other antennas must be approved through Locus, Inc.

Antenna gain (dBi)	**Locus Inc. approved antennas (Manufacturer: mfg number)**	**Distance for 1mW/cm^2 power density**	**Distance (in)**
2	NCC: N24ARSMA1 NCC: N2400SM8 NCC: NOV2400SMA	4.0 (1.6in)	20cm (7.9in)
5	NCC: N24HGASM1B NCC: NOV24HEARSMA2B	6 (2.2in)	20cm (7.9in)
6	MaxRad: MFB-24006	6.5 (2.5in)	20cm (7.9in)
8	MaxRad: MFB-24008 MaxRad: MP24008FSMA	8.0 (3.1in)	20cm (7.9in)
9	Mobile Mark: 0D9-2400	9.0 (3.5in)	20cm (7.9in)
11	MaxRad: MP24011FSMA	12.0 (4.4in)	20cm (7.9in)
13	MaxRad: MP24013FSMA	15.0 (6.0in)	20cm (7.9in)
The following high gain antennas can only be used for point -to-point network applications.			
15	Astron: P-2415	18.0 (7.0in)	20cm (7.9in)
24	Pacific Wireless: PMANT25	50.0 cm (19.7in)	50cm (19.7in)

Max Antenna Gain / Output Power

NOTE:

All of the Locus Inc. approved antennas meet this Point-to-Point antenna gain / output power emissions requirement. For a list of the antennas approved by Locus, Inc. for use with its OverAir Solutions OS2400 module, see See “MANUFACTURER-APPROVED ANTENNAS” on page 14.

The FCC transmitter power limit for this type of radio is 30 dBm (or 1 watt). In addition, to ensure safety, the output of this module is limited to 250mW. To meet the FCC requirements for emissions, the following restrictions on antenna gain must be adhered to when establishing a radio network.

Point-Multipoint network:

max power 250 mW / max antenna gain 12 dBi

- The transmitter power reference for a Point-Multipoint network is 30 dBm (1 watt) of output power with a maximum antenna gain of 6 dBi.
- For each 1 dB decrease of output power below this reference point, the antenna gain can increase by 1 dB.
- The OS2400 radio module has a maximum output power of 250 mW or 24 dBm. Therefore, the maximum allowable antenna gain at full output power is 12 dBi in a Point-Multipoint application.

  (30dBm -24dBm) + 6dBi = 12dBi

Point-Point network:

max power 250 mW / max antenna gain 24 dBi

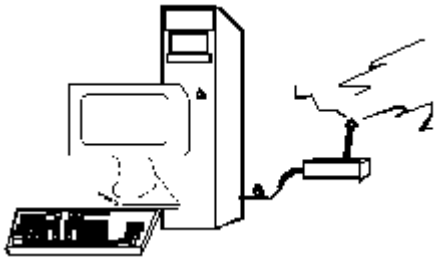
- The transmitter power reference for a Point-to-Point network is 30dBm (1 watt) of output power with an antenna gain of 6dBi. For each 1 dB decrease in output power below this reference point, the antenna gain can increase by 3 dB.
- With the OS2400 radio module’s maximum output power of 250 mW, the maximum allowable antenna gain is 24 dBi in a Point-to-Point application.

  (30dBm - 24dBm) + (6dBi * 3) = 24dB

Getting Started

Setup Overview

A new radio network must be configured to function as required for the specific application.



These are the main steps in the configuration of a new OS2400 radio net work:

- Installing the setup/diagnostic software
- Identifying and setting the serial port
- Making the cable connections
- Network design
- Graphically defining the network
- Configuring the radios
- Physically installing the radios and antennas
- Verification of network installation

The Setup / Diagnostic Software

The OS2400 Setup Application provides a user interface for the configuration and maintenance of a radio network, regardless of the intended application. It graphically reflects the physical layout of the component radios.

