NetSilicon
A Digi International® Company

Digi Connect Family™ User's Guide

Making DEVICE NETWORKING easy™

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Contents

About this Guide

Purpose

This guide introduces the features of Digi Connect™ devices, and shows you how to configure, monitor, and administer Connect devices.

Audience

This guide is intended for those responsible for setting up a Digi Connect device. It assumes that you are somewhat familiar with networking. A glossary is provided with definitions for networking terms and features discussed in the content.

Scope

This guide focuses on configuration, monitoring, and administration of Digi Connect devices. It does not cover hardware details beyond a certain level, application development, or customization of Connect devices and interfaces to them.

Where to Find More Information

In addition to this guide, the following documents are part of the Digi Connect library.

General Release Documentation

These documents are of interest to end users of Digi Connect devices:

- Digi Connect User's Guide (this guide)

- Online help and tutorials
- Context-sensitive assistance available in the Web-based interface to Connect devices.
- Digi Connect Hardware Reference Guides
- Quick Start Guides
- RealPort® Installation Guide
- Release Notes
- Cabling Guides

Integration Documentation

These documents are of interest to customers who purchase the Digi Connect Integration Kit for product customization. The Digi Connect Integration Kit includes such resources as development board schematics for module products, firmware release notes, hardware reference manuals, specifications, and documentation for the sample applications. For more information, see the document *Getting Started with Digi Connect* included with the Integration Kit and accessed from the Start menu (**Start > Digi Connect > Getting Started with Digi Connect**).

Additional Product Information on www.digi.com

In addition to the previous documents, product information is available on the digi.com web site, including:

- Support Forums
- Knowledge Base
- Data sheets/product briefs
- Application/solution guides

Digi Contact Information

To contact Digi International for more information about your Digi products, or for customer service and technical support, use the following contact information:

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Introduction

CHAPTER 1

This chapter introduces:

- The devices in the Digi Connect Family
- The features available in Digi Connect devices
- The types of connections and data paths in which Digi Connect devices can be used
- The processes and interface options available for configuring, monitoring, and administering Digi Connect devices
- Basic safety considerations for using Digi Connect devices

The Digi Connect Family

Following is an overview of the devices in the Digi Connect Family.

Digi Connect SP™

The Digi Connect SP (Single Port) device server is the ideal platform for your custom web- and network-enabled embedded applications. Combining Digi and NetSilicon technology, it eliminates the hardware design effort and delivers a true device networking solution that is powerful enough to meet your future performance requirements.

Built on leading NetSilicon 32-bit NET+ARM technology, the Digi Connect SP device server provides a powerful off-the-shelf hardware platform for embedded web- and network applications with a seamless migration path to embedded modules and a fully

integrated NetSilicon system-on-chip solution using the award-winning family of Ethernet-enabled NET+ARM microprocessors.

Digi Connect Wi-SP™

The Digi Connect Wi-SP (Wireless Single Port) device server is a secure 802.11b wireless network solution. Combining Digi and NetSilicon technology, configuration is simple without complex integration tools. The compact hardware design delivers a powerful networking solution to meet your performance requirements.

Built on leading NetSilicon 32-bit NET+ARM technology, the Digi Connect Wi-SP device server provides a powerful off-the-shelf hardware platform for embedded web- and network applications with a seamless migration path to embedded modules and a fully integrated NetSilicon system-on-chip solution using the award-winning family of Ethernet-enabled NET+ARM microprocessors.

Digi Connect ME™

The Digi Connect ME (Micro Embedded) device server enables manufacturers to keep pace with ever-evolving networking technology by easily adding web-enabled network connectivity to existing products. This network connectivity is provided without the added complexities of extensive hardware and software integration, and at a fraction of the time and cost that would be required to develop a custom solution.

Built on leading 32-bit ARM technology using the network-attached NetSilicon NS7520 microprocessor, the Digi Connect ME combines true plug-and-play functionality with the freedom and flexibility of complete product customization options. These options are based on the NetSilicon NET+Works development platform. This platform offers a seamless migration path to a fully integrated NetSilicon system-on-chip solution.

The Digi Connect ME Integration Kit is available to help you customize the look-and-feel of the device interface.

Digi Connect Wi-ME™

The Digi Connect Wi-ME (Wireless Micro Embedded) is a fully customizable and secure 802.11b wireless device server. It is based on the common platform design approach of the Digi Connect family of embedded products, which minimizes design risk and reduces

time to market by allowing customers to easily accommodate both wired and wireless network functionality in a single future-proof product design.

The Digi Connect Wi-ME device server is pin-compatible with the Digi Connect ME, and makes fully transparent 802.11b integration possible without the traditional complexities of hardware and software integration work.

Built on leading NetSilicon 32-bit NET+ARM technology, the Digi Connect Wi-ME embedded module offers a seamless migration path to a fully integrated NetSilicon system-on-chip solution. It combines true plug-and-play functionality with the freedom and flexibility of complete software customization using the proven NetSilicon NET+Works development platform.

The Digi Connect Wi-ME Integration Kit is available to help you customize the look-and-feel of the device interface.

Digi Connect EM™

The Digi Connect EM (Embedded Module) device server delivers true Web-enabled device networking that is easy and cost-effective to implement, while being powerful enough to meet future performance needs.

Built on leading 32-bit ARM technology using the network-attached NetSilicon NS7520 microprocessor and featuring a wide variety of connectivity options, the Digi Connect EM provides the freedom and flexibility of complete custom product development.

The Digi Connect EM Integration Kit is available to help you customize the look-and-feel of the device interface.

Digi Connect Wi-EM™

The Digi Connect Wi-EM (Wireless Embedded Module) device server is a fully customizable and secure 802.11b wireless embedded module that provides integration flexibility in a variety of connection options. Based on the common platform design approach of the Digi Connect family of embedded products, the Digi Connect Wi-EM minimizes design risk and reduces time to market by allowing customers to easily accommodate both wired and wireless network functionality in a single future-proof product design.

The Digi Connect Wi-EM wireless embedded module is pin-compatible with the Digi Connect EM, and makes fully transparent 802.11b integration possible without the traditional complexities of hardware and software integration work.

Built on leading NetSilicon 32-bit NET+ARM technology, the Digi Connect Wi-EM combines true plug-and-play functionality with the freedom and flexibility of complete software customization using the proven NetSilicon NET+Works development platform, and offers a seamless migration path to a fully integrated NetSilicon system-on-chip solution.

The Digi Connect Wi-EM Integration Kit is available to help you customize the look-and-feel of the device interface.

Digi Connect™ WAN

The Digi Connect WAN (Wide Area Network) wireless device server is an alternative to traditional wired TCP/IP WANs. The Digi Connect WAN uses GSM (Global System for Mobile communication) to connect virtually any EIA-232 serial device to your network. Wireless cellular connectivity can be used to create primary and backup network access for uninterrupted communication.

The Digi Connect WAN device server uses auto-connect features to maintain connection without any airtime or usage charges until the connection is actually used. Remote access is easy, cost-effective, and continuous through standard TCP/IP protocols.

The Digi Connect WAN device server allows remote devices to easily and cost effectively communicate back to a central office through standard TCP/IP communications.

Digi Connect™ RG

The Digi Connect RG (Remote Gateway) wireless cellular device provides high-speed serial-to-serial conectivity to remote devices via wireless cellular networks. The Digi Connect RG device employs wireless cellular networks to connect virtually any EIA-232/422/485 serial device to TCP/IP networks. It allows remote devices to communicate easily and cost-effectively to a central office through standard TCP/UDP communications. In addition, Digi patented RealPort® COM port redirection software supports remote connections to serial devices as if they were actually connected to local COM ports.

Wireless communications via Digi Connect RG device servers include instant deployment, elimination of wiring costs and problems due to wire breaks, and the ability

to move the connection virtually anywhere. Typical applications include utilities, industrial automation, financial, retail/POS or any industry where remote or portable IP connections are required.

Digi Connect™ ES

The Digi Connect ES (Extended Safety) provides sensitive serial over Ethernet connectivity for applications. It is the first IEC 60601/EN60601 compliant device of its kind and consists of four, eight, or 16 galvanically isolated RS-232 serial ports, with a 10/100 Mbps network interface and Ethernet switch (eight- 16-port models). Common applications include providing Ethernet connections from serial devices such as ventilators, EKGs, patient monitoring systems, infusion pumps and glucose meters to the central data management system.

Galvanical isolation provides extended electrical safety. There is no electrical path for current to earth ground, ensuring no electrical shock when making physical contact with the Digi Connect ES. There is no electrical path from port to port, ensuring a ground fault will not affect the operation of the Digi Connect ES for the operation of any device connected to it.

Features

Following is a discussion of key features in Digi Connect devices.

Hardware Features

Following are summaries of the hardware features for Digi Connect devices. For detailed hardware specifications, see the *Hardware Reference* for your Digi Connect device.

Digi Connect SP

- Memory: 4 MB Flash; 16 MB RAM
- Serial Interface:
  - Switch-selectable EIA-232/422/485 interface (DB-9M).
  - Throughput up to 230,400 bps.

  - 5, 6, 7, 8 data bits.
  - 1, 1.5, 2 stop bits.
  - Mark/space/even/odd parity.
  - Full signal support for TXD, RXD, RTS, CTS, DTR, DSR, and DCD.
  - Hardware and software flow control.
  - RTS Toggle
- Power requirements: See "Power Requirements Digi Connect SP Digi Connect Wi-SP, Digi Connect WAN, and Digi Connect RG" on page 26.

Digi Connect Wi-SP

- Memory: 4 MB Flash; 16 MB RAM
- Serial Interface:
  - Switch-selectable EIA-232/422/485 interface (DB-9M).
  - Throughput up to 230,400 bps.
  - 5, 6, 7, 8 data bits.
  - 1, 1.5, 2 stop bits.
  - Mark/space/even/odd parity.
  - Full signal support for TXD, RXD, RTS, CTS, DTR, DSR, and DCD.
  - Hardware and software flow control.
  - RTS Toggle

Power requirements: See "Power Requirements Digi Connect SP Digi Connect Wi-SP, Digi Connect WAN, and Digi Connect RG" on page 26

Digi Connect ME

- Memory: 2 MB Flash; 8 MB RAM
- Serial interface:
  - High-speed TTL serial interface.
  - Throughput up to 230,400 bps.
  - 5, 6, 7, 8 data bits.
  - 1, 1.5, 2 stop bits.
  - Mark/space/even/odd parity.

  - Full signal support for TXD, RXD, RTS, CTS, DTR, DSR, and DCD.
  - Hardware and software flow control.
  - RTS Toggle
- Five configurable GPIO pins
- Power requirements: See "DC Characteristics for Embedded Devices Digi Connect ME, Digi Connect Wi-ME, Digi Connect EM, and Digi Connect Wi-EM" on page 26.

Digi Connect Wi-ME

- Memory: 4 MB Flash; 8 MB RAM
- Serial interface:
  - High-speed TTL serial interface.
  - Throughput up to 230,400 bps.
  - 5, 6, 7, 8 data bits.
  - 1, 1.5, 2 stop bits.
  - Mark/space/even/odd parity.
  - Full signal support for TXD, RXD, RTS, CTS, DTR, DSR and DCD.
  - Hardware and software flow control.
  - RTS Toggle
- Five configurable GPIO pins
- Power requirements: See "DC Characteristics for Embedded Devices Digi Connect ME, Digi Connect Wi-ME, Digi Connect EM, and Digi Connect Wi-EM" on page 26.

Digi Connect EM

- Memory: 4 MB Flash; 8 MB RAM
- Serial interface:
  - Two high-speed TTL serial interfaces.
  - Throughput up to 230,400 bps.
  - 5, 6, 7, 8 data bits.
  - 1, 1.5, 2 stop bits.

  - Mark/space/even/odd parity.
  - Full signal support for TXD, RXD, RTS, CTS, DTR, DSR and DCD on port 1
  - TXD / RXD signals support on port 2.
  - Hardware and software flow control on port 1.
  - RTS Toggle
- Nine configurable GPIO pins
- Power requirements: See "DC Characteristics for Embedded Devices Digi Connect ME, Digi Connect Wi-ME, Digi Connect EM, and Digi Connect Wi-EM" on page 26.

Digi Connect Wi-EM

- Memory: 4 MB Flash; 8 MB RAM
- Serial interface:
  - Two high-speed TTL serial interfaces.
  - Throughput up to 230,400 bps.
  - 5, 6, 7, 8 data bits.
  - 1, 1.5, 2 stop bits.
  - Mark/space/even/odd parity.
  - Full signal support for TXD, RXD, RTS, CTS, DTR, DSR and DCD on port 1.
  - TXD / RXD signals support on port 2.
  - Hardware and software flow control on port 1.
  - RTS Toggle
- Nine configurable GPIO pins
- Power requirements: See "DC Characteristics for Embedded Devices Digi Connect ME, Digi Connect Wi-ME, Digi Connect EM, and Digi Connect Wi-EM" on page 26.

Digi Connect ES

- RS-232 Serial Ports (2.5 kV)
- Connect to 10/100 Mbps Ethernet LAN
- Surge protection on all ports

- Serial Interface
  - Intergrated 2-port Ethernet switch on 8 and 16-port models
  - HTTP for easy browser configuration
  - Up to 9 Telnet or Rlogin sessions per port
  - Password access
  - Firmware upgrades via TFTP
  - Save/Restore configuration to host
  - 230 Kbps throughput on all ports
  - Full modem and hardware flow control
- LEDs for serial Ethernet activity

Digi Connect WAN

- Memory: 4MB Flash; 8 MB RAM
- Serial interface:
  - Switch-selectable EIA-232 (DB-9M)
  - Throughput up to 230,400 bps
  - 5, 6, 7, 8 data bits.
  - 1, 1.5, 2 stop bits.
  - Mark/space/even/odd parity.
  - Full signal support for TXD, RXD, RTS, CTS, DTR, DSR, and DCD.
  - Hardware and software flow control.
- DHCP Server (enabled by default)
- Power requirements: See "Power Requirements Digi Connect SP Digi Connect Wi-SP, Digi Connect WAN, and Digi Connect RG" on page 26.

Digi Connect RG

- One EIA-232/422/485 serial port
- 10/100 Base-T Ethernet
- GPRS with EDGE network for high speed wireless network connectivity
- 1900/850 MHz EDGE/GPRS modem for use in U.S. and other markets

- TCP/UDP socket service
- Patented Digi RealPort® COM port redirector
- Web and central console configuration
- Supports static/dynamic and public/private IP addresses
- Integrates with Digi Connectware™ Manager for easy device connectivity and management
- 256-bit AES security provides encryption and authentication for data communications

The following is a discussion of some of these key configurable hardware features.

Serial Interface Features and Options

The serial interface for Digi Connect devices includes the following features (except where noted) and configurable options:

- Full signal support for TXD, RXD, RTS, CTS, DTR, DSR, and DCD.
- RTS Toggle: The RTS signal can be enabled or disabled on a given serial port. This toggling of RTS can be used to raise RTS when sending data (not supported in Digi Connect WAN).
- Data bits 5 through 8 are supported.
- Stop bits 1, 1.5, and 2 are supported.
- RCI over Serial (DSR) can be enabled or disabled.
- Hardware and software flow control.
- Serial data over User Datagram Protocol (UDP) also known as udpserial (not supported in Digi Connect WAN). Supported udpserial inlcudes the following functionality:
  - controlling forwarding characteristics based on size, time, and patterns.
  - incoming datagrams from multiple destinations.
  - outgoing datagrams sent to multiple destinations.
- Serial data over Transmission Control Protocol (TCP), also known as autoconnect and tcpserial. Supported tcpserial includes the following functionality:
  - controlling forwarding characteristics based on size, time, and pattern.

  - creating an autoconnection from serial port to remote network destination based on data and/or serial hardware signals.
  - allowing incoming raw, Telnet, and SSL (secure socket) connections
  - controlling serial port via Telnet also known as RFC 2217 (not supported in Digi Connect WAN).
- Alarms: Issuing of email triggers or SNMP traps based on patterns found in serial data (alarms feature), also emails based on General Purpose Input/Output (GPIO) signals. See "Alarms" on page 39 for more details.
- Port buffering: Allows you to monitor incoming ASCII serial data in log form.
- Session management (not supported in Digi Connect WAN):
  - You can connect to a device through Telnet or Rlogin.
  - You can make connections to serial ports and switch between them using escape key sequences.
- Modem emulation over Ethernet (see also "Modem Emulation" on page 39, not supported in Digi Connect WAN):
  - Dial into serial port from network
  - Dial out of serial port to network
  - Dial-in modem pool
- Line Printer Daemon (LPD): Allows network printing over a serial port (not supported in Digi Connect WAN).
- RealPort software (see also "RealPort Software" on page 38, not supported in Digi Connect WAN):
  - Support network serial port on many popular operating systems.
  - Support encrypted RealPort over SSL on selected operating systems.

Configurable GPIO Pins

All devices in the Digi Connect Family except the Digi Connect SP, Digi Connect ES, Digi Connect Wi-SP and the Digi Connect WAN have a set of General Purpose I/O (GPIO) pins. In normal operation, the GPIO pins are used for the serial CTS, DCD, DSR, DTR, and RTS signals. On Digi Connect EM and Wi-EM devices, both sets of RXD/TXD signals are also configured. These GPIO pins can be configured for one of three modes: serial, input, and output.

- Serial mode allows normal serial operation.
- Input mode allows input of GPIO signals. Alarms can be issued when GPIO pins change state. Input mode is used in conjunction with alarms to trigger emails or SNMP traps when a particular signal change is detected (see "Alarms" on page 39).
- Output mode allows output of GPIO signals. This mode can be used to toggle the output of GPIO signals between high and low.

The configuration and current state of GPIO pins can be easily viewed, through the Web user interface or by issuing commands from the command line.

DHCP Server

The Digi Connect WAN device is running a DHCP server. The DHCP server is enabled by default but can be disabled in the setup wizard. Configure the setup device to obtain IP adresses automatically. This eliminates subnet errors.

Power Requirements

The power requirements for Digi Connect devices are as follows. See also the *Hardware Reference* for your Digi Connect device for additional information.