The Setup Application provides a means to:

- **configure new** networks or radios:
- assign roles (Master or Remote) to the radios.
- define data paths
- set the radio's operation parameters (baud rate, parity, et c.)
- **edit existing networks or radios:**
  - add or delete Remote Radios (in point-multipoint networks only)
  - re-assign roles to the radios.
  - re-assign operation parameters
- **diagnose functioning of existing networks.**
  With a MASTER cabled to the PC, the status of each REMOTE can be displayed.

NOTE:
It is recommended that the OS2400 Setup Application be installed on only one computer and that the network configuration be done from only that one computer.

When a network is designed, the configuration settings a re stored in a database which is internal to the OS2400 Setup Application. When networks are modified, the OS2400 Setup Application depends upon the retrieval of the network's configuration history. Modification of networks is easier if the OS2400 Applic ation Software is installed on only one computer and that all network-related configurations be done using that one computer.

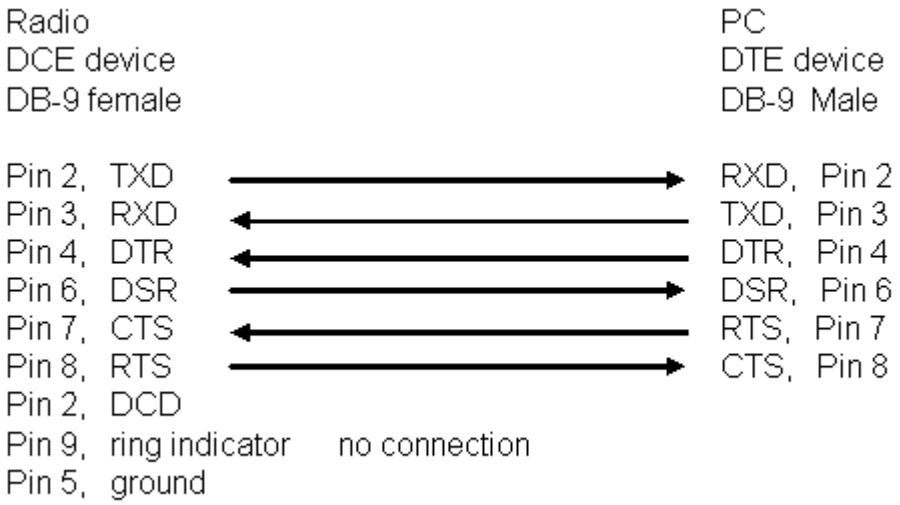
To keep clearly present these Help files, the computer into which the OS2400 Setup Application has been installed will be refer red to as the Configuration PC.

Hardware Installation

CABLE SPECIFICATIONS

The Radio is considered to be a DCE device and the PC a DTE device. The following illustrates the wiring of the straight through serial cable which is connected to the:

- the Configuring PC and each radio that as it is configured
- the Configuring PC and the Master radio.



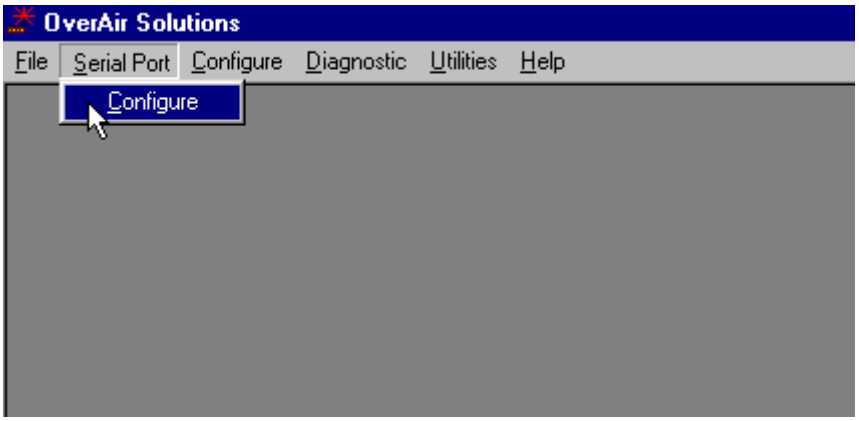
RADIO POWER REQUIREMENTS

THE SERIAL PORT

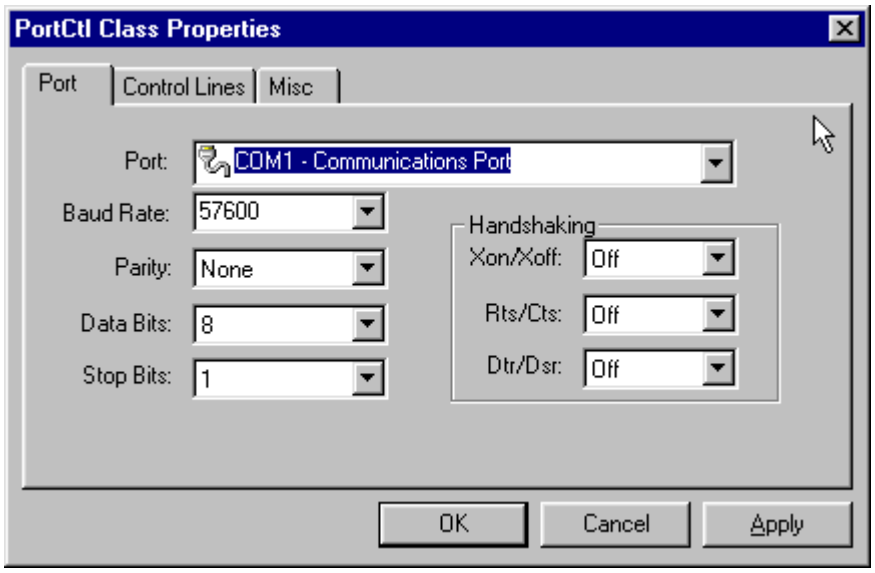
VIEWING THE SERIAL PORT SETTINGS

The serial port of the Configuration PC must be identified and its parameters set before radio communication can begin.
To view the current settings, from the main menu of the OS2400 Setup Application select:

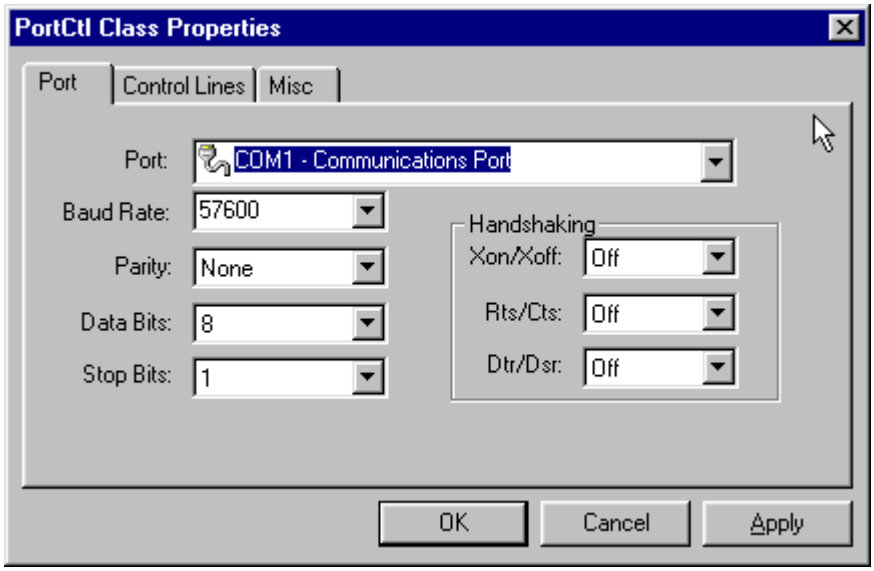
- ?? SERIAL PORT
- ?? CONFIGURE



The displayed dialog box has three tabs. With the first of the tabbed dialog boxes, PORT, the serial port settings are displayed. To understand how to customize these settings see Setting the Serial Port.