Power Requirements Digi Connect SP Digi Connect Wi-SP, Digi Connect WAN, and Digi Connect RG

The Digi Connect SP, Digi Connect Wi-SP, Digi Connect WAN, and Digi Connect RG must be powered by a Listed LPS or Class II power supply rated 9-30 VDC, 0.37 A minimum. The power supply shipped with the Digi Connect WAN provides surge protection covering 4Kv burst (EFT) per -4-4 and 2Kv surge per EN61000-4-5 (non-condensing). See the *Hardware Reference* or the *Quick Start guide* for your Digi Connect device for additional information.

DC Characteristics for Embedded Devices
Digi Connect ME, Digi Connect Wi-ME, Digi Connect EM, and Digi Connect Wi-EM

The following tables list DC characteristics for operating conditions, inputs, and outputs for Digi Connect ME, Digi Connect Wi-ME, Dig Connect EM, and Digi Connect Wi-EM devices.

Operating Conditions					
Symbol	**Description**	**Min**	**Typ**	**Max**	**Unit**
V_{CC}	Supply Voltage	3.14	3.3	3.45	V
I_{CC}	Supply Current for Digi Connect ME & EM	—	—	270	mA
I_{CC}	Supply Current for Digi Connect Wi-ME & Wi-EM	—	—	400	mA
I_{IL}	Input Current as “0” (57K pull-up resistor)	—	—	57	µA
I_{IH}	Input Current “1” (57K pull-up resistor)	-10	—	10	µA
I_{OZ}	HighZ Leakage Current	-10	—	10	µA
I_{OD}	Output Drive Strength	—	—	2	mA
C_{IO}	Pin Capacitance (V_O=0)	—	—	4	pF

Note VCC absolute max rating is -.03V and max 3.9V

Warning The assertion of the 3.3V supply voltage must be stable within 140 ms. If the rise time is greater than specified, it could lead to the 3-1-3 diagnostic error.

GPIO Inputs					
Symbol	**Description**	**Min**	**Typ**	**Max**	**Unit**
V_{IH}	Input High Voltage	2	—	V_{CC}+0.3	V
V_{IL}	Input Low Voltage	V_{SS}-0.3	—	0.2*V_{CC}	V

GPIO Outputs					
Symbol	**Description**	**Min**	**Typ**	**Max**	**Unit**
V_{OH}	Output High Voltage	2.4	—	3.45	V
V_{OL}	Output Low Voltage	0	—	0.4	V

Note The Digi Connect ME and Digi Connect Wi-ME modules use a supervisor circuit with a 2.88 reset threshold and an internal 5k pull-up resistor. When VCC falls to the threshold voltage, a reset pulse is issued, holding the output in active state. When power rises above 2.88V, the reset remains for approximately 250 ms to allow the system clock and other circuits to stabilize.

Note The Digi Connect EM and Digi Connect Wi-EM modules use a supervisory circuit with a 2.93V reset threshold. When VCC falls to the threshold voltage, a reset pulse is issued, holding the output in active state. When power rises above 2.93V, the reset remains for approximately 200 ms to allow the system clock and other circuits to stabilize.

Network Interface Features

Key features of the network interface for Digi Connect products are as follows:

- Standard:
  - IEEE 802.3 for Digi Connect SP, Digi Connect ME, Digi Connect EM, Digi Connect WAN, and Digi Connect RG.
  - IEEE 802.11b for Digi Connect Wi-SP, Digi Connect Wi-ME and Wi-EM.
- Physical layer: 10/100 Mbit Base-T for Digi Connect SP, Digi Connect ME, Digi Connect EM, Digi Connect WAN, and Digi Connect RG.
- Network data rate:
  - 10 Mbps/100 Mbps, with auto-sensing of speed for Digi Connect SP, Digi Connect ME, Digi Connect EM, Digi Connect WAN, and Digi Connect RG.
  - Up to 11 Mbps with automatic fallback for Digi Connect Wi-SP Digi Connect Wi-ME and Wi-EM.

- Ethernet duplex mode: full-duplex, half-duplex, with auto-sensing of duplex mode for Digi Connect SP, Digi Connect ME, Digi Connect EM, Digi Connect WAN, and Digi Connect RG.
- Ethernet connector: RJ-45 for Digi Connect SP, Digi Connect ME, Digi Connect WAN, and Digi Connect RG.
- RJ-45 or pin header for Digi Connect EM.
- Serial connector: DB-9M for Digi Connect SP, Digi Connect Wi-SP,Digi Connect WAN, and Digi Connect RG. TTL-level pins for Digi Connect ME, Wi-ME, Digi Connect EM, and Wi-EM.

Wireless Devices Digi Connect Wi-ME, Wi-EM, Wi-SP, and Digi Connect WAN (see also "Wireless Networking Features" on page 30):

- Wireless Modulation: CCK (11/5 Mbps), DQPSK (2 Mbps), DBPSK (1 Mbps)
- Wireless Transmit Power: 16 dBm
- Wireless Receive Sensitivity: -82 dBm at 11 Mbps
- Wireless Antenna Connector: 1 x RP-SMA for Digi Connect Wi-ME, Wi-SP, and Digi Connect WAN; 2 x RP-SMA for Digi Connect Wi-EM
- Wireless Security: Wi-Fi Protected Access (WPA/WPA2/802.11i), Wired Equivalent Privacy (WEP)
  - Full-duplex
    Half-duplex
  - Auto-sensing of duplex mode

Configurable Network Services

Access to network services can be enabled and disabled. This means that you can restrict a device's use of services to only those strictly needed by the device. To improve device security, you can also turn off any non-secure services, such as Telnet. Network services that can be enabled or disabled include:

- Advanced Digi Discovery Protocol (ADDP)
- RealPort (not supported in Digi Connect WAN)
- Encrypted RealPort (not supported in Digi Connect WAN)
- HTTP/HTTPS
- Line Printer Daemon (LPD) (not supported in Digi Connect WAN)
- Remote Login (rlogin) (not supported in Digi Connect WAN)

- Remote Shell (rsh) (not supported in Digi Connect WAN)
- Simple Network Management Protocol (SNMP)
- Telnet

In the default web interface, access to network services is enabled and disabled on the Network Services page of Network Configuration. For more information, see "Enable or Disable Network Services" on page 84. In the Command-Line Interface, network services are enabled and disabled through the set service command. See the *Digi Connect Family Command Reference* for the set service command description.

Wireless Networking Features

The following table summarizes key wireless-networking features in the Digi Connect wireless devices (Digi Connect Wi-ME and Digi Connect Wi-EM). For more details on support of these features, see the readme file for this release. The following features can be configured in wireless Digi Connect devices.

Feature	Description
Country Code	Specifies the country in which the product is used.
Network Mode	-- Infrastructure Mode -- Ad-Hoc Mode
Channel	Can use automatic channel search-and-select or a user-configurable channel number.
Data Rate	Auto, 1Mbps, 2Mbps, 5.5Mbps, 11Mbps
Service Set Identifier (SSID)	A user-configurable SSID string or auto-connect option.
Authentication Options	-- Open -- Shared -- Wi-Fi Protected Access (WPA2/802.11i) -- WPA/WPA2 with pre-shared key (WPA-PSK)
802.1x (WPA2/802.11i) Authentication	-- Protected Extensible Authentication Protocol (PEAP) with EAP- MS See "Supported WPA Authentication Methods" on page 40
Encryption	-- Temporal Key Integrity Protocol (TKIP) --Counter mode CBC MAC Protocol (CCMP) -- Wired Equivalent Privacy (WEP) -- Use of encryption can be disabled.

Feature	Description
Network Key	A shared key (ASCII or Hexadecimal) to be used for WEP or WPA-PSK.
Username	A username to be specified when 802.1x -based authentication (WPA) is used.
Password	A password to be specified when 802.1x based authentication (WPA) is used.
Wireless Networking Status Features:	You can display the following status information for Wireless Digi Connect devices. For more detailed descriptions, see "Wireless Statistics" on page 113.
Connection Status	The status of the wireless network connection.
Network Mode	The network mode currently in use: -- Infrastructure Mode --Ad-Hoc Mode
Data Transfer Rate	The data transfer rate of the current connection.
Channel	The wireless network channel currently in use.
SSID	The selected SSID of the wireless network.
WEP / WPA security and encryption	The status of the WEP/WPA/WPA2 security features, including: -- The Authentication Method currently in use -- Whether authentication is enabled or disabled
Signal Strength	A statistic that indicates the strength of the radio signal between 0 and 100 percent.

User Interfaces

Digi Connect devices support a variety of user interfaces for configuring and monitoring tasks, including:

- The Digi Device Setup Wizard
- A default web-based interface
- An optional Java-applet interface
- Telnet Command-Line Interface
- Configuration via Remote Command Interface (RCI) over the serial port
- Simple Network Management Protocol (SNMP)
- Connectware Manager Console

Some of these user interfaces may be customized. For additional details on these user interfaces, see "Configuration Interfaces" on page 45 and "Monitoring Interfaces" on page 57.

Protocol Support

All the devices in the Digi Connect Family include a Robust on-board TCP/IP stack with a built-in web server. The protocols supported in each Digi Connect device (unless noted otherwise) include:

- Transmission Control Protocol (TCP)
- User Datagram Protocol (UDP) (not supported in Digi Connect WAN)
- Dynamic Host Configuration Protocol (DHCP)
- Simple Network Management Protocol (SNMP)
- Secure Sockets Layer (SSL)/Transport Layer Security (TLS)
- Telnet Com Port Control Option (Telnet) including support of RFC 2217 (ability to control serial port via Telnet -however, Digi Connect WAN does not support the additional extension of RFC 2217. See "Serial Data Communication over TCP and UDP" on page 33 for additional information
- Remote Login (rlogin) (not supported in Digi Connect WAN)
- Line Printer Daemon (LPD) (not supported in Digi Connect WAN)
- HyperText Transfer Protocol (HTTP)/HyperText Transfer Protocol over Secure Socket Layer (HTTPS)
- Simple Mail Transfer Protocol (SMTP)
- Internet Control Message Protocol (ICMP)
- Internet Group Management Protocol (IGMP)
- Address Resolution Protocol (ARP)
- Advanced Digi Discovery Protocol (ADDP)
- Point to Point Protocol (PPP) with Network Address Technology (NAT) (Only supported in Digi Connect WAN and Digi Connect RG)
- Secure Shell (SSHv2) (Only supported in Digi Connect WAN and Digi Connect RG)

- Global System for Mobile communication (GSM) (Only supported in Digi Connect WAN and Digi Connect RG)
- General Packet Radio Service (GPRS) (Only supported in Digi Connect WAN and Digi Connect RG)
- Enhanced Data Rates for Global Evolution (EDGE) (Only supported in Digi Connect WAN and Digi Connect RG)

Following is an overview of some of the services provided by these protocols.

Serial Data Communication over TCP and UDP

The Digi Connect family supports serial data communication over TCP and UDP. The only exception is the Digi Connect WAN which does not support UDP. Key features include:

- Serial data communication over TCP, also known as autoconnect and tcpserial can automatically perform the following functions:
  - Establish bidirectional TCP connections, known as autoconnections, between the serial device and a server or other network device. Autoconnections can be made based on data and or serial hardware signals.
  - Control forwarding characteristics based on size, time, and pattern
  - Allow incoming raw, Telnet, and SSL/TLS (secure-socket) connections
  - Support RFC 2217 (an extension of the Telnet protocol not supported in Digi Connect WAN)
- Serial data communication over UDP, also known as udpserial (not supported in Digi Connect WAN) can automatically perform the following functions:
  - Digi Connect devices can automatically send serial data to one or more devices or systems on the network using UDP sockets. Options for sending data include whether specific data is on the serial line, a specific time period has elapsed, or after the specified number of bytes has been received on the serial port.
  - Control forwarding characteristics based on size, time, and patterns.
  - Support incoming datagrams from multiple destinations.
  - Support outgoing datagrams sent to multiple destinations.
- TCP/UDP forwarding characteristics.
- Extended communication control on TCP/UDP data paths.

- Timeout
- Hangup
- User-configurable Socket ID string (text string identifier on autoconnect only)

Dynamic Host Configuration Protocol (DHCP)

Dynamic Host Configuration Protocol (DHCP) can be used to automatically assign IP addresses, to deliver TCP/IP stack configuration parameters such as the subnet mask and default router, and to provide other configuration information. For further details, see "IP Address Assignment" on page 37.

Simple Network Management Protocol (SNMP)

Simple Network Management Protocol (SNMP) is a protocol that can be used to manage and monitor network devices. The SNMP architecture enables a network administrator to manage nodes--servers, workstations, routers, switches, hubs, etc.--on an IP network; manage network performance, find and solve network problems, and plan for network growth. Digi devices support SNMP Version 1. For more information about using SNMP as an interface to manage devices, see "Simple Network Management Protocol (SNMP)" on page 55.

Supported RFCs and MIBs

The following SNMP-related Request for Comments (RFCs) and Management Information Bases (MIBs) are supported:

- RFC 1213 - Management Information Base (MIB) II
- RFC 1215 - Generic Traps (coldStart, linkUp, authenticationFailure only)
- RFC 1316 - Character MIB
- RFC 1317 - RS-232 MIB
- DIGI-DEVICE-INFO.mib - A Digi enterprise MIB for the Digi Connect Family
- DIGI-SERIAL-ALARM-TRAPS.mib - A Digi enterprise MIB for sending alarms as SNMP traps

Supported SNMP Traps

SNMP traps can be enabled or disabled. Supported SNMP traps include:

- Authentication failure

- Login
- Cold start
- Link up
- Alarms can be issued in the form of SNMP traps

Secure Sockets Layer (SSL)/Transport Layer Security (TLS)

Secure Sockets Layer (SSL)/Transport Layer Security (TLS) are used to provide authentication and encryption for Digi Connect devices. For more information, see "Security Features" on page 40.

Telnet

Digi Connect devices support the following types of Telnet connections:

- Telnet Client
- Telnet Server
- Reverse Telnet, often used for console management or device management
- Telnet Autoconnect
- RFC 2217 (Telnet Com Port Control Option and extension of the Telnet protocol is not supported in Digi Connect WAN)

For more information on these connections, see "Supported Connections and Data Paths" on page 42. Access to Telnet network services can be enabled or disabled.

Remote Login (rlogin)

Users can perform logins to remote systems (rlogin). Remote Login is not supported in Dig Connect WAN. Access to rlogin service can be enabled or disabled.

Line Printer Daemon (LPD)

The Line Printer Daemon (LPD) allows network printing over a serial port. The Line Printer Daemon is not supported in the Digi Connect WAN. Each serial port has a dedicated LPD server that is independently configurable. Access to LPD service can be enabled or disabled.

HyperText Transfer Protocol (HTTP)/Hypertext Transfer Protocol over Secure Socket Layer (HTTPS)

Digi Connect devices provide web pages for configuration that can be secured by requiring a user login.

Internet Control Message Protocol (ICMP)

ICMP statistics can be displayed, including the number of messages received, bad messages received, and destination unreachable messages received.

Point-to-Point Protocol (PPP)

The Point-to-Point Protocol (PPP) transports multi-protocol packets over point-to-point links. PPP encapsulates the data packet, allows the server to inform the dial-up client of its IP address (or client to request the IP address), authenticates the exchange, negotiates multiple protocols, and reassembles the data packet for network communication. Digi Connect WAN supports PPP with NAT (Network Address Technology). NAT reduces the need for a large amount of publicly known IP addresses by creating a separation between publicly known and privately known IP addresses.

Advanced Digi Discovery Protocol (ADDP)

The Advanced Digi Discovery Protocol (ADDP) runs on any operating system capable of sending multicast IP packets on a network. ADDP allows the system to identify all ADDP-enabled Digi devices attached to a network by sending out a multicast packet. The Digi devices respond to the multicast packet and identify themselves to the client sending the multicast.

ADDP needs to communicate with the TCP/IP stack using UDP. The TCP/IP stack should be able to receive multicast packets and transmit datagrams on a network.

Not all Digi devices support ADDP.

Access to ADDP service can be enabled or disabled.

Global System for Mobile communication (GSM) (Only supported in Digi Connect WAN and Digi Connect RG)

The GSM protocol is a digital mobile telephone system used in Europe and other parts of the world. There are three major types of digital mobile systems and GSM is the most widely used. GSM compresses and digitizes data and sends it down a channel along with two other streams of user data - each in its own time slot.

General Packet Radio Service (GPRS) (Only supported in Digi Connect WAN and Digi Connect RG)

GPRS is based on Global System for Mobile (GSM) communication. GPRS is a packet-based wireless communication service that transports data rates from 56 up to 114 Kbps and continuous connection to the Internet for mobile phone and computer users. Higher data rates allow users more flexibility in the media they transmit. In theory, GPRS packet-based service costs users less than circuit-switched services since communication channels are being used on a shared-use, as-packets-are-needed basis rather than dedicated only to one user at a time. It should also be easier to make applications available to mobile users because the faster data rate means that middleware currently needed to adapt applications to the slower speed of wireless systems will no longer be needed.

Enhanced Data Rates for Global Evolution (EDGE) (Only supported in Digi Connect WAN and Digi Connect RG)

EDGE is a faster version of the GSM wireless service and designed to deliver data at rates up to 384 Kbps and enable the delivery of multimedia and other broadband applications to mobile phone and computer users. The EDGE standard is built on the existing GSM standard, using the same time-division multiple access frame structure and existing cell arrangements.

IP Address Assignment

There are several ways to assign an IP address to a Digi Connect device:

- Static IP: Assign a specific IP address to a device, through the Digi Device Setup Wizard, the default web interface, or the Command-Line Interface.
- Using Dynamic Host Configuration Protocol (DHCP). The device server's default configuration is as a DHCP client. Dynamic Host Configuration

Protocol (DHCP) is an Internet protocol for automating the configuration of computers that use TCP/IP. DHCP can be used to automatically assign IP addresses, to deliver TCP/IP stack configuration parameters such as the subnet mask and default router, and to provide other configuration information.

- Auto Private IP Addressing (APIPA), also known as Auto-IP: A standard protocol that will automatically assign an IP address from a reserved pool of standard Auto-IP addresses to the computer on which it is installed. The device is set to obtain its IP address automatically from a DHCP server. But if the DHCP server is unavailable or nonexistent, Auto-IP will assign the device an IP. If DHCP is enabled or responds later or you use ADDP, both will override the Auto-IP address previously assigned.