SETTING THE SERIAL PORT



These are the factory set serial port parameters for the Configuration PC.
Change these defaults with care.

- Baud rate: 115200 (default).
- Parity: None (default).
- Data Bits: 8 (default).
- Stop Bits: 1 (default).
- Handshaking:

  It is suggested that the handshaking defaults not be changed.
- Xon/Xoff OFF
- Rts/Cts ON (Request to Send/Clear to Send)
- Dtr/Dsr OFF (Data Terminal Ready/Data Set Ready)

- From the drop down list, select the COM port to be used. The term COM port refers to those hardware connections usually located on the back of the computer to which cables are connected, allowing the computer to COMmunicate with other devices (like a printer or an OS2400 radio).

  The OS2400 Setup Application automatically determines and displays the available serial ports.

NOTE:
The determination of the designation (name) of each COM port can be accomplished several ways:

- look for a label at the connector on the back of the PC.
- consult the computer's documentation.
- experiment, trial and error.
- check (and or adjust) the PC's BIOS configuration.

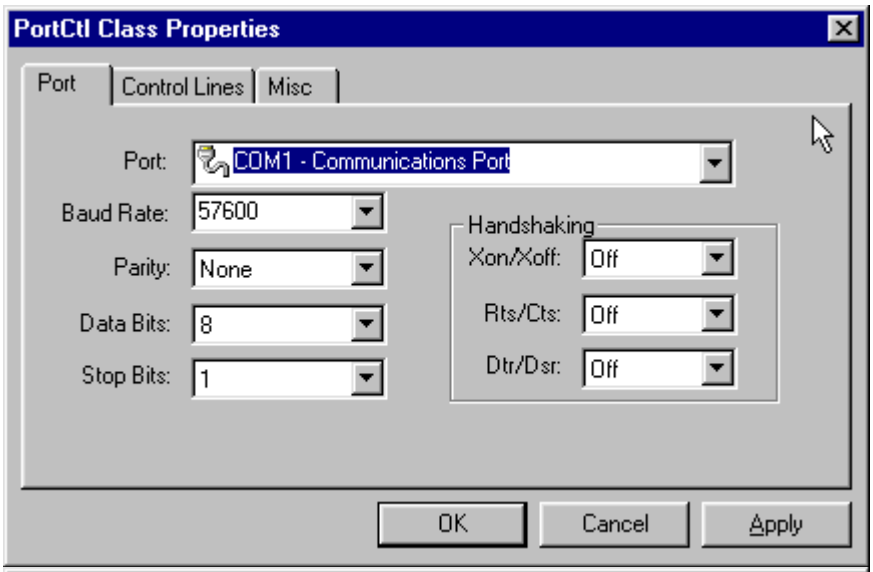
- Select OK.

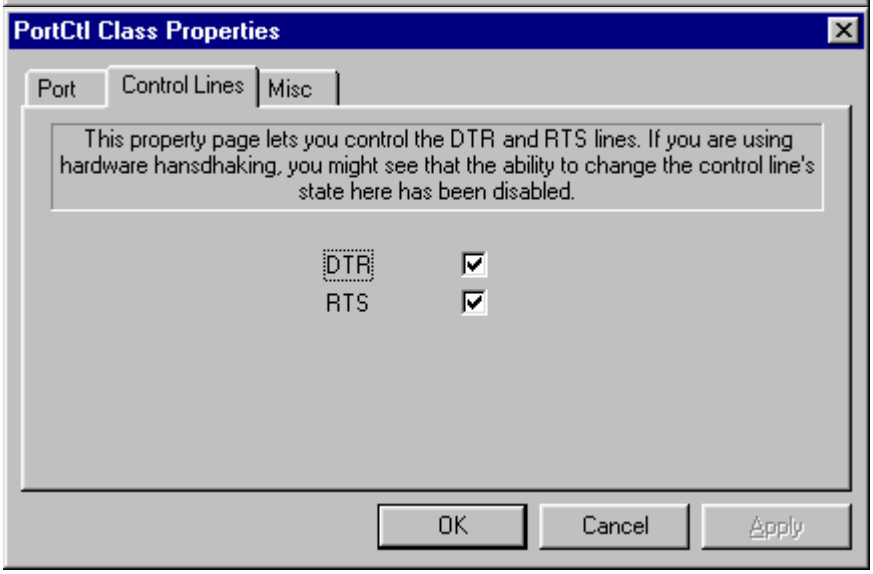
In general, the factory set defaults will not have to be changed. For an illustration of the factory default serial port settings see Serial Port Factory Default Settings.

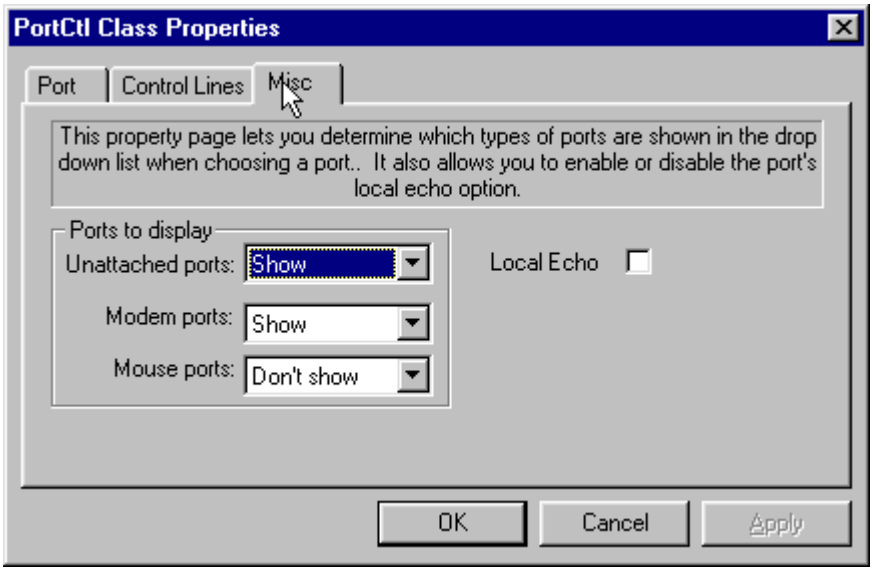
SERIAL PORT FACTORY DEFAULTS ILLUSTRATED

From any of the three associated dialog boxes, select:

- ?? OK to confirm/enter any changes made and return to the Setup Software main menu.
- ?? CANCEL to discard any cha nges and return to the Setup Software main menu.






PortCtl Class Properties
Port
Control Lines
Misc
This property page lets you determine which types of ports are shown in the drop down list when choosing a port.. It also allows you to enable or disable the port's local echo option.
Ports to display
Unattached ports:
Show
Modem ports:
Show
Mouse ports:
Don't show
Local Echo
OK
Cancel
Apply

Network Design

Radio Network Basics

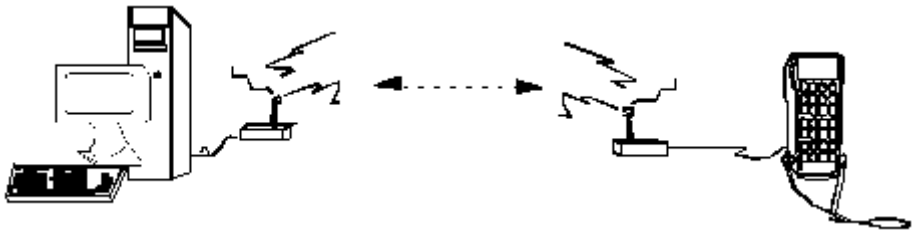
RADIO NETWORK DEFINED

A radio network provides a wireless communication link between a Master Device and any Remote Device that could be connected to Master Device using a serial cable. For example, a Master Device and its associated Remote Device can be:

- a computer with a printer,
- a computer with a scanner,
- a scanner with a printer.