For more details, see "Assign an IP Address to the Device" on page 69.

RealPort Software

Digi Connect devices use the patented RealPort COM/TTY port redirection for Microsoft Windows, UNIX, and Linux environments (not supported in Digi Connect WAN). RealPort software provides a virtual connection to serial devices, no matter where they reside on the network. The software is installed directly on the host and allows applications to talk to devices across a network as though the devices were directly attached to the host. Actually, the devices are connected to a Digi device server or terminal server somewhere on the network.

RealPort is unique among COM port re-directors because it is the only implementation that allows multiple connections to multiple ports over a single TCP/IP connection. Other implementations require a separate TCP/IP connection for each serial port. Unique features also include full hardware and software flow control, as well as tunable latency and throughput.

Access to RealPort services can be enabled or disabled.

Encrypted RealPort

Digi Connect devices support the patent-pending RealPort software with encryption. The Digi Connect WAN does not support Encrypted RealPort. Encrypted RealPort offers a secure Ethernet connection between the COM or TTY port and a device server or terminal server. Encryption prevents internal and external snooping of data across the network by encapsulating the TCP/IP packets in a Secure Sockets Layer (SSL) connection and

encrypting the data using Advanced Encryption Standard (AES), one of the latest, most efficient security algorithms.

Digi's RealPort with encryption driver has earned Microsoft's Windows Hardware Quality Lab (WHQL) certification.

Drivers are available for a wide range of operating systems, including Microsoft Windows Server 2003, Windows XP, Windows 2000, Windows NT, Windows 98, Windows ME; SCO Open Server; Linux; AIX; Sun Solaris SPARC; Intel; and HP-UX. It is ideal for financial, retail/point-of-sale, government or any application requiring enhanced security to protect sensitive information.

Access to Encrypted RealPort services can be enabled or disabled.

Alarms

Digi Connect devices can be configured to issue alarms, in the form of email message or SNMP traps, when certain device events occur. These events include changes in GPIO pin status, and data patterns in the serial stream. Receiving alarms about these conditions provides you with the advantage of being notified when events occur, rather than having to monitor the device on an ongoing basis to determine whether these events have occurred.

For more information on configuring alarms, see "Configure Alarms" on page 93.

Modem Emulation

Digi Connect devices include a configuration profile that allows the device to emulate a modem (not supported in Digi Connect WAN). Modem emulation sends and receives modem responses to the serial device over the Ethernet instead of Public Switched Telephone Network (PSTN). The modem emulation profile allows you maintain your current software application but use it over the less expensive Ethernet network. In addition, Telnet processing can be enabled or disabled on the incoming and outgoing modem-emulation connections.

The modem-emulation commands supported in Digi Connect devices are documented in the *Digi Connect Family Command Reference*.

Security Features

Security-related features in Digi Connect devices include:

- Secure access and authentication:
  - One password, one permission level.
  - Can issue passwords to device users.
  - Can selectively enable and disable IP services: network services such as ADDP, RealPort, Encrypted RealPort, HTTP/HTTPS, LPD, Remote Login, Remote Shell, SNMP, and Telnet, can be enabled and disabled.
  - Can control access to inbound ports.
  - Secure sites for configuration: HTML pages for configuration have appropriate security.
  - Can control access to specific devices, IP addresses, or networds through IP filtering.
- Encryption:
  - Digi Connect devices include strong Secure Sockets Layer (SSL) V3.0/ Transport Layer Security (TLS) V1.0-based encryption: DES (56-bit), 3DES (168-bit), AES (128-/156-bit).
  - Encrypted RealPort offers encryption for the Ethernet connection between the COM/TTY port and the Digi Connect device. (Not supported in Digi Connect WAN)
  - Wireless Digi Connect devices provide Wi-Fi Protected Access (WPA/WPA2/802.11i) and Wired Equivalent Privacy (WEP) encryption (64-/128-bit). The following table shows the supported WPA/WPA2/802.11i authentication methods.

Supported WPA Authentication Methods		
EAP-TLS	**PEAP**	**EAP/TTLS**
LEAP (WEP only)	EAP-PEAP/MSCHAPv2 (both PEAPv0 and PEAPv1)	EAP-TTLS/EAP-MD5-Challenge
	EAP-PEAP/TLS (both PEAPv0 and PEAPv1)	EAP-TTLS/EAP-GTC
	EAP-PEAP/GTC (both PEAPv0 and PEAPv1)	EAP-TTLS/EAP-OTP
	EAP-PEAP/OTP (both PEAPv0 and PEAPv1)	EAP-TTLS/EAP-MSCHAPv2

Supported WPA Authentication Methods		
EAP-TLS	**PEAP**	**EAP/TTLS**
	EAP-PEAP/MD5-Challenge (both PEAPv0 and PEAPv1)	EAP-TTLS/EAP-TLS
		EAP-TTLS/MSCHAPv2
		EAP-TTLS/MSCHAP
		EAP-TTLS/PAP
		EAP-TTLS/CHAP

- SNMP security:
  - Authorization: Changing public and private community names is recommended to prevent unauthorized access to the device.
  - You can disable SNMP set commands to make use of SNMP read-only.

Configuration Management

Once Digi Connect devices are configured and running, configuration-management tasks need to be periodically performed, such as:

- Upgrading firmware
- Copying configurations to and from a remote host
- Software and factory resets
- Rebooting the device
- Memory management
- File management

For more information on these configuration-management tasks, see Chapter 4, "Administering Digi Connect Devices".

Customizing Features

Several aspects of using Digi Connect devices can be customized. For example:

- The look-and-feel of the device interface for Connect devices can be customized, to use a different company logo or screen colors.

- Custom Java applets can be created, using the Java configuration applet as a sample for further development.
- Redefined Custom Factory Defaults -allows you to define a new set of factory defaults so when you revert back to factory default it will be your settings and not the Digi default settings.

The Digi Connect Integration Kit provides a platform for evaluation, rapid prototyping, and integration of Digi Connect embedded modules with plug-and-play firmware. It includes tools, sample code, and documentation to help with your product integration and web-based customization efforts. Contact Digi International for more information on the Integration Kit and for assistance with your customization efforts.

Supported Connections and Data Paths

Digi Connect devices allow for several kinds of connections and paths for data flow between the device and other entities. These connections can be grouped into two main categories:

- Network services, in which a remote entity initiates a connection to a Digi Connect device.
- Network/serial clients, in which a Digi Connect device initiates a network connection or opens a serial port for communication.

Following is a discussion of these connections. The intent of this information is to illustrate how the connections are made and data is passed. This in turn may help you better understand the effects of enabling certain features and choosing certain settings when configuring Digi Connect devices.

Network Services

A network service connection is one in which a remote entity initiates a connection to a Digi Connect device. There are several categories of network services:

- Network services associated with specific serial ports
- Network services associated with serial ports in general
- Network services associated with the Command-Line Interface (CLI)

Network Services Associated with Specific Serial Ports

Network service connections associated with specific serial ports include:

- Reverse Telnet: A telnet connection is made to a Digi Connect device, in which data is passed transparently between the telnet connection and a named serial port.
- Reverse raw socket: A raw TCP socket connection is made to a Digi Connect device, in which data is passed transparently between the socket and a named serial port.
- Reverse TLS socket: An encrypted raw TCP socket is made to a Digi Connect device, in which data is passed transparently to and from a named serial port.
- LPD: A TCP connection is made to a named serial port, in which the Digi Connect device interprets the LPD protocol and sends a print job out of the serial port. (Not supported in Digi Connect WAN.)
- Modem emulation, also known as Pseudo-modem (pmodem) (not supported in Digi Connect WAN): A TCP connection is made to a named serial port, and the connection will be “interpreted” as an incoming call to the pseudo-modem.

Network Services Associated with Serial Ports in General

The Digi Connect WAN does not support the following features: RealPort, Modem emulation, and rsh. Network service connections associated with serial ports in general include:

- RealPort: A single TCP connection manages (potentially) multiple serial ports.
- Modem emulation, also known as pseudo-modem (pool): A TCP connection to the "pool" port is interpreted as an incoming call to an available pseudo-modem in the "pool" of available port numbers.
- rsh: Digi Connect devices support a limited implementation of the Remote Shell (rsh) protocol, in that a single service listens to connections and allows a command to be executed. Only one class of commands is allowed: a single integer that specifies which serial port to connect to. Otherwise, the resulting connection is somewhat similar to a reverse telnet or reverse socket connection.

Network Services Associated with the Command-Line Interface (CLI)

Network service connections associated with the Command-Line Interface (CLI) include:

- Telnet: A user can Telnet directly to a Digi Connect device’s CLI.

- rlogin: A user can perform a remote login (rlogin) to a Digi Connect device's CLI. The Digi Connect WAN does not support rlogin.

Network/Serial Clients

A network/serial client connection is one in which a Digi Connect device initiates a network connection or opens a serial port for communication. There are several categories of network/serial client connections:

- Autoconnect behavior client connections
- Command-Line Interface (CLI)-based clients
- Modem emulation (pseudo-modem) client connections (not supported in Digi Connect WAN.)

Autoconnect Behavior Client Connections

In client connections that involve autoconnect behaviors, a Digi Connect device initiates a network connection based on timing, serial activity, or serial modem signals. Autoconnect-related client connections include:

- Raw TCP connection: The Dig Connect device initiates a raw TCP socket connection to a remote entity.
- Telnet connection: The Dig Connect device initiates a TCP connection using the Telnet protocol to a remote entity.
- Raw TLS encrypted connection: The Dig Connect device initiates an encrypted raw TCP socket connection to a remote entity.
- Rlogin connection: The Dig Connect device initiates a TCP connection using the rlogin protocol to a remote entity. (Not supported in Digi Connect WAN.)

Command-Line Interface (CLI)-based Client Connections

CLI-based client connections are available for use once a user has established a session with the Digi Connect device's Command-Line Interface. CLI-based client connections include:

- telnet: A connection is made to a remote entity using the Telnet protocol.
- rlogin: A connection is made to a remote entity using the Rlogin protocol. (Not supported in Digi Connect WAN.)
- connect: Begin communicating with a local serial port.

Modem Emulation (Pseudo-Modem) Client Connections

When a port is in the modem-emulation or pseudo-modem mode, it can initiate network connections based on AT command strings received on the serial port. (Not supported in Digi Connect WAN.) The AT commands for modem emulation are documented in the *Digi Connect Family Command Reference*.

Configuring Devices: Overview

Following is an overview of the configuration capabilities and interfaces for Digi Connect devices. Chapter 2, "Configuring the Digi Connect Devices" covers these capabilities and interfaces in more detail.

Configuration Capabilities

Device configuration involves setting values and enabling features for such areas as:

- Network configuration: Specifying the device's IP address and IP settings, network-service settings, and advanced network settings.
- Serial port configuration: Specifying the serial port characteristics for the device.
- GPIO pin configuration (for all devices except Digi Connect SP, Digi Connect Wi-SP, and Digi Connect WAN): Specifying how the various GPIO pins for the device will be used.
- Alarms: Defining whether alarms should be issued, the conditions that trigger alarms, and how the alarms should be delivered.
- Security configuration: Configuring security features, such as whether password authentication is required for device users.
- System configuration: Specifying system-identifying information, such as a device description, contact person, and physical location.

Configuration Interfaces

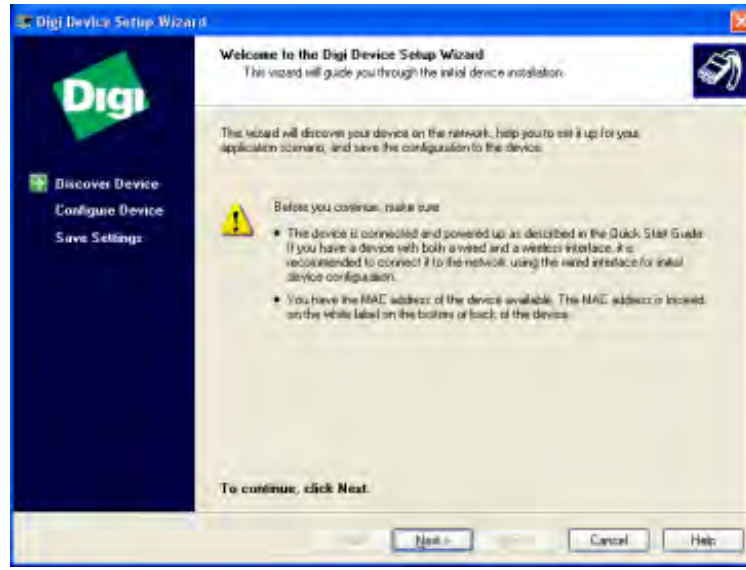
There are several interfaces available for configuring devices, including:

- The Digi Device Setup Wizard, which helps you set up an IP address for the device and quickly configure features.
- A default web-based interface embedded with the product. This interface also provides device configuration profiles.
- An optional Java applet that can be used for web-based device configuration, and as a sample application for customization and further application development.
- A Command-Line Interface (CLI).
- Connectware Manager, a configuration interface to fine tune or monitor the Connectware devices. Connectware Manager cannot assign an IP address but it can change one.
- Remote Command-line Interface (RCI) protocol.
- Simple Network Management Protocol (SNMP).

Following is more information about each type of interface, the advantages of each interface, how to access the interface, and where to find more information.

The Digi Device Setup Wizard

A wizard for configuring Connect devices, called the Digi Device Setup Wizard, is provided on the CD shipped with each device. The Digi Device Setup Wizard is available in Microsoft Windows or UNIX platforms. Using the Digi Device Setup Wizard is the recommended and preferred method for configuration. It assigns an IP address for the device, configures the device based on your description of the device environment, and determines whether you need to install RealPort.



Advantages

Using the Digi Device Setup Wizard to configure devices provides several advantages:

- The Digi Device Setup Wizard is the preferred approach for initial configuration. For most users, the Digi Device Setup Wizard interface will provide adequate device configuration.
- Device configuration is made easier by providing a set of port profiles which configure a serial port based on the way the port will be used. Each port profile displays the relevant settings for the configuration. There are several profile choices, including RealPort, Console Management, TCP Sockets, UDP Sockets, Serial Bridging, Modem Emulation, and a Custom profile.
- The Digi Device Setup Wizard is intended to be run only once, and is not installed on a user's PC.

Disadvantages

While the Digi Device Setup Wizard provides for easy configuration, it presents some disadvantages:

- The Digi Device Setup Wizard requires Microsoft Windows for full support, and the PC running Windows usually needs to be on same network segment as the Digi device. The Unix version of the Wizard does not include all the features of the Windows version. The Unix version is limited to network

configuration settings, and does not allow you to configure or choose a scenario through port profiles.

- Some sites disallow users from running wizards, which would prevent users at such sites from using this interface.
- While the configuration capabilities of the Digi Device Setup Wizard are acceptable for most Connect device users, it only provides for the most common configuration scenarios, and is not as flexible as configuring through the default web interface Interface or the command line.

How to access the Digi Device Setup Wizard

To access the Digi Device Setup Wizard, insert the Software and Documentation CD that accompanies your Digi Connect device in a PC's CD drive. The Digi Device Setup Wizard will automatically start.

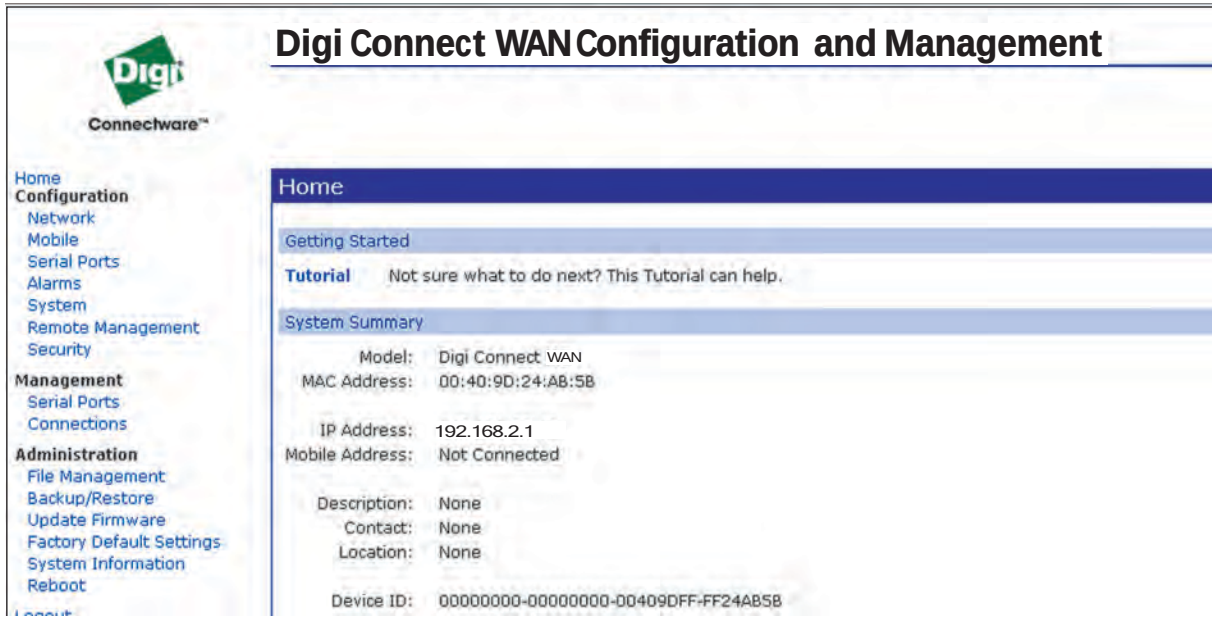
Where to find more information

See "Configuration through the Digi Device Setup Wizard" on page 72 for details on running the wizard. The Digi Device Setup Wizard also has online help, accessed from the Help button on wizard screens. In addition, the Getting Started Guide for the Digi Connect Family Integration Kit provides discussions of the various communications models from which you can choose.

The Default Web Interface

A default web interface is provided as an easy way to configure and monitor Digi Connect devices. Configurable features are grouped into several categories: Network, Serial Port, GPIO (for all devices except Digi Connect SP, Digi Connect Wi-SP, and Digi Connect WAN), Alarms, Security, and System. Most of the configurable features are arranged by most basic settings on a page, with associated and advanced settings accessible from that page. As in the Digi Device Setup Wizard, serial-port configurations are classified into port profiles, or configuration scenarios that allow you to select the scenario that best represents the environment and set up the appropriate parameters that are needed.

When configuring some features, you may want to establish a basic configuration using the Digi Device Setup Wizard, and then fine-tune the configuration using the default web interface.



Advantages

Using the default web interface to configure devices provides the following advantages:

- Ease of use, including point-and-click functionality and wizards that make configuration quick and complete.
- Secure access to devices.
- No need for programming experience.
- Port profiles simplify the configuration process.

Disadvantages

- You must have Internet access.
- This method requires that you configure the IP address before you can access the configuration from the web interface, however, some features cannot be configured this way.

Accessing the Default Web Interface

To access the default web interface, enter the Digi Connect device's IP address or host name in a browser's URL window. The main menu of the web interface is displayed.

Where to find more information

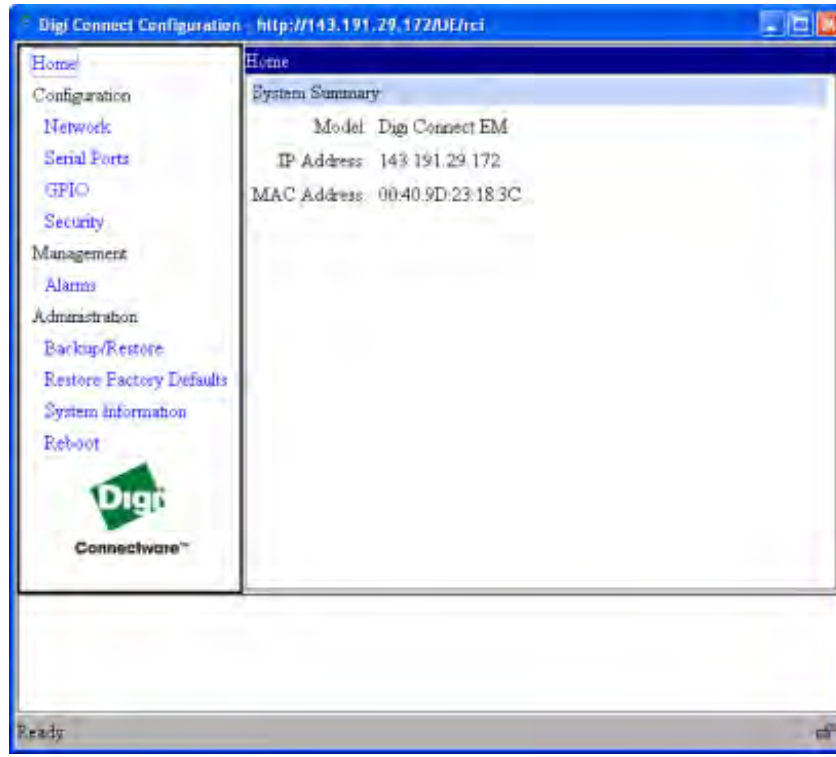
For more information, see "Configuration through the Default Web Interface" on page 77.

The default web interface has a tutorial, accessed from the Home page, and online help, accessed from the Help link on each page. In addition, the Getting Started Guide for the Digi Connect Family Integration Kit provides discussions of the various communications models from which you can choose.

Java Applet Interface

An alternative configuration interface is provided with Digi Connect devices, in the form of a Java applet. This interface provides many, but not all, of the configuration choices available through the default web interface.

The Java applet is primarily intended as a sample alternative interface for embedded products. Embedded product manufacturers can use the applet as a base for their custom user interface. Because the interface is customizable, embedded product manufacturers can use it to provide a totally unique user interface that represents the kind of device the Digi Connect device is being embedded into. For example, the configuration interface for a printer would look nothing like the default web interface. Today, the only way to create a totally custom interface to the device is through an applet or other Remote Command Interface (RCI) application. The applet can be slightly modified using a configuration file, or it can be changed extensively. In addition, it can be used as a sample by those customers who choose to writer their custom configuration user interface from scratch.



Advantages

Using the Java applet interface to configure devices provides the following advantages:

- A completely customizable interface. For example, you can change the look of the web interface by adding your company logo or changing the colors used in the interface workspace.
- The Java applet can also be used as a basis for further interface development. That is, if the Java applet is adequate for most of your configuration needs, but needs some modifications, then you can customize the applet's operation. If you want a totally unique user interface, you can use the Java applet as a sample program that illustrates how this can be done. The applet can be used as a starting point from which to build new interfaces. It illustrates such concepts as configuring various aspects of the device using the RCI, applet packaging, and Swing user interface. You can write custom management applications in other languages that run on a separate system in the network and talk to the device using RCI. For example, a printer manufacturer might have a

configuration utility written in C++ that is installed on the PC along with the print driver.

Disadvantages

- The Java applet requires that the Sun Java Runtime environment be loaded.
- The Java applet does not allow for configuration of as many features as the default web interface.
- The Java applet interface is essentially frozen, and will not be updated with additional configurable features or values in future releases.
- There is limited online help for the Java applet configuration screens. If you need more information on configurable areas, fields, and selectable values, it is recommended that you familiarize yourself with these areas by reviewing the online help for the default web interface.

Accessing the Java applet configuration interface

You can access the Java applet interface from the User Interface section of the Home page of the default web interface. You can either click the Launch button next to the Custom Interface option to launch the Java applet, or click the Set as Default to set the Java applet as the default device interface. In some cases, your device's default device interface may have already been preset to the Java applet by a system administrator.

Where to find more information

See Chapter 2 for more information on using the Java applet to configure devices. While that chapter primarily focuses on configuring Connect devices from the default web interface, it also covers configuration from the Java applet, primarily the differences from the default Web interface. In addition, the Getting Started Guide for the Digi Connect Family Integration Kit provides discussions of the various communications models from which you can choose.

For details on customizing the applet, See the Getting Started Guide for the Digi Connect Family Integration Kit.

The Command-Line Interface

Connect devices can be configured by issuing commands from the command line. The Command-Line Interface allows communication directly without a graphical interface. For example, the following is a command issued from the command line to set general serial configuration options:

```
set serial baudrate=9600 flowcontrol=hardware
```

Advantages

Using the command-line interface to configure devices provides the following advantages:

- Flexibility. Although the Command-Line Interface is for experienced users and considered complex, it allows flexibility for precise configuration alterations.
- Direct communication to device or system.
- Can be used in UNIX or Linux environments.

Disadvantages

- Users must have experience issuing commands.
- This interface is not intended for Windows environments.
- Command documentation is required.
- The command line allows you the greatest flexibility to configure your device, but is also considered complex.

Accessing the command line

Users access the command line via a Telnet connection or through Hyperterm to set up the configuration. To access the device, specify the device IP address as the IP address of the Telnet server. Depending on the serial port profile used for a Digi Connect device, you can Telnet directly to the device using the telnet command, or perform a remote login using the rlogin command.

Where to find more information

See the *Digi Connect Family Command Reference* for command descriptions and examples of entering configuration commands from the command-line interface. In addition, online help is available for the commands, through the help and '?' commands.

The Connectware Manager Interface

In the Connectware Manager interface, devices can be managed from the Devices menu. Tasks such as configuring, rebooting, disconnecting, and redirecting devices are available. You can also backup/restore device configuration properties, and import or export the device configuration properties.

The server itself can also be managed from the Server menu of the Connectware Manager Console. From this menu, you can shut down the

server, stop and restart it, and reconfigure the server as needed. You can also display reports and logs on server activity.

Advantages

- Allows multiple devices to be managed (configured and monitored) from one source.
- Server can also be managed from same location.
- Logs and reports can be generated and reviewed. Summaries or totals can be linked back to the original devices for more thorough investigations.

Disadvantages

- Devices must be provisioned (assigned an IP address) before they can be accessed on Connectware Manager (use the Digi Connect Wizard to provision devices.)
- Must have Internet access.

The Remote Command Interface (RCI)

Remote Command Interface (RCI) is a programmatic interface for configuring and controlling Connect family devices. RCI is an XML-based request/response protocol that allows a caller to query and modify device configurations, access statistics, reboot the device, and reset the device to factory defaults.

Unlike other configuration interfaces that are designed for a user, such as the command-line or browser interfaces, RCI is designed to be used by a program. A typical use of RCI is in a Java applet that can be stored on the Connect device to replace the default web interface with a custom browser interface. Another example is a custom application running on a PC that monitors and controls an installation of many Connect devices.

Advantages

- As RCI is designed to be used by a program, it is useful when creating a custom configuration user interface, or if you want to create utilities to configure or initialize devices through external programs or scripts.

Disadvantages

Using RCI as a device configuration interface presents these disadvantages:

- RCI uses HTTP as the underlying transport protocol. Depending on the network configuration, use of HTTP as a transport protocol could be blocked by some firewalls.
- RCI is quite complex to use, requiring users to phrase configuration requests in Extensible Markup Language (XML) format. It is a "power-user" option, intended more for users developing their own user interfaces, or for users implementing embedded control (and thus potentially using RCI over serial) than for end-users with limited knowledge of device programming.
- Not all actions taken through the default web interface have direct equivalents in RCI. Therefore, it may not be easy for some end-users to determine what needs to be sent via XML for a particular style of request.

Accessing the Remote Command Interface

RCI access consists of program calls.

Where to find more information

See the Digi Connect Integration Kit for more details on RCI.

Simple Network Management Protocol (SNMP)

Simple Network Management Protocol (SNMP) is a protocol for managing and monitoring network devices. The SNMP architecture enables a network administrator to manage nodes--servers, workstations, routers, switches, hubs, etc.--on an IP network; manage network performance, find and solve network problems, and plan for network growth. Digi devices support SNMP Version 1.

Advantages

- SNMP is easy to implement in extensive networks.
- Programming new variables is easy.
- SNMP is widely used. SNMP is a standard interface that integrates well with network management stations in an enterprise environment. While its capabilities are limited to device monitoring and display of statistics in Connect devices, read/write capabilities are expected to be added to Connect devices in future releases.
- It is easy to ‘drop in’ new devices.

Disadvantages

- As device communication is UDP-based, the communication is not secure. If you require more secure communications with a device, you will need to use an alternate interface.
- Using SNMP, you cannot do as many tasks as you can from the default web interface, such as file management, uploading firmware, or backing up/ restoring configurations.
- Compared to the default web interface or the command-line interface, SNMP is limited in its ability to set specific parameters, such as set port profile, is not possible.

Accessing the SNMP Interface

Accessing the SNMP interface requires a tool, such as a network management station. The management station relies on an agent at a device to retrieve or update the information at the device, including Device configuration, status, and statistical information. This information is viewed as a logical database, called a Management Information Base (MIB). MIB modules describe MIB variables for a variety of device types and computer hardware and software components.

The MIB for managing a TCP/IP network, called MIB-II, is an update on the original MIB, now called MIB-I. MIB-II contains variable definitions that describe the most basic information needed to manage a TCP/IP network. These variable definitions are organized into several groups, such as groups for managing the system, network interfaces, address translation, transmission media, and various protocols, including IP, ICMP, TCP, UDP, EGP, and SNMP.

In addition to the standard MIBs, Digi Connect devices use several Digi enterprise MIBs, including MIB DIGI-DEVICE-INFO.mib for handling device information, and DIGI-SERIAL-ALARM-TRAPS.mib for handling alarms sent as SNMP traps.

Where to find more information

A variety of resources about SNMP are available, including reference books, and overviews and other files on the Internet. For an overview of the SNMP interface and the components of MIB-II, point your Internet browser to the address www.rfceditor.org, and enter “MIB-II.” From the results, you can display a text file describing the SNMP interface, titled “Management Information Base for Network Management of TCP/IP-based internets: MIB-II.” You can also view the text of the Digi enterprise MIBs.

For additional discussion of using SNMP as a device monitoring interface, see "Monitoring Capabilities from SNMP" on page 115.

Monitoring Devices: Overview

Following is an overview of the capabilities and interfaces for monitoring Digi Connect devices. Chapter 3, "Monitoring Digi Connect Devices" covers these capabilities and interfaces in more detail.

Monitoring Capabilities

Monitoring Digi Connect devices includes such tasks as checking device status, viewing information on a device's GPIO pins, checking runtime state, viewing serial port operations, and reviewing network statistics.

Monitoring Interfaces

As with device configuration, there are several interfaces available for configuring devices, including:

- The default web interface embedded with the product
- The optional Java applet
- SNMP
- The Command-Line Interface
- Connectware Manager

Following is more information about each type of interface, the advantages of each interface, how to access the interfaces, and where to find more information.

Default Web and Java Applet Interfaces

The default web interface provides several screens for monitoring devices, including:

- Serial Port Management: for each port, the port's description, current profile, and current serial configuration.
- Connections Management: A display of all active system connections.

- System Information:
  - General device information
  - Current GPIO pin states
  - Serial port information: for each port, the port's description, current profile, and current serial configuration. This is the same information displayed by choosing Serial Port Management.
  - Network statistics: statistics for IP, TCP, UDP, and ICMP

SNMP

The monitoring capabilities of SNMP include managing network performance, gathering device statistics, and finding and solving network problems. For more information on using SNMP for device-monitoring purposes, see "Monitoring Capabilities from SNMP" on page 115.

Command-Line Interface

Several commands that can be issued from the command line to monitor devices. For a review of these commands and what they can provide from a device-monitoring perspective, see "Monitoring Devices from the Command Line" on page 116.

Connectware Manager

The monitoring capabilities can be sorted by the server and the devices managed by the server. The information is available in logs and can be generated into reports. When available, the reports post linked totals that can be drilled back to the original devices that make up the activity of the report.

Administering Devices: Overview

Periodically, you will need to perform administrative tasks on Digi Connect devices, such as:

- Uploading and managing files
- Changing the password for logging onto the device
- Backing up and restoring the configuration

- Updating firmware
- Restoring the configuration to factory defaults
- Rebooting the module

Chapter 4, "Administering Digi Connect Devices" covers device administration in more detail.

RF Exposure Statement

Digi Connect Wi-SP, Digi Connect Wi-EM, and Digi Connect Wi-ME

The Digi Connect Wi-EM and Wi-ME embedded modules comply with the RF exposure limits for humans as called out in RSS-102.

These devices are exempt from RF evaluation based on its operating frequency of 2400 MHz, and effective radiated power of 100 milliwatts. This would be less than the 3 watt requirement for a mobile device (>20 cm separation) operating at 2400 MHz.

Digi Connect WAN and Digi Connect RG

In order to comply with RF exposure limits established in the ANSI C95.1 standards, the distance between the antenna(s) and the user should not be less than 20 cm.

FCC Certifications for Digi Connect ES and Digi Connect RG

For FCC certification for other Digi Connect devices, see the Hardware Reference.

FCC Part 15 Class A

These devices comply with part 15 of the FCC rules. Operation is subject to the following two conditions: (1) These devices may not cause harmful interference, and (2) These devices must accept any interference received, including interference that may cause harmful operation.

Radio Frequency Interference (RFI) (FCC 15.105)

This equipment has been tested and found to comply with the limits for Class A digital devices pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential environment. This equipment generates, uses, and can radiate radio frequency energy, and if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try and correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and the receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

Labeling Requirements (FCC 15.19)

This device complies with Part 15 of FCC rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Modifications (FCC 15.21)

Changes or modifications to this equipment not expressly approved by Digi may void the user's authority to operate this equipment.

Cables (FCC 15.27)

Shielded cables *must* be used to remain within the Class A limitations.

Industry Canada

This digital apparatus does not exceed the Class B limits for radio noise emissions from digital apparatus set out in the Radio Interference Regulations of the Canadian Department of Communications.

Le present appareil numerique n'emet pas de bruits radioelectriques depassant les limites applicables aux appareils numeriques de la class B prescrites dans le Reglement sur le brouillage radioelectrique edicte par le ministere des Communications du Canada.

International EMC Standards

:

Electromagnetic Emissions Standards	
Digi Connect RG	**Digi Connect ES**
EN55022	EN55022
EN55024	EN55024
VCCI	EN60601-1-2
AS 3548	IEC/UL/EN 60601-1
	EN55011
	AS/NZS 3548 AS/NZS CISPR -22
	CAN/CSA 22.2 60950-1-3
	ICES-003
	IEC/UL/EN 60950-1

Safety Standards

There are no user serviceable parts inside the Digi Connect ES. Contact your Digi representative through "Digi Contact Information" on page 12 for repair information.

Safety Standards	
Digi Connect RG	**Digi Connect ES**
UL 60950	UL 60950-1
CSA 22.2 No. 60950	CSA 22.2 No. 60950
EN60950	EN60950
	IEC/EN 60601-1
	UL/CUL 60601-1

Important Safety Information

To avoid contact with electrical current:

- Never install electrical wiring during an electrical storm.
- Never install an Ethernet connection in wet locations unless that connector is specifically designed for wet locations.
- Use caution when installing or modifying Ethernet lines.
- Use a screwdriver and other tools with insulated handles.
- You and those around you should wear safety glasses or goggles.
- Do not place Ethernet wiring or connections in any conduit, outlet or junction box containing electrical wiring.
- Installation of inside wire may bring you close to electrical wire, conduit, terminals and other electrical facilities. Extreme caution must be used to avoid electrical shock from such facilities. You must avoid contact with all such facilities.
- Ethernet wiring must be at least 6 feet from bare power wiring or lightning rods and associated wires, and at least 6 inches from other wire (antenna wires, doorbell wires, wires from transformers to neon signs), steam or hot water pipes, and heating ducts.

- Do not place an Ethernet connection where it would allow a person to use an Ethernet device while in a bathtub, shower, swimming pool, or similar hazardous location.
- Protectors and grounding wire placed by the service provider must not be connected to, removed, or modified by the customer.
- Do not touch uninsulated Ethernet wiring if lightning is likely!
- External Wiring: Any *external* communications wiring you may install needs to be constructed to all relevant electrical codes. In the United States this is the National Electrical Code Article 800. Contact a licensed electrician for details.
- Do not touch or move the antenna(s) while the unit is transmitting or receiving.
- Do not hold any component containing a radio such that the antenna is very close to or touching any exposed parts of the body, especially the face or eyes, while transmitting.
- Do not operate a portable transmitter near unshielded blasting caps or in an explosive environment unless it is a type especially qualified for such use.
- Antenna use:
  - Warning for laptop users: In order to comply with the FCC RF exposure limits, it is recommended when using a laptop with a PC client adapter, that the adapter's integrated antenna should not be positioned closer than 2 inches (5 cm) from your body or nearby persons for extended periods of time while it is transmitting (or operating). If the antenna is positioned less than 2 inches (5 cm) from the user, it is recommended that the user limit exposure time.