A radio link can be used in a situation wher e a Master Device and its Remote Device are located such that a serial cable connection between them is impractical or impossible.

The simplest radio network consists of one Master Radio and one Remote Radio, one Master Device that must communicate with a Remote Device. The Master Radio is cabled to the Master Device, the Remote Radio is cabled to the Remote Device. In the example illustrated below, the Master Device is a computer and its Remote Device is a hand held terminal.

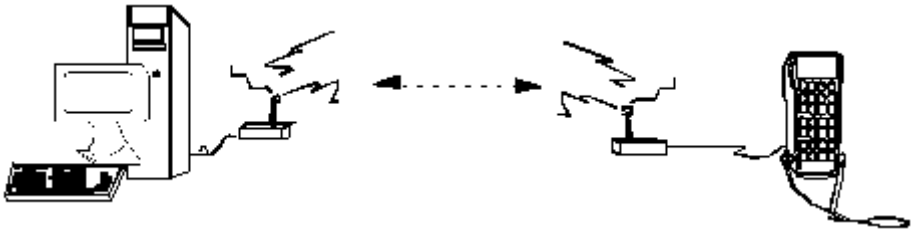


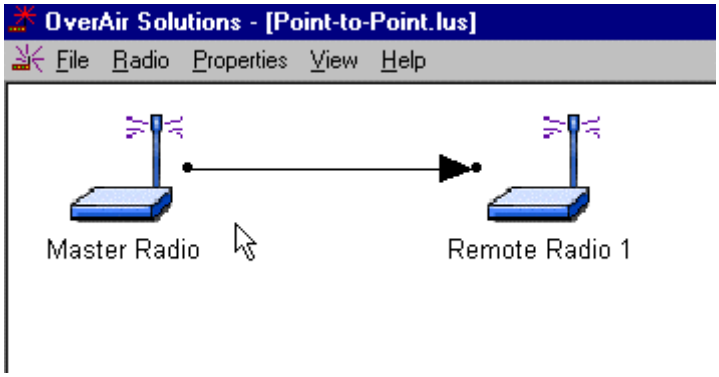
CHANNELS

POINT-TO-POINT

There are two network types , point-to-point and point-to-multipoint. In all networks there is only one Master Radio.

Point–to–Point networks are the simplest radio network consisting of one Master Radio and one Remote Radio, one Master Device that must communicate with a Remote Device. Several point-to-point networks can operate at the same location, however each Master-Remote network must use a different communication channel.

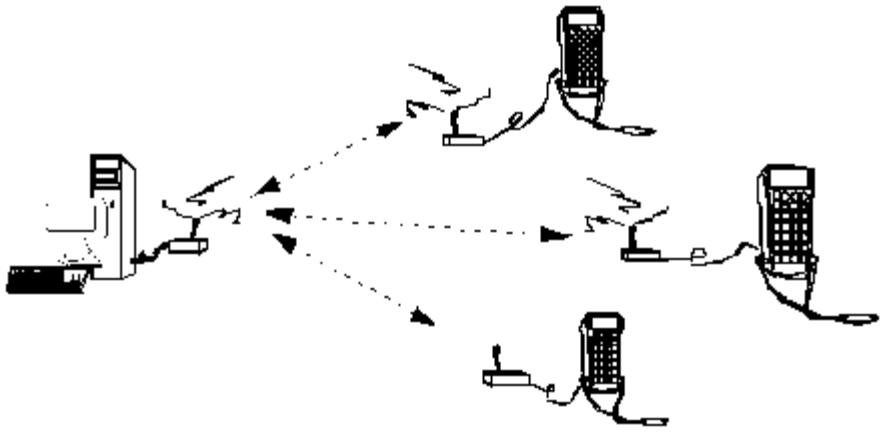




- Channel: Channel selection is used to allow the operation of up to 8 different networks in the same location. For network functionality these channel requirements must be adhered to:
- The Master Radio and Remote Radio (or Remote Radios) of each network must be assigned to the same channel.
- Networks in close proximity must be assigned to different channels.