Digi Connect ES Specifications

Environmental

- Ambient Temperature - 0^{o} - 55^{o}C (32^{o} to 130^{o} F)
- Relative Humidty - 5 to 95% (non-condensing)
- Storage and Transport Temperature - 30^{o} to 85^{o} C (-122^{o} to 185^{o} F)
- Altitude - 3657.6 meters (12000 feet)
- Serial Port Protection (ESD): +15 kV human body model

Power Requirements

- Internal 100-240V
- Input frequency 50-60 Hz
- Input current protection - 2.0 A / 250 V(Time Lag) rated fuse
- UL certified
- Surge protection
    - 4 kV burst (EFT) per EN61000-4-4
    - 4 kV isolation input to output
    - 2 kV surge per EN61000-4-5

Mechanical

Length - 23.5 cm (9.3 in)

Width - 26.9 cm (10.6 in)

Depth - 4.2 cm (2.1 in)

Configuring the Digi Connect Devices

CHAPTER 2

This chapter describes how to configure Digi Connect devices. It covers the following topics:

- Alternative configuration options for the Digi Connect Wi-SP
- Assign an IP address to the device, using one of the several alternative methods
  - Configuration through the Digi Device Setup Wizard
  - Configuration through the default web interface
  - Configuration through the Java applet
  - Configuration through the Command-Line Interface
  - Customization through the Connectware Manager interface

The primary focus of this chapter is on configuring devices through the default web interface. Configuration through the Java applet interface is mentioned, but not at the same level as the default web interface. Connectware Manager interface cannot set the IP. To use Connectware Manager you must set up the Digi device with the Digi Device Setup Wizard and then install Connectware Manager. For more information, see the Connectware Manager User's Guide.

Alternative Configuration Options for Digi Connect Wi-SP

If you prefer to configure the Digi Connect Wi-SP with a serial connection, you have several alternative options.

Configure with an Access Point - Infrastructure Mode

1 Configure your network using an access point with the SSID - `Connect` and all encryption disabled (such as WEP & WPA).

2 Power up the device.

3 Launch the Discovery program and proceed with the configuration.

Configure without an Access Point - Laptop with a Wireless Card Ad-Hoc Mode

1 Configure the wireless card to operate in Ad-Hoc mode with the SSID - `Connect`.

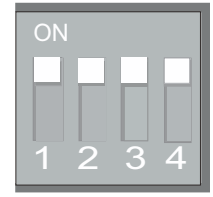
2 Power up the device.

3 Launch the Discovery application on the laptop and proceed with the configuration.

Command Line Access

1 Connect the Digi Connect Wi-SP to a PC with a serial cable.

2 Set the Digi Connect Wi-SP DIP switches in the On or up position.



DIP Switch settings for Command Line access
for both the Digi Connect Wi-SP and the Digi Connect SP.

3 Access a terminal emulation program such as HyperTerm

Start > Accessories > Communication > Hyperterm and enter a name for the connection.

4 Select COM1 and click OK

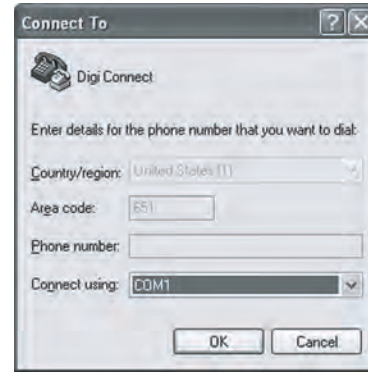
5 Set the port settings to 9600, 8, None, 1, None (default settings) click Apply then OK.

6 Enter the login username - root

and the default password -dbps

7 Go to the *Digi Connect Family Command Reference* on the enclosed CD for the command descriptions. See the set wlan command for all parameters.

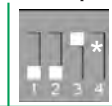

Connection Description
New Connection
Enter a name and choose an icon for the connection:
Name:
Digi Connect
Icon:
OK
Cancel


Connect To
Digi Connect
Enter details for the phone number that you want to dial:
Country/region:
Area code:
Phone number:
Connect using:
COM1
OK
Cancel


COM1 Properties
Port Settings
Bits per second:
9600
Data bits:
8
Parity:
None
Stop bits:
1
Flow control:
None
Restore Defaults
OK
Cancel
Apply

8 After you have configured the Digi Connect Wi-SP parameters to function within your network, disconnect the power supply and the serial cable from your Digi Connect Wi-SP

9 Reset your DIP switch settings according to your serial device requirements (EIA-232/422/485).

Switch Settings		EIA-232	EIA-422/485 Full-Duplex	EIA-485 Half-Duplex
	Up/On			
	Down/Off			
DB-9 Pinouts	1	DCD	CTS-	Not Used
	2	RxD	RxD+	RxD+
	3	TxD	TxD+	TxD+
	4	DTR	RTS-	Not Used
	5	GND	GND	GND
	6	DSR	RxD-	RxD-
	7	RTS	RTS+	Not Used
	8	CTS	CTS+	Not Used
	9	RI	TxD-	TxD-
	Shell	GND		

*If switch 4 is up, termination resistor connected
If down, termination resistor not connected.

10 Connect the antenna and the power supply to the Digi Connect Wi-SP.

11 Insert the Software & Documentation CD and follow the wizard to discover and the configure your Digi Connect Wi-SP for your network.

Note You may also use the Digi support site http://www.digi.com/support/ for additional command resources.

Assign an IP Address to the Device

There are several ways to assign an IP address to a device:

- Using the Digi Device Setup Wizard.
- Using Dynamic Host Configuration Protocol (DHCP) from the default web interface (only for changing the IP address once it has been assigned).
- Using the Command-Line Interface.
- Using Automatic Private IP Addressing (APIPA), also known as Auto-IP.

Configuring the IP Address Using the Digi Device Setup Wizard

Using the Digi Device Setup Wizard is the preferred method of assigning an IP address and initially configuring your Digi Connect device. The Digi Device Setup Wizard is supplied on the CD that accompanies your Digi Connect device.

The Digi Device Setup Wizard "discovers" the device, and then provides a method for assigning an IP address as well as configuring your device for your needs. It can be used in conjunction with the web interface to 'tweak' the specific environment. Setup is specially designed for the Windows environments, and is quick, automated, and complete.

Prerequisites

This procedure assumes the following:

- The device server is connected to the network and powered up.
- The CD will be used on a system running Microsoft Windows operating system or a Unix operating system.
- That you have located the device server's MAC address, located on the label on the bottom of the product, and recorded it for later use in assigning an IP address.

Procedure

1. Insert the Digi CD in the CD drive.
2. If the CD does not start automatically, double-click **My Computer > CD ROM Drive > setup.exe**

3 The Digi Device Setup Wizard will automatically pop up. Select your platform and click **Next**.
The Digi application finds and lists all of the Digi devices on your network.

4 Locate your device server by its MAC address.

5 Select the device server and then click **Next**.

Follow the instructions in the wizard to configure your Digi Connect device. Use the online help supplied with the wizard if you need more information about values the wizard prompts you to supply and select.

Configuring the IP Address Using DHCP

Using DHCP from the default web interface to configure an IP address works only for *changing the IP address* of a device server that has already been assigned an IP address. However, once an IP address is assigned, any configuration changes can be made from the Web interface.

Prerequisite

This procedure assumes the following:

- That the device server is configured as a DHCP client. Since this is the default configuration, this will be the case unless the configuration has been changed.
- That the device server is not powered on

Procedure

1 Set up a permanent entry for the device server on a DHCP server.

2 Connect the device server to the network and power it on. The IP address configured in step 1 is assigned automatically.

Configuring the IP Address using Auto-IP

The standard protocol Automatic Private IP Addressing (APIPA or Auto-IP) assigns the IP address from the reserved IP addresses in Auto-IP. Use ADDP or DHCP to find the device and assign it a new IP address that is compatible with your network. Once the unit is plugged in, Auto-IP automatically assigns the IP address.

Configuring the IP Address from the Command-Line Interface

The set network command is used to configure an IP address from the command line. To configure the Digi Connect SP through the command line, the DIP switches must be changed. See "Command Line Access" on page 66 for an illustration of the DIP switch settings. On the set network command, include the following parameters:

- ip=*device ip*: The IP address for the device.
- gateway=*gateway*: The network gateway IP address.
- submask=*device submask*: The device submask.
- dhcp=off: Turns off use of the Dynamic Host Configuration Protocol (DHCP), so that the IP address assigned is permanent.
- static=on: Specifies that the IP address is static, and will remain as the specified IP address, gateway, and submask.

For example:

```
set network ip=10.0.0.1 gateway=255.255.255.0
submask=255.255.255.0 dhcp=off static=on
```

Connectware Manager

The IP address cannot be set in Connectware Manager but it can be changed.

Open the browser based on the IP address the device has and go to Configuration > Network > IP Settings and enter the new IP address, subnet mask, and gateway.

Testing the IP Address Configuration

Once the IP address is assigned, you should test the IP address configuration to be sure it works as configured.

Prerequisite

This procedure assumes that you have configured the device server with an IP address.

Procedure

1 Access the command line of a PC or other networked device.

2 Issue the following command:

```
ping ip-address
```

where *ip-address* is the address you assigned to the device server.

Example

```
ping 192.168.2.2
```

A reply should be returned.

Configuration through the Digi Device Setup Wizard

The Digi Device Setup Wizard helps you configure the device according to one of several port profiles, or configuration scenarios that characterize the manner in which the device will be used.

Using Port Profiles to Configure Devices

The Digi Device Setup Wizard allows you to configure a serial port based on the way the port will be used. Each port profile displays the relevant settings for the configuration. There are several port profile choices for the Connect Family but if you see a profile listed that is not available in your brower, it means your device does not support the feature. The profiles are described in more detail on the following pages:

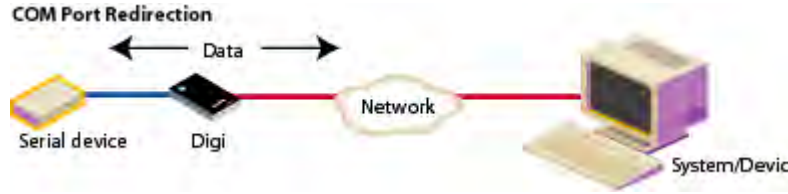
- RealPort: Allows you to map a COM or TTY port to the serial port. (Not supported in Digi Connect WAN)
- Console Management: Allows you to access a device's console port over a network connection.
- TCP Sockets: Allows a serial device to communicate over a TCP network.
- UDP Sockets: Allows a serial device to communicate using UDP.(Not supported in Digi Connect WAN)
- Serial Bridge: Configures one side of a serial bridge. A bridge connects two serial devices over the network, as if they were connected with a serial cable.
- Modem Emulation: Allows you to configure the serial port to act as a modem. (Not supported in Digi Connect WAN.)

- Custom: An advanced option to allow full configuration of the serial port. This profile allows you to view all settings associated with the serial port.

RealPort Profile

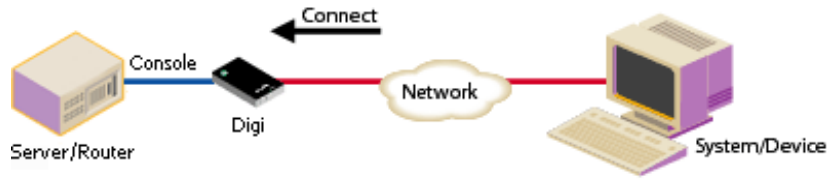
The RealPort Profile allows you to configure your device to create a virtual COM port on your PC, known as COM Port Redirection. (Not supported in Digi Connect WAN.) The PC applications send data to this virtual COM port and RealPort sends the data across the network to the Digi device server. The data is routed to the serial device connected to the Digi device server's serial port. The network is transparent to both the application and the serial device (not supported in Digi Connect WAN).

⇨⇨⇨ **RealPort software (from the Software and Documentation CD) must be installed and configured on each PC that will use RealPort ports. Enter the IP address of the Digi device server and the RealPort TCP port number 771.**



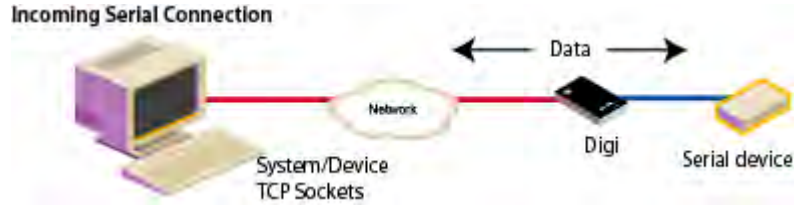
Console Management Profile

The Console Management Profile allows access to a device's console port over a network connection. Most network devices such as routers, switches, and servers offer serial port(s) for management. Instead of connecting a terminal to the console port, cable the console port to the serial port of your Digi device. Then using Telnet features, network administrators can access these consoled serial ports from the LAN by addressing the appropriate TCP port.



TCP Sockets Profile

The TCP Sockets profile allows serial devices to communicate over a TCP network. The TCP Server allows other network devices to initiate a TCP connection to the serial device attached to the serial port of the Digi device server. The TCP Client allows the Digi device server to automatically establish a TCP connection to an application or a network.



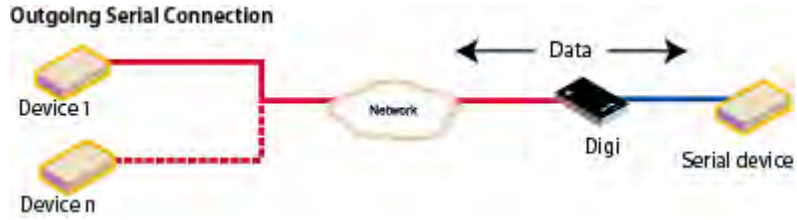
RFC 2217 Support

Digi Connect devices -except Digi Connect WAN support RFC 2217, an extension of the Telnet protocol used to access serial devices over the network. RFC 2217 implementations enable applications to set the parameters of remote serial ports (baud rate, flow control, etc.), detect line signal changes, as well as receive and transmit data. The configuration information provided in this section applies to Digi Connect devices functioning as RFC 2217 servers.

If using the RFC 2217 protocol, do not modify the port settings from the defaults. If you have altered the device server, restore the factory default settings (see "Restore Device Configuration to Factory Defaults" on page 127). No additional configuration is required.

UDP Sockets Profile

The UDP Sockets profile allows serial devices to communicate using UDP. (Not supported in the Digi Connect WAN.) The UDP Server configuration allows the serial port to receive data from one or more systems or devices on the network. The UDP Client configuration allows the automatic distribution of serial data from one host to many devices at the same time using UDP sockets.



About TCP and UDP Port Numbers

Digi Connect devices use the following default TCP and UDP port numbering conventions described in the following table:

For this connection type...	Use this Port
Telnet to the serial port	2001 (TCP only)
Raw connection to the serial port	2101(TCP and UDP)

You must ensure that the application or device that initiates communication with the Digi Connect device uses these ports. If they cannot be configured to use these ports, you can change the individual network port on the Digi Connect device, which allows you to use different port numbers to designate a Telnet or raw connection to the serial port.

Serial Bridge Profile

The Serial Bridge profile allows users to create a serial bridge. A serial bridge is a network connection between two serial devices, each of which uses a Digi Connect device. The serial devices “think” they are communicating with each other across a serial cable using serial communication techniques. There is no need to reconfigure the server or the serial device. Neither is aware of the intervening network.

This profile configures each side of the bridge separately. Repeat the configuration for the second Digi device server of the bridge specifying the IP address of the first Digi device server.

Modem Emulation Profile

The Modem Emulation profile allows the Digi Connect family (except Digi Connect WAN) to emulate a modem. It sends and receives modem responses to the serial device over the Ethernet instead of PSTN (Public Switched Telephone Network). This profile allows you maintain your current software application but use it over the less expensive Ethernet network.

The commands that can be issued in a modem-emulation configuration are described in the *Digi Connect Family Command Reference*.

Custom Profile

This profile allows you to see all serial-port settings and set them accordingly. Use this profile only if your application does not fit into any of the predefined port profiles. For example, if your network connections will involve a mix of TCP and UDP sockets, you would need to select the Custom Profile.

To Further Configure the Digi Connect Device

Once a Digi Connect device is configured through the Digi Device Setup Wizard, if any configuration values need to be viewed or changed, you can use one of the other device interfaces to view and change the configuration, such as the default web interface, Java applet interface, or Command-Line Interface. See "Configuration through the Default Web Interface" on page 77, "Configuration through the Java Applet Interface" on page 98, and "Configuration Through the Command Line" on page 104 for more information.

Configuration through the Default Web Interface

This section describes using the default web interface to configure your Digi Connect device. The interface is recommended for use if the Digi Device Setup Wizard is unavailable, if your application requires specific alterations not accessible on the Wizard, or if you wish to modify the device configuration from the values that were setup through the Digi Device Setup Wizard.

Configuring Connect devices through the default web interface involves these tasks:

- Change the IP address, (must be configured. See page 82.
- Configure network communications. See page 83
- Configure mobile settings See "Configure Mobile Settings" on page 85.
- Configure the serial ports. See page 85.
- Configure GPIO pins (except Digi Connect SP, Digi Connect Wi-SP, and Digi Connect WAN). See page 90.
- Configure alarms. See page 93.
- Configure security features. See page 96.
- Configure system settings. See page 97.
- Configure remote management. See "Configure Remote Management" on page 96

At any point in the configuration process, if you need to restore the device configuration to factory defaults at any point in the configuration process, see "Restore Device Configuration to Factory Defaults" on page 122.

Open the Web Interface

To open the default web interface, you can either:

- Enter the Digi Connect device's URL in a Web browser and log on to the device, if required.
- Use the Digi Device Discovery utility to locate the device and open the Web interface.

By Entering the Device's URL in a Web Browser

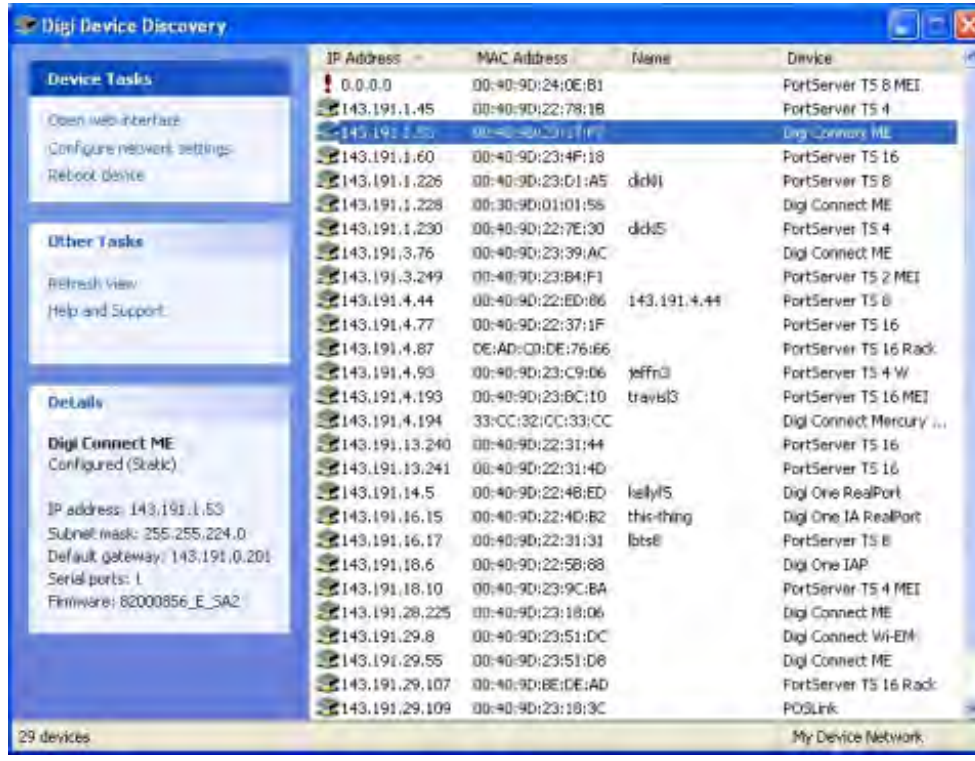
1. In the URL address bar of a Web browser, enter the IP address of the device.
2. If security has been enabled for the device, a login dialog will be displayed. Enter the user name and password for the device. If you do not know the user name and password for the device, contact the system administrator who initially set up the device.
3. After you log on, the Home page of the default web interface is displayed. See "Organization of the Web Interface" on page 80 for an overview of using the Home page and other linked pages.

   Note The idle timeout will automatically log the user out of the device after 5 minutes.

By Using the Digi Device Discovery Utility

Alternatively, you can use the Digi Device Discovery Utility to locate your Digi Connect device and open the default web interface.

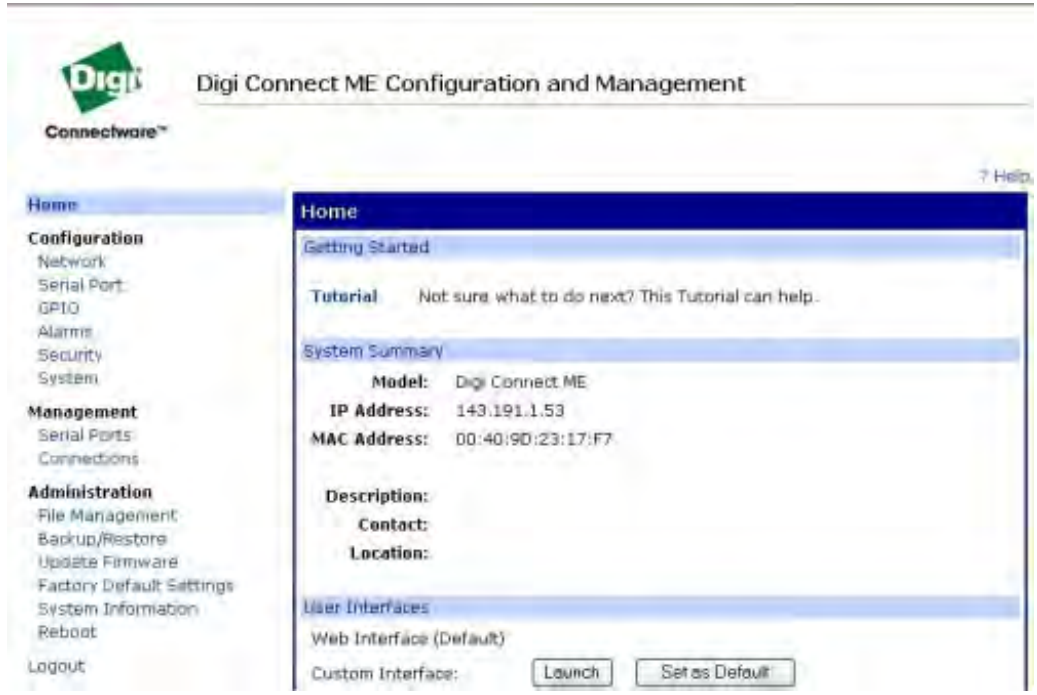
1. From the start menu, select **Start > Programs > Digi Connect > Digi Device Discovery**. The Digi Device Discovery utility is displayed.
2. Locate the device in the list of devices, and double-click it, or select the device from the list and select Open web interface in the Device Tasks list.
3. Depending on whether a system administrator has configured password authentication for the device, you may need to log on to the device. If a login dialog is displayed, enter the user name and password for the device. If you do not know the user name and password for the device, contact the system administrator who initially set up the device.



Now you can configure the device, as described on the following pages.

Organization of the Web Interface

When you open the default web interface, the Home page is displayed.



The Home Page

The Home page of the default web interface displays the following:

- On the left is a menu of choices that display pages for configuration, management, and administration tasks, and to log out of the default web interface. This chapter focuses on the choices under Configuration. For details on using the choices under Management and Administration, see Chapter 3, "Monitoring Digi Connect Devices" and Chapter 4, "Administering Digi Connect Devices".

  Clicking Logout logs you out of a configuration and management session with a Digi Connect device. It does not close the browser window, but takes you to a logout window. To finish logging out of the default web interface and prevent access by other users, you must close the browser window. Or, you can log back on to the device by clicking the link on the screen. After 5 minutes, the idle timeout will also automatically log you out.

- The Getting Started section provides a link to a tutorial on configuration and management of your Digi Connect device.
- The System Summary section notes all available device-description information.

Configuration Pages

The choices under Configuration in the menu display pages for configuring various features, including:

- Network: For configuring network communications. See "Configure Network Communications" on page 83.
- Mobile Settings: For configuring mobile settings. See "Configure Mobile Settings" on page 85
- Serial Ports: For configuring serial ports. See "Configure Serial Ports" on page 85.
- GPIO: For configuring the GPIO pins. See "Configure GPIO Pins" on page 90. Not supported in Digi Connect SP, Digi Connect Wi-SP, and Digi Connect WAN.
- Alarms: for configuring alarms. See "Configure Alarms" on page 93
- Security: For configuring security features. See "Configure Security Features" on page 96.
- System: For configuring system-identifying information and SNMP. See "Configure System Settings" on page 97.

Some of the configuration pages organize the configuration settings on different sets of linked screens. For example, the Network Configuration screen initially displays the IP Settings, and provides links to the Network Services Settings and Advanced Settings.

Applying and Saving Changes

The default web interface runs locally on the device, which means that the interface always maintains and displays the latest settings in the device.

On each screen, the Apply button is used to save any changes to the configuration settings to the device.

Canceling Changes

To cancel changes you have made on a configuration change, click the Refresh or Reload button on the Web browser. This will cause the browser to reload the page. Any changes made since the last time you clicked the Apply button are reset.

Online Help

Online help is available for all screens of the default web interface, and for common configuration and administration tasks. If you are new to device configuration, you might also want to review the tutorial that is available on the Home page.

Change the IP Address, As Needed

Normally, IP address assignment is done through the Setup Wizard, and is the recommended method. However, some organizations will not allow users to run wizards. If you are unable to run the Setup Wizard, then you must assign an IP address to the device using one of the alternative methods.

Changing an IP Address from a Web Browser

Prerequisite

This procedure assumes that the device server already has an IP address and you simply want to change it.

Procedure

1. Open a web browser and enter the device server's current IP address in the URL address bar.
2. If security is enabled for the device, a login prompt is displayed. Enter the user name and password for the device. If you do not know the user name and password, contact the system administrator who initially set up the device.
3. Click **Network** to access the Network Configuration page.
4. On the IP Settings page, select "Use the following IP address."
5. Enter an IP address (and other network-related parameters) and then click **Apply** to save the configuration.

Configure Network Communications

The Network configuration pages include the following:

- IP Settings: Allow you to change the IP address.
- Network Services: Allow you to enable and disable access to various network services, such as ADDP, RealPort and Encrypted RealPort (not supported in Digi Connect WAN), Telnet, HTTP/HTTPS, and other services.
- Advanced Network Settings allow you alter the Ethernet Interface speed and mode, TCP/IP settings, TCP keepalive settings, or DHCP settings.

Alternatives for Configuring Network Communications

There are three ways a Digi device server can be configured on the network.

- Using dynamic settings: All network settings will be assigned automatically by the network, using a protocol called DHCP. Contact your network administrator to find out if a DHCP server is available.
- Using static settings: All network settings are set manually and will not change. The IP address and Subnet Mask are mandatory. The rest are not mandatory, but may be needed for some functions. Contact your network administrator for the values you need.
- Using Auto-IP: Auto-IP will assign your device an IP address immediately after it is plugged in. If you are running DHCP or ADDP, the Auto-IP address will be overridden and a network compatible IP address will be assigned or you can assign the device a static IP address.

Additional Considerations

Even if a DHCP server is available, your configuration may work better with static settings. Once set, static settings will not change, so you and other network devices can always find the Digi device server by the IP address. With dynamic settings, the DHCP server can change the IP address. This can happen frequently or infrequently depending on how it has been configured by your network administrator.

When the IP address does change, you and other network devices configured to talk to it will no longer be able to. You will then need to find the Digi device server again using the setup wizard on your CD. You must also reconfigure other network devices that wish to talk to this Digi device server.

View and Change IP Settings, as Needed

The IP Settings page shows how the device's IP address is obtained, either by DHCP or by using a static IP address, subnet mask, and default gateway. If you do not know what these settings mean, or when you may be asked to supply these values for a device, contact your network administrator. In addition, you can see the online help for the page for descriptions of these settings.

Enable or Disable Network Services

The Network Services page shows a set of common network services that are available for devices, and the port on which the service is running.

You can enable or disable several common network services and configure the TCP port they listen on. Disabling services may be done for security purposes. That is, you can disable certain services so that a device is running only those services specifically needed by the device. As needed, you can also disable any non-secure services, such as Telnet.

Network Services that Can Be Enabled or Disabled

Following are the network services which can be enabled or disabled:

- ADDP: This service controls use of Advanced Digi Device Discovery Protocol. If it is disabled, you can no longer use the Digi Device Setup Wizard, or Digi Device Discovery utility to locate the device.
- HTTP & HTTPS: These services control the use of the Web interface. If you disable them, device users cannot use the default web interface or Java applet to configure, monitor, and administer the device.
- RealPort or Encrypted RealPort: (Not supported in Digi Connect WAN) These services control use of COM port redirection. If disabled, COM port redirection cannot be used for the device.
- Rlogin: (Not supported in Digi Connect WAN) Enables or disables the remote login (rlogin) service. If disabled, users cannot perform a remote login to the device.
- Rsh: (Not supported in Digi Connect WAN) Enables or disables the remote shell (rsh) service.
- SNMP: Enables or disables the use of SNMP. If disabled, SNMP services such as traps and device information are not used.

- Telnet: Enables or disables the Telnet service. If disabled, users cannot Telnet to the to the device.

Port Numbers for Network Services

For each network service, the Port field shows the port on which the service is running.It is usually best to use the default TCP port numbers for these services because they are well known by most applications.

Configure Advanced Network Settings

The Advanced Network Settings are used to further define the network interface, including:

- Whether Auto-IP address assignment is enabled or disabled.
- The Ethernet Interface speed and duplex mode (Auto, Half-Duplex, or Full Duplex).
- For wireless products only, there is an advanced network setting of maximum transmission rate.

Configure Mobile Settings

The Mobile Settings identify the provider, service plan, and connection settings to connect to the mobile network.

- The Service plan can be proxy, public, internet, or custom
- Connection settings can be set up for both continuous sending and receiving data.

Configure Serial Ports

Use the Serial Port Configuration page to establish a port profile for the Connect device's serial port. The Serial Port Configuration page includes the following information:

- The currently selected port profile for the serial port.
- Detailed configuration settings for the serial port, dependent on the port profile selected.
- Links to Basic Serial Settings and Advanced Serial Settings.

Port Profiles

Port profiles allow you to easily configure serial ports by displaying only those items that are relevant to the currently selected profile. The port profiles you can select include the following. If you used the Digi Device Setup Wizard to initially configure your device, you were prompted to select a port profile. These port profiles are described in more detail on "Using Port Profiles to Configure Devices" on page 72, and are as follows: RealPort Profile: Allows you to map a COM or TTY port to the serial port. (Not supported in Digi Connect WAN)

- Console Management Profile: Allows access to a device's console port over a network connection.
- TCP Sockets: Allows a serial device to communicate over a TCP network.
- UDP Sockets: Allows a serial device to communicate using UDP.
- Serial Bridge: Configures one side of a serial bridge. A bridge connects two serial devices over the network, as if they were connected with a serial cable.
- Modem Emulation: Allows you to configure the serial port to act as a modem. (Not supported in Digi Connect WAN)
- Custom: An advanced option to allow full configuration of the serial port. This profile allows you to view all settings associated with the serial port.

If a port profile has already been selected for the Digi Connect device, for example, if it has already had an initial configuration set through the Digi Device Setup Wizard, the currently selected port profile is shown at the top of the screen. You can change the port profile to another one, or keep the profile but adjust individual settings.

Everything on the Serial Port Configuration screen between the Port Profile Settings and the links to the Basic and Advanced Serial Settings is dependent on the port profile selected.Selecting a port profile displays the relevant information for your profile.

Selecting and Configuring a Port Profile

1. To configure any profile select **Serial Ports.**
2. Click the port to be configured.
3. Click **Change Profile.**
4. Select the appropriate profile and Click **Apply**.

5 Enter the appropriate parameters for each profile. Refer to the online help for the configuration screens for more details about settings and values. Click **Apply** to save the settings.

Configure Basic Serial Settings

After you select your port profile, the profile settings will appear. Click the appropriate features for your environment. The following information is a brief description of the fields within the Basic Serial Settings. See the online help for detailed information about each setting.

- Description -Specifies an optional character string for the port which can be used to identify the device connected to the port.
- Basic Serial Settings include Baud Rate, Data Bits, Parity, Stop Bits, and Flow Control. The basic serial port settings must match the serial settings of the connected device. If you do not know these settings, consult the documentation that came with your serial device. These serial settings may be documented as 9600 8N1, which means that the device is using a baud rate of 9600 bits per second, 8 data bits, no parity, and 1 stop bit.

  When using RealPort (COM port redirection) or RFC 2217, these settings are supplied by applications running on the PC or server, and the default values on your Digi device server do not need to be changed. (Not supported in Digi Connect WAN.)

Configure Advanced Serial Settings

The advanced serial settings allow you to further define the serial interface, including whether port buffering (also known as port logging), RTS Toggle, and RCI over Serial are enabled as general serial interface options. You can also define how specific aspects of TCP and UDP serial communications should operate, including timeouts and whether a socket ID is sent.

Serial Settings

The Serial Settings part of the page includes these options:

- Enable Port Logging: Enables the port-buffering feature, which allows you to monitor incoming ASCII serial data in log form. The Log Size field specifies the size of the buffer that contains the log of ASCII serial data.

- Enable RTS Toggle: When enabled, the RTS (Request To Send) signal is forced high (on) when sending data on the serial port.
- Enable RCI over Serial (DSR): This choice allows the Digi device to be configured through the serial port using the RCI protocol. See the RCI specification in the Integration Kit for further details.

  RCI over Serial uses the DSR (Data Set Ready) serial signal. Verify that the serial port is not configured for autoconnect, modem emulation, or any other application which is dependent on DSR state changes.

TCP Settings

The TCP Settings are displayed only when the current port is configured with the TCP Sockets or the Custom Profile.

- Send Socket ID: Include an optional identifier string with the data sent over the network. The Socket ID can be 1 to 256 ASCII characters. Non-printable characters can be entered as follows:

Character	Key Sequence
backspace	\b
formfeed	\f
tab	\t
new line	\n
return	\r
backslash	\\
hexadecimal values	\xhh

- Send data only under any of the following circumstances: Enable if you need to specify the conditions when the Digi device server will send the data read from the serial port to the TCP destination.
- Send when data is present on the serial line: Send the data to the network destinations when a specific string of characters is detected in the serial data.

Enter the string 1 to 4 characters in the Match String field. Non-printable characters can be entered as follows:

Character	Key Sequence
hexadecimal values	\xhh
tab	\t
line feed	\n
backslash	\\

- Check Strip: Match string before sending to strip the string from the data before it is sent to the destination.
- Send after the following number of idle milliseconds: Send the data after the specified number of milliseconds has passed with no additional data received on the serial port. This can be 1 to 65,535 milliseconds.
- Send after the following number of bytes: Send the data after the specified number of bytes has been received on the serial port. This can be 1 to 65,535 bytes.
- Close connection after the following number of idle seconds: Enable to close an idle connection. Use the Timeout field to enter the number of seconds that the connection will be idle before it is closed. This can be 1 to 65000 seconds.
- Close connection when DCD goes low: When selected, the connection will be closed when the DCD (Data Carrier Detected) signal goes low.
- Close connection when DSR goes low: When selected, the connection will be closed when the DSR (Data Set Ready) signal goes low.

UDP Settings

The UDP Settings are displayed only when the current port is configured with the UDP Sockets or the Custom Profile. Not supported in Digi Connect WAN.

- Send Socket ID: Include an optional identifier string with the data sent over the network. The Socket ID can be 1 to 256 ASCII characters. Non-printable characters can be entered as follows:

Character	Key Sequence
backspace	\b
formfeed	\f
tab	\t
new line	\n
return	\r
backslash	\\
hexadecimal values	\xhh

Configure GPIO Pins

All Digi Connect devices except the Digi Connect SP, Digi Connect Wi-SP, and Digi Connect WAN devices have several General Purpose IO (GPIO) pins that can be used for either standard serial communication signalling or for a user-defined purpose, such as when a significant event occurs within the device. In the latter case, the Digi Connect device can be configured so that when an event occurs, an alarm can be sent in the form of an email message to an administrator or technician, or in the form of an SNMP trap.

The number of GPIO pins varies by device. Digi Connect ME and Wi-ME devices have five GPIO pins, while Digi Connect EM and Wi-EM devices have nine GPIO pins.

The GPIO Configuration page configures the settings for the GPIO pins on your Digi Connect device. The settings on this page apply only to those devices that support configurable GPIO pins: Digi Connect ME, Digi Connect Wi-ME, Digi Connect EM, and Digi Connect Wi-EM. For a discussion of the possible uses of configurable GPIO pins, see "Configurable GPIO Pins" on page 25.

GPIO Pin Settings

The GPIO pins on a Digi Connect device can be set to one of three states:

- Serial: The GPIO pin is used for standard serial communication signalling. Each pin maps to a different serial signal as listed in parentheses next to the pin. (DCD, CTS, DSR, ...). This is the default setting for all GPIO pins. The default serial settings for the GPIO pins on a Digi Connect device are as follows. Depending on the device, there are five or nine pins.

Pin Number	Default Serial Signal	Signal Direction
GPIO 1	DCD	Input
GPIO 2	CTS	Input
GPIO 3	DSR	Input
GPIO 4	RTS	Output
GPIO 5	DTR	Output
GPIO 6	TXD	Output
GPIO 7	RXD	Input
GPIO 8	TXD for port 2	Output
GPIO 9	RXD for port 2	Input

- In: The GPIO pin is used for user-defined signal input from the connected device to the Digi Connect device. An email notification can be sent when an input event is signalled, as discussed in "Configure Alarms" on page 93.
- Out: The GPIO pin is used for user-defined signal output from the Digi Connect device to the connected device.

Additional Implementation Required for Input and Output Choices

Changing the GPIO pin settings from Serial to Input or Output means that you are completely responsible for implementing how the pins and signals will work, including developing any applications, signal-handling, and hardware.

Set Alarms for GPIO Pin Changes, as Needed

If you want alarms to be issued in the form of email notifications or SNMP traps when a GPIO pin signals that an event has occurred on the Digi Connect device, go to the Alarms page and configure those alarms. See "Configure Alarms" on page 93.

Exercise GPIO Pins

Once the GPIO pins and any alarms associated with them have been configured, you should exercise the GPIO pins to test their configuration.

Exercise GPIO Input

Typically, you will use input signals on GPIO pins to trigger an email alarm, which tells an administrator or technician that a significant event has occurred within the device. The process for testing GPIO input is as follows:

1. On the SW2 bank of switches on the development board, ensure that one of the GPIO pins is set to high.
2. On the SW1 bank of switches, set the same GPIO pin to IO.
3. Configure the GPIO pin for input. See "Configure GPIO Pins" on page 103.
4. Configure an email alarm for the GPIO pin. See "Configure Alarms" on page 103.
5. Toggle the SW2 switch several times to generate several email alarms.

Exercise GPIO Output

The process for testing GPIO output is as follows. In this process, raising a GPIO signal from the configuration application causes an LED on the development board to turn on.

1. On the SW2 bank of switches on the development board, ensure that one of the GPIO pins is set to High.
2. On the SW1 bank of switches, set the same GPIO pin to IO.
3. In the default web interface for the Digi Connect device, click the GPIO link. On the GPIO page, configure one or more GPIO pins for output. See "Configure GPIO Pins" on page 103 for details.
4. Under Administration, click the System Information link. On the System Information page, click the GPIO link.
5. Choose Asserted to raise the signal, and then click Set Pins.

   An LED on the development board is turned on.

Note that this process does not configure the Digi Connect device. Settings are not saved. If the module reboots, you will have to perform steps 2 and 3 again.

Configure Alarms

Use the Alarms page to configure device alarms or display current alarms settings. Device alarms are used to send email messages or SNMP traps when certain device events occur. These events include changes in GPIO signals and certain data patterns being detected in the data stream.

Configure Alarm Notification Settings

On the Alarms page, the Alarm Notification Settings control the following:

- The “Enable alarm notifications” checkbox enables or disables all alarm processing for the Digi Connect device.
- The Mail Server Address (SMTP) field specifies the IP address of your SMTP mail server. Ask your network administrator for this IP address.
- The From field specifies the text that will be used in the “From:” field for all alarms that are sent as emails.

Configure Alarm Conditions

The Alarm Conditions part of the Alarms page shows a list of all of the alarms. Up to 32 alarms can be configured for a Digi Connect device, and they can be enabled and disabled individually.

Alarm List

The list of alarms displays the current status of each alarm. If there are any alarms already configured for the device, and after you have configured any new alarms, you can use this list to view alarm status at a glance, then view more details for each alarm as needed.

- Enable: Checkbox indicates whether the alarm is currently enabled or disabled.
- Alarm: The number of the alarm.
- Status: The current status of the alarm, which is either enabled or disabled.
- Type: Specifies whether the alarm is based on GPIO pin state changes or serial data pattern matching.
- Trigger: The conditions that trigger the alarm.

- SNMP Trap: Indicates whether the alarm is sent as an SNMP trap.
  - If the SNMP Trap field is disabled, and the Send To field has a value, then the alarm is sent as an email message only.
  - If the SNMP trap field is enabled and the Send To field is blank, then the alarm is sent as an SNMP trap only.
  - If the SNMP Trap field is enabled, and a value is specified in the Send to field, then that means the alarm is sent both as an email and as an SNMP trap.
- Send To: The email address to which the alarm is sent.
- Email Subject: The text to be included in the "Subject:" line of any alarms sent as email messages.

Alarm Conditions

To configure an alarm, click on it. The configuration page for individual alarms has two sections:

- Alarm Conditions: For specifying the conditions on which the alarm is based, whether on GPIO pin state changes or serial data pattern matching.
- Alarm Destinations: For specifying how the alarm is sent, either as an email message or an SNMP trap, or both, and where the alarm is sent.

Alarm Conditions

The Alarm Conditions part of the page is for specifying the conditions on which the alarm is based. Alarm conditions include:

- Send alarms based on GPIO pin states: Click this radio button to specify that this alarm is sent when the specified GPIO pin states are detected. Then specify the following:
  - Pins: An alarm is sent when the specified combination of pin states is detected.

    High - pin is asserted.

    Low - pin is not asserted.

    Ignore - pin state is ignored.
  - Alarm recurrence time: Defines how often a new alarm can be sent. For example, if the alarm recurrence time is 10 seconds then even if the pin states are detected 5 times within a 10 second period only one alarm will be sent.
  - Send reminders while GPIO pins remain in this state: If enabled, reminders will be sent if the pins remain in the defined state for an extended period of time.

  - Every: The number of seconds the pins must remain in the defined state for a reminder to be sent.

- Send alarms based on serial data pattern matching: Click this radio button to specify that this alarm is sent when the specified serial data pattern is detected. Then specify the following:
  - Serial Port: The serial port to monitor for the data pattern. This field is displayed for devices where more than one serial port is available.
  - Pattern: An alarm is sent when the serial port receives this data pattern. You can include special characters such as carriage return carriage return (\r) and new line (\n) in the data pattern.

Alarm Destinations

The Alarm Destination part of the page defines how alarm notifications are sent—either as an email message or an SNMP trap, or both—and where the alarm notification is sent.

- Send E-mail to the following recipients when alarm occurs: Select the checkbox to specify that the alarm should be sent as an email message. Then specify the following information:
  - To: The email address to which this alarm notification email message will be sent.
  - CC: The email address to which a copy of this alarm notification email message will be sent (optional).
  - Priority: The priority of the alarm notification email message.
  - Subject: The text to be included in the Subject: line of the alarm-notification email message.
- Send SNMP trap to the following destination when alarm occurs: Select the checkbox to specify that the alarm should be sent as an SNMP trap.

  For alarms to be sent as SNMP traps, the IP address of the destination for the SNMP traps must be specified in the SNMP settings. This is done on the System Configuration pages of the default web interface. See "Configure SNMP" on page 97. That destination IP address is then displayed below the “Send alarm to SNMP destination” checkbox.
- To configure an alarm notification to be sent as both an email message and an SNMP trap, select both “Send E-Mail” and “Send SNMP trap” checkboxes.
- Click Apply to apply changes for the alarm and return to the Alarms Configuration page.

Enable and Disable Alarms

Once alarm conditions are configured, you can enable and disable individual alarms by selecting or deselecting the Enable checkbox for each alarm.

Configure Security Features

The Security page allows you to change your password from the default password.

To increase security for your device, change the password.

To further secure your Digi Connect device, you might want to disable those network services not necessary to the device, or turn off any non-secure network services, such as Telnet. See "Enable or Disable Network Services" on page 84.

Configure Remote Management

.The Remote Management configuration page sets up the connection to the Connectware server so the device knows how to connect to the server.

- The Connections page sets up the IP address of the host, the mobile and Ethernet settings.
- Connection Methods include Automatic, TCP, HTTP, HTTP over Proxy, or None (which will disable the current interface and disable it from communicating with the server.)
- The HTTP over Proxy settings (available only with Automatic and HTTP over Proxy) identifies the server and user access through identifying server, username, TCP port, password and the option to enable persistent proxy connections.
- The Security settings control the security processes used in communicating with the Connectware server.
- Security can be simple authentication or an encrypted connection to communicate with the server.
- Encryption methods include: Discovery/Facility Encryption or Message Passing Encryption. These settings should correspond to the server.
- Encryption Key size can be either 128-, 192-, or 256-bits

- Additional encryption choices include: Generate device encryption key from the following master encryption key and Use the following device encryption key are both administrator defined.

Advanced

The default settings usually work for most situations, however you can fine tune the connection between the Connectware server and the device. Be sure to try the default settings before altering the advanced settings. The settings allow you adjust the setting intervals for HTTP and TCP keep-alive, receive and transmit intervals, and interval for connection lost.

Configure System Settings

Configuring system settings is done on the System Configuration page. On this page, you can:

- Configure device description information, including the device name, contact, and location.
- Configure SNMP, including whether SNMP is enabled or disabled, and the types of SNMP traps to be enabled.

Configure Device Description Information

A device description is a system description of the device's name, contact, and location. This device description can be useful for identifying a specific device when you are working with a large number of devices in multiple locations.

Configure SNMP

Simple Network Management Protocol (SNMP) is a protocol that can be used to manage and monitor network devices. You can configure your Digi Connect device to use SNMP features, or disable its use entirely for security reasons. To configure SNMP settings, click the Simple Network Management Protocol link at the bottom of the System Configuration page. SNMP settings include:

- Enable Simple Network Management Protocol (SNMP): This checkbox enables or disables use of SNMP.

- The Public community and Private community fields specify passwords required to get or set SNMP-managed objects. Changing public and private community names from their defaults is recommended to prevent unauthorized access to the device.
  - Public community: The password required to get SNMP-managed objects. The default is “public.”
  - Private community: The password required to set SNMP-managed objects. The default is “private.”
- Allow SNMP clients to set device settings through SNMP: This checkbox enables or disables the capability for users to issue SNMP set commands uses use of SNMP read-only for the Digi Connect device.
- Enable Simple Network Management Protocol (SNMP) traps: Enables or disables the generation of SNMP traps.
- Destination IP: The IP address of the system to which traps are sent. In order to enable any of the traps, a non-zero value must be specified. This field is required in order for alarms to be sent in the form of SNMP traps. See "Configure Alarms" on page 93.
- At the bottom of the page are checkboxes for the SNMP traps that can be used: authentication failure, login, cold start, and link up traps.

Configuration through the Java Applet Interface

The Java applet interface for configuring devices is similar to the default web interface, but has these differences:

- While the default web interface runs directly on the device, the Java applet runs remotely. This means that when you start the Java applet, all the device settings are updated from the device and stored in memory. These are the settings that are shown when you click on a configuration choice or click Cancel.
- Because the Java applet runs remotely, it is not always aware when settings have been changed by other users. Therefore, it is sometimes necessary to refresh the applet to retrieve those settings.

- There are fewer configuration options under “Configuration:” Network, Serial Ports, GPIO, and Security. Alarm configuration is organized under “Management,” and there is no System configuration option.
- Some configuration categories have limited choices compared to the default web interface. areas have limited choices. For example, the port profiles used for configuring serial ports in the default web interface are not available in the Java applet.
- The button used to save configuration settings is labeled Save rather than Apply, and there are additional buttons, Cancel and Apply.
- A status pane logs all activities in your session.
- There is limited online help available for the applet screens. To familiarize yourself with the configurable fields, you might want to switch to the default web interface and review the online help for the screens in that interface.

System Requirements for Using the Java Applet Interface

Using the Java applet interface requires that the Sun Java Runtime environment be loaded on the computer used to configure, monitor, and administer the Digi Connect device.

Accessing the Java Applet Interface

You can temporarily launch the Java Applet interface or use it as the default device interface. In some cases, a system administrator may have already set the Java applet as the default device interface. In that case, when you access the device, the Java applet interface will automatically be displayed. To access the Java Applet Interface:

1 Go to the Home page of the default web interface.

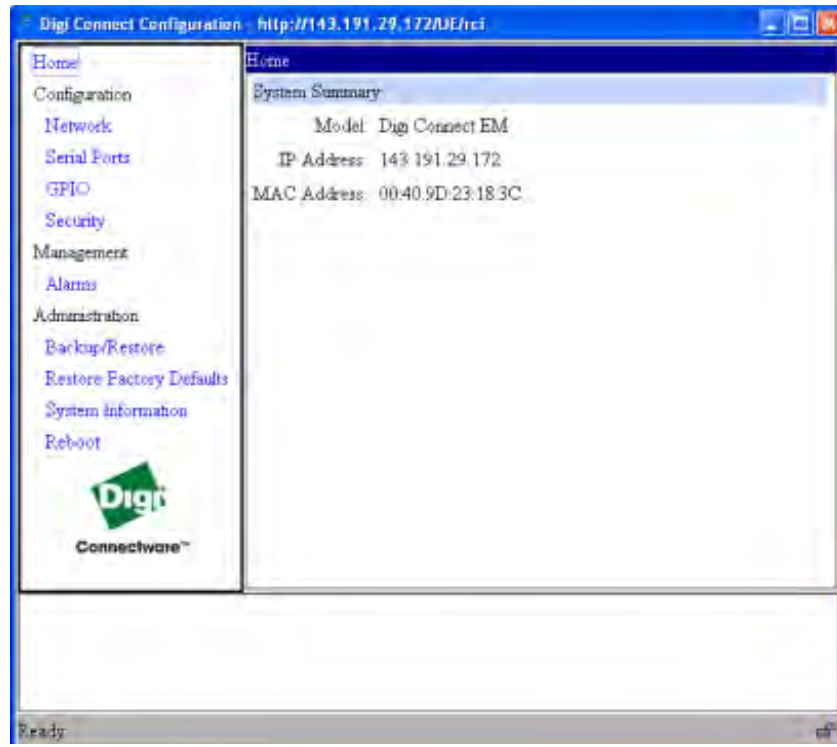
2 Under User Interface, click the Launch button to launch the Java applet.

OR

Click the Set as Default button to use the Java applet as the default device interface.

Organization of the Java Applet Interface

When you open the Java applet interface for a Digi Connect device, the Home page is displayed.



The Home Page

The Home page of the Java applet interface displays the following:

- On the left is a menu of choices that link to pages for configuration, management, and administration tasks.
  - This chapter focuses on the links under Configuration and Management.
  - For details on using the links under Administration, see Chapter 4, "Administering Digi Connect Devices".
- The System Summary section notes all currently available device-description information.

Configuration Pages

In the menu on the left side of the screen, the choices under Configuration display pages for configuring various features, including:

- Network: For configuring network communications. See "Configure Network Settings" on page 102.
- Serial Ports: For configuring serial ports. See "Configure Serial Ports" on page 103.
- GPIO: For configuring the GPIO pins. See "Configure GPIO Pins" on page 103.
- Security: For configuring security features. See "Configure Security Features" on page 104.
- In addition, to configure alarms, you use the Alarms link under Management. See "Configure Alarms" on page 103

Some of the configuration pages organize the configuration settings into tabs. For example, the Serial Ports Configuration screen has tabs for Basic, Port Services, Network Services, and Advanced settings.

Saving, Canceling, and Refreshing Configuration Settings

The configuration screens in the Java applet interface contain several buttons: Save, Cancel, and Refresh.

- Save: Saves the values you have entered or changed to the Digi Connect device.
- Cancel: Only changes that have been made prior to clicking Save are reset to the initial values when you first arrived on that particular page. For example, Cancel would be useful in the following sequence:

  1 Suppose you click on the Network choice, and on the Network page, DHCP is currently selected.

  2 Instead, you select to manually assign a static IP.

  3 Next, you enter an IP address and Subnet Mask.

  4 Then, you realize that you do not want to use those settings, and click Cancel.

5 The Network configuration pages are returned to their initial settings, in which DHCP was selected.

- Refresh: Because the Java applet runs remotely, it is not always aware when device settings have been changed by other users. Therefore, it is sometimes necessary to refresh the applet to retrieve those settings. When you start the Java applet interface, all the device settings are updated and stored in memory. These are the settings that are shown when you click on a configuration page or click Cancel. Clicking Refresh updates all the stored settings with the settings from the Digi Connect device (that is, if someone else had made a change while you were navigating around the applet).