POINT-MULTIPOINT

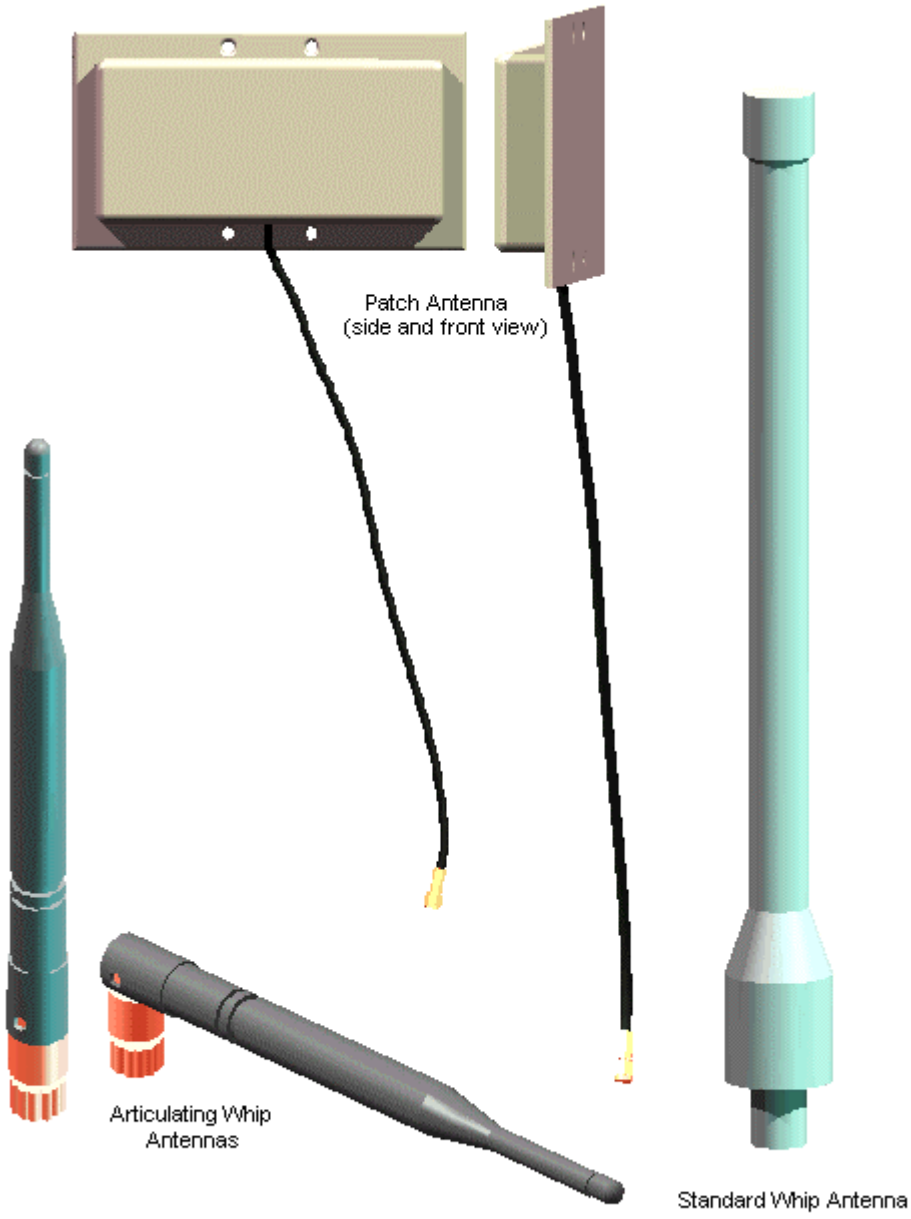
In **Point-Multipoint** networks one Master Radio is in communication with at least two Remote Radios. The Remotes can only communicate with their Master. Remotes cannot communicate with each other directly, the data must be passed through the Master. A Point-Multipoint network will not work with an application which requires peer to peer communication. The OS2400 Point-Multipoint network can only be used with applications that use the Modbus communication protocol.