Restoring Settings

There is no way in the Applet or Web UI to restore a certain group of settings to factory defaults. Once you save the settings, they are in the device. If you want to restore the device to its true default settings, you must completely reset the device to factory defaults. See "Restore Device Configuration to Factory Defaults" on page 122.

Configure Network Settings

To configure network settings, click the Network link. Network Settings are organized on three tabs:

- Basic: The Basic tab shows how the device's IP address is obtained, either by DHCP or by using a static IP address, subnet mask, and default gateway. If you do not know what these settings mean, or when you may be asked to supply these values for a device, contact your network administrator.
- Network Services: The Network Services tab shows a set of common network services that are available for devices, and the port on which the service is running. You can enable or disable several common network services and configure the TCP port they listen on. Disabling services may be done for security purposes. That is, you can disable certain services so that a device is running only those services specifically needed by the device. As needed, you can also disable any non-secure services, such as Telnet. For a discussion of the effects of disabling these network services, see "Network Services that Can Be Enabled or Disabled" on page 84
- Advanced: The Advanced tab sets the Ethernet Interface speed and duplex mode (Auto, Half-Duplex, or Full Duplex).

Configure Serial Ports

To configure serial ports, click the Serial Ports link. In contrast to the default web interface, the Java applet interface does not make use of port profiles to configure serial port settings. The serial port information displayed is similar to that shown when configuring serial ports using a Custom Profile in the default web interface. The Serial Configuration page involves several groups of settings arranged on tabs:

- The Basic tab shows basic serial configuration settings, such as baud rate, data bits, parity, stop bits, and flow control.
- The Port Services tab is for configuring TCP and UDP client services.
- The Network Services tab is for configuring services that monitor data on the network and relay it to the serial port.
- The Advanced tab shows: Advanced serial configuration settings for TCP and UDP client services, including whether a socket ID is sent, and whether a connection should be closed after a certain number of idle seconds or if the DCD or DSR signals go low.

Configure GPIO Pins

To configure GPIO pins, click the GPIO link. The GPIO pin configuration is very similar to screen in the default web interface. It shows the current settings for all GPIO pins in the device, and allows you to change the settings.

As in the default web interface, once you have configured GPIO pins, you can then define alarms to send notifications in the event of any changes to GPIO pin states.

Configure Alarms

To configure alarms, click the Alarms link under “Management.”

On the Alarm Configuration screen:

- The checkbox at the top of the screen shows whether alarms are currently enabled or disabled
- The Email Server Information fields show the IP address of the email server used to send emails when conditions that trigger an alarm occur, and the text to be included in the “from” field of an alarm-triggered email.

- The Alarm List shows all the alarms that are currently defined for a device.

Differences for alarm configuration in the Java applet include:

- Alarms can be configured to be sent as email messages only. They cannot be sent as SNMP traps. You would need to override the alarm configuration either by toggling to the default Web UI or issuing a followup set alarm command from the Command-Line Interface.
- The method for specifying trigger conditions is different from those in the default web interface. There, each trigger condition has a combo box for selecting the condition. In the Java applet, conditions are defined by specifying one of the following values:
  - X: Ignore
  - 1: High
  - 0: Low

Configure Security Features

To configure security features, click the Security link. Currently, configurable security features are limited to specifying whether password authentication is required for the Digi Connect device, and the user name and password required for logging on to the Digi Connect device.

Configuration Through the Command Line

Configuring Connect devices through the command line consists of entering a series of commands to set values in the device. For example:

To Configure:	Use This Command:
system-identifying information	set system
general serial port options	set serial
serial TCP and serial UDP	set tcpserial and set udpserial

To Configure:	Use This Command:
autoconnection behaviors for serial port connections	set autoconnect
RTS toggle	set rtstoggle
Ethernet communications parameters	set ethernet
SNMP	set snmp
network options	set network
network services	set service
GPIO pins	set gpio
alarms	set alarms
modem emulation	set pmodem
port buffering	set buffer
users, user groups, and user permissions	set user, set group, set permissions, newpass
wireless devices	set wlan
operating options for Telnet	mode
send Telnet control command to last active Telnet session	send
limit network access to device	set accesscontrol
Connectware Device Protocol device security settings	set devicesecurity
create or establish group attributes, also update or remove groups or group attributes	set group

To Configure:	Use This Command:
create or modify custom menus	set menu
Connectware Device Protocol connection settings	set mgmtconnection
Connectware Device Protocol global settings	set mgmtglobal
Connectware Device Protocol network settings	set mgmtnetwork
router and Network Address Translation settings	set nat
permissions as various services and command line interface commands	set permissions
Point-to-Point (PPP) outbound connecitons	set pppoutbound
mobile statistics	display mobile
forwarding IP settings	set forward

For a more complete summary of configurable features and the commands used to configure them, and descriptions of the commands and their fields, see the *Digi Connect Family Command Reference*.

What's Next?

Now that your Digi Connect device is configured, it is ready for use. For more information on using Digi Connect devices, see these chapters:

- Chapter 3, "Monitoring Digi Connect Devices" provides details on monitoring Digi Connect devices, including viewing system information and device statistics.
- Chapter 4, "Administering Digi Connect Devices" describes common administrative tasks such as file management, updating firmware, and restoring the configuration to factory defaults.

Monitoring Digi Connect Devices

CHAPTER 3

This chapter discusses the monitoring capabilities in Digi Connect devices, and monitoring tasks that can be performed from various interfaces. It covers these main topics:

- About monitoring
- Monitoring capabilities from Web-based and Java applet interfaces
- Monitoring capabilities from SNMP
- Monitoring devices from the command line

About Monitoring

With Digi Connect devices, you have the ability to monitor port, device, system, and network activities. Changes in data flow may indicate problems or activities that may require immediate attention.

Monitoring Capabilities from Web-Based and Java Applet Interfaces

Following is an overview of the monitoring capabilities from the default web interface and the Java applet interface.

View System Information

The System Information page, organized under Administration on the default web interface home page, displays information about your Digi Connect device. It is typically used by technical support to troubleshoot problems. The System Information page includes:

- General system information
- GPIO pin information, including the current state of GPIO pins
- Serial port information
- Network statistics

General System Information

The General page displays the following information about a Digi Connect device, which can be useful in device monitoring and troubleshooting.

Model

The model of the Digi Connect device.

MAC Address

A unique network identifier. All network devices are required to have their own unique MAC address. The MAC address is on a sticker on your Digi Connect device. The number is displayed as 12 hexadecimal digits, usually starting with 00:40:9D.

Firmware Version

The current firmware version. This information may be used to help locate and download new firmware.

Firmware updates may be downloaded from http://support.digi.com/support/firmware.

CPU Utilization

The amount of CPU resources being used by the Digi Connect device.

Up Time

The amount of time the Digi Connect device has been running since it was last powered on or rebooted.

Total/Used/Free Memory

The amount of memory (RAM) available, currently in use, and currently not being used.

GPIO Information

The GPIO page displays the current state of the General Purpose I/O pins on the Digi Connect device. The state of pins configured for output can be changed, as discussed in "Configure GPIO Pins" on page 90. Alarms can be issued when GPIO pins change state, as discussed in "Configure Alarms" on page 93.

Serial Port Information

The serial port information provides details that may aid in troubleshooting serial communication problems. Click on a port to view more detailed serial port information.

Configuration

The Configuration section of serial port information includes the electrical interface (Port Type) and basic serial settings.

Signals

The serial port signals are green when asserted (on) and gray when not asserted (off). These signals are defined as follows:

- RTS: Request To Send
- CTS: Clear To Send
- DTR: Data Terminal Ready
- DSR: Data Set Ready
- DCD: Data Carrier Detected
- IFC: Input Flow Control
- OFC: Output Flow Control

Serial Statistics

The Statistics section of serial port information includes data counters and error tracking that will help determine the quality of data that is being sent or received. If the error counters are accumulating, you may have a problem with your Digi device server.

Total Data In

Total number of data bytes received.

Total Data Out

Total number of data bytes transmitted.

Overrun Errors

Number of overrun errors - the next data character arrived before the hardware could move the previous character.

Overflow Errors

Number of overflow errors - the receive buffer was full when additional data was received.

Framing Errors

Number of framing errors received - the received data did not have a valid stop bit.

Parity Errors

Number of parity errors - the received data did not have the correct parity setting.

Breaks

Number of break signals received.

Network Statistics

The Network Statistics information is used to view more detailed network statistics that may aid in troubleshooting network communication problems. The statistics displayed are those gathered since the tables containing the statistics were last cleared. Descriptions of the network statistics follow. If any error counter is accumulating at an unexpected rate for that type of counter, you may have a problem with your Digi Connect device.

IP Statistics

Datagrams Received

Datagrams Forwarded

Number of datagrams received or forwarded.

Forwarding

Displays whether forwarding is enabled or disabled.

No Routes

Number of outgoing datagrams for which no route to the destination IP could be found.

Routing Discards

Number of outgoing datagrams which have been discarded.

Default Time-To-Live

Number of routers an IP packet can pass through before being discarded.

TCP Statistics

Segments Received

Segments Sent

Number of segments received or sent.

Active Opens

Number of active opens. In an active open, the Digi device server is initiating a connection request with a server.

Passive Opens

Number of passive opens. In a passive open, the Digi device server is listening for a connection request from a client.

Bad Segments Received

Number of segments received with errors.

Attempt Fails

Number of failed connection attempts.

Segments Retransmitted

Number of segments retransmitted. Segments are retransmitted when the server doesn't respond to a packet sent by the client. This is to handle packets that might get lost or discarded somewhere in the network.

Established Resets

Number of established connections that have been reset.

Mobile Statistics

Mobile Connection Statistics

Connection statistics include the interface status, bytes received and sent, baud rate, modem resets, and inactivity timer.

Registration Status

A binary/integer value, indicating the status of the modem's connection to the cellular network. Values are described in the following list:

- Not Registered - Device is not currently searching a new operator to register to
- Registered - Home Network
- Not Registered - Device is currently searching a new operator to register to"
- Registration Denied
- Unknown
- Registered - Roaming

Cell ID

The modem reports this as a 4-hex-digit string. In the mobile statistics it is displayed both as hex and decimal representations. For example: "00C3 (195)"

Location Area Code (aka "LAC")

Just as for the cell ID, the modem reports this as a 4-hex-digit string. In the mobile statistics it is displayed both as hex and decimal representations. For example: "00C3 (195)"

Signal Strength (RSSI)

Returned as a signed integer value. 0 (zero) indicates no signal. Signal strength is indicated as a negative value in units of dBm. The following scale indicates the signal strength LEDs ("bars" of signal strength):

* -101 or less dBm == Unacceptable (0 LEDs)
* -100 to -91 dBm == Weak (1 LED)
* -90 to -81 dBm == Moderate (2 LEDs)
* -80 to -75 dBm == Good (3 LEDs)
* -74 or better dBm == Excellent (4 LEDs)
* 0 is not known or not detectable (0 LEDs)

IP Address

The IP address of the PPP connection provided by the mobile service.

IMSI

A character string, null-terminated, up to 16 bytes in length. This is the subscriber's code to access the cellular network, and it is used by the network to admit the device/user to its provisioned services.

Manufacturer ID

A character string, null-terminated describing the modem module.

Model ID

A character string, null-terminated describing the modem module.

Revision ID:

A character string, null-terminated describing the modem module's firmware version.

Serial Number:

A character string, null-terminated used as a unique ID per modem module.

UDP Statistics

Datagrams Received

Datagrams Sent

Number of datagrams received or sent.

Bad Datagrams Received

Number of bad datagrams that were received. This number does not include the value contained by "No Ports."

No Ports

Number of received datagrams that were discarded because the specified port was invalid.

ICMP Statistics

Messages Received

Number of messages received.

Bad Messages Received

Number of received messages with errors.

Destination Unreachable Messages Received

Number of destination unreachable messages received. A destination unreachable message is sent to the originator when a datagram fails to reach its intended destination.

Wireless Statistics

This section is used to view more detailed wireless statistics that may aid in troubleshooting network communication problems with your wireless network.

Status

The current status of the wireless device, which may include:

- Not Connected -not associated or connected w/ any access point - may be because it has not fully initialized, you are out of range, or the wireless interface is disconnected because the ethernet interface is enabled
- Searching for Network -searching for a wireless network or access point for connection
- Associated with Network -successfully associated with the network w/ the proper network settings and encryption
- Authenticated with Network -successfully authenticated a username/password with the network when WPA is enabled.
- Joined Ad Hoc Network-successfully connected to and joined an ad-hoc network.
- Started Ad Hoc Network -successfully created, started, and joined an ad-hoc network.

Network Name

The name of the wireless network to which the device is connected.

Network ID

The ID of the wireless network to which the device is connected and communicating.

Channel

The frequency channel used by the wireless Ethernet radio for the Connect device.

Transmit Rate

The current transmission rate for the wireless Ethernet radio.

Signal Strength

The current receive signal strength as reported by the wireless Ethernet radio. Ranges are from 0 to 100.

Mobile Statistics

Mobile Connection

Registration Status, Cell ID, and Location Area Code are identifying details of the connection.

Signal Strength indicates the quality of the signal in dBms.

Mobile Statistics

IP Address, Data Received, Data Sent, Modem Resets, and Inactivity Timer are the activities of the modem.

Mobile Information

IMSI, Modem Manufacturer, Model Number, Modem Serial Number, Modem Revision are identifying details of the modem.

Monitoring Capabilities from Connectware Manager

Statistics available through Connectware Manager can be collected by servers or groups of servers. Server activities include:

- current connections
- session counts
- connection times

Statistics can also be collected through device reports. Device reports are a high level view of activity of any device that is on the server and has activity. Device type lists are useful for managing firmware updates.

Error reports show major, minor, and informational errors and can be linked back to specific devices.

Console logging allows you to determine the types of messages to appear in the logs or displayed.

Monitoring Capabilities from SNMP

Device monitoring capabilities from SNMP include, among other things:

- Network statistics, defined in RFC 1213, MIB-II
- Port statistics, defined in RFCs 1316 and 1317
- Device information, defined in Digi enterprise MIB DIGI-DEVICE-INFO.mib

For more information on the statistics available through the standard RFCs listed above, refer to the RFCs available on the IETF web site (www.ietf.org). For enterprise MIBs, refer to the description fields in the MIB text.

Monitoring Devices from the Command Line

There are several commands that can be issued from the command line to monitor devices:

- display: The "display" command displays real-time information about a device, including:
  - General product information, including the product name, MAC address, boot, post, and firmware versions, memory usage, utilization, and uptime, or the amount of time since the device was booted.
  - GPIO signals.
  - Memory usage information.
  - Serial modem signals (DTR, RTS, CTS, DSR, DCD, TXD, RXD).
  - Uptime information.
- info: The "info" command displays statistical information about a device over time. There are several variations of the "info" command.The statistics displayed are those gathered since the tables containing the statistics were last cleared. The "info" command displays the following types of statistics:
  - Device statistics. The "info device" command displays such details as product, MAC address, boot, post, and firmware versions, memory usage, utilization, and uptime.
  - Ethernet statistics. The "info ethernet" command displays statistics regarding the Ethernet interface, including the number of bytes and packets sent and received, the number of incoming and outgoing bytes that were discarded or that contained errors, the number of Rx overruns, the number of times the transmitter has been reset, and the number of incoming bytes when the protocol was unknown.
  - ICMP statistics. The "info icmp" command displays the number of messages, bad messages, and destination unreachable messages received.

  - Serial statistics. The “info serial” command displays the number of bytes received and transmitted, signal changes, FIFO and buffer overruns, framing and parity errors, and breaks detected.
  - TCP statistics. The “info tcp” command displays the number of segments received or sent, the number of active and passive opens, the number of bad segments received, the number of failed connection attempts, the number of segments retransmitted, and the number of established connections that have been reset.
  - UDP statistics. The “info udp” command displays the number of datagrams received or sent, bad datagrams received, and the number of received datagrams that were discarded because the specified port was invalid.
  - Wireless statistics. The “info wlan” command displays detailed statistics for wireless devices that may aid in troubleshooting network communication problems with a wireless network.

- set alarm: The “set alarm” command displays current alarm settings, including the conditions which trigger alarms, and how the alarms are sent, either as an email message, an SNMP trap, or both. The alarms can be reconfigured as needed.
- set gpio: The “set gpio” command displays current GPIO pin settings. The pin settings can be reconfigured as needed.
- set buffer and display buffers: These commands can be used to display port-buffering-related information. The “set buffer” command both configures buffering parameters on a port and displays the current port buffer configuration. The “display buffers” command displays the contents of a port buffer, or transfers the port-buffer contents to a server running Trivial File Transfer Protocol (TFTP).
- set snmp: Configures SNMP, including SNMP traps, such as authentication failure, cold start, link up, and login traps. This command also displays current SNMP settings.
- status: Displays a list of sessions, or outgoing connections made by connect, rlogin, or telnet commands for a device. Typically, the status command is used to determine which of the current sessions to close.
- who: The who command provides a global list of connections. Currently, this list of connections includes those associated with a serial port or the command-

line interface. The who command is particularly useful in conjunction with the kill command. The who command can be used to determine any connections that are no longer needed, which can then be ended by the kill command.

For descriptions of these commands, see the *Digi Connect Family Command Reference*.

Administering Digi Connect Devices

CHAPTER 4

This chapter discusses the administration tasks that need to be performed on Digi Connect devices periodically, such as file management, changing the password used for logging onto the device, backing up and restoring device configurations, updating firmware and Boot/POST code, restoring the device configuration to factory defaults, and rebooting the device. As with device configuration and monitoring, it covers performing administrative tasks through a variety of device interfaces. It covers the following main topics:

- Administration from the default Web interface
- Administration from the Java applet interface
- Administration from the command-line interface
- Administration from Connectware Manager

Administration from the Default Web Interface

The Administration section of the web interface main menu provides the following choices:

- File Management: For uploading and managing files, such as custom web pages, applet files, and initialization files. See "File Management" on page 120.
- Backup/Restore: For backing up or restoring a device's configuration settings. See "Backup/Restore Device Configurations" on page 121.
- Update Firmware: For updating firmware, including Boot and POST code. See "Update Firmware and Boot/POST Code" on page 121.

- Factory Default Settings: For restoring a device to factory default settings. See "Restore Device Configuration to Factory Defaults" on page 122.
- System Information: For displaying