- Channel: Channel selection is used to allow the operation of up to 8 different networks in the same location. For network functionality these channel requirements must be adhered to:
- The Master Radio and Remote Radio (or Remote Radios) of each network must be assigned to the same channel.
- Networks in close proximity must be assigned to different channels.

Antenna Types

ANTENNA TYPES ILLUSTRATED



MANUFACTURER APPROVED ANTENNAS

Locus Inc. has tested and approved the use of these antennas wit h its OverAir Solutions OS2400 radio module. At the time of this printing, the antennas listed below were the only antennas approved for use with the OS2400 Radio Modem. Use of other antennas must be approved through Locus, Inc.

Antenna type	***Gain***	***Connector type***	***Mfg***	***Mfg part number***
1/2 wave whip, artculating	2dBi	reverse polarity SMA	NCC	N24ARSMA1
1/2 wave whip	2dBi	reverse polarity SMA	NCC	N2400SM8
1/2 wave whip, articulating	2dBi	reverse thread SMA	NCC	NOV2400SMA
collinear array whip, articulating	5dBi	reverse polarity SMA	NCC	N24HGASM1B
collinear array whip, articulating	5dBi	reverse thread SMA	NCC	NOV24HEARSMA2B
collinear array whip	9dBi	reverse thread N	Mobile Mark	OD9-2400
collinear array whip	8dBi	reverse thread N	MaxRad	MFB-24008
collinear array whip	6dBi	reverse thread N	MaxRad	MFB-24006
patch	13dBi	reverse thread SMA	MaxRad	MP24013FSMA
patch	11dBi	reverse thread SMA	MaxRad	MP24011FSMA
patch	8dBi	reverse thread SMA	MaxRad	MP24008FSMA

The following high gain antennas can only be used for point -to-point network applications.

Yagi	15dBi	reverse thread N	Astron	P-2415
Parabolic Grid	24dBi	reverse thread N	Pacific Wireless	PMANT25

SITE SELECTION

ANTENNA SELECTION

Graphically Layout the Network

NEW NETWORK NAMED

GRAPHICAL LAYOUT SCREEN

ADDING RADIOS FOR POINT MULTIPOINT

MOVE RADIOS

RENAME RADIOS

DELETE A RADIO

SAVE THE NETWORK'S DEFINITION

Configuring the Radios

Physical Installation and Network Verification

Modifying an Existing Network

Upgrade Software - Download Code

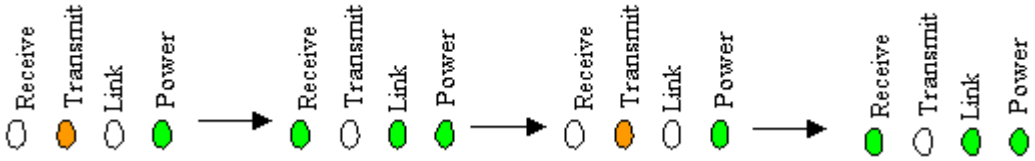
The Download Code function is available under these circumstances. If either of these conditions is missing the Download Code function will be unavailable (greyed out).

- the Download Code CD is in the Configuration PC's CD drive
- at least one network has been configured

Troubleshooting

Radios do not communicate

Radio is in “bootloader” mode:
If the cause of the problem is that the radio is in bootloader mode the diagnostic LEDs on the radio will flash in the following sequence.



Software must be re-loaded from the Download Code CD. See Download Code for instructions.

Reference Information

Shortcut Keys

Serial Port Basics

Help on Windows Help

Index

T

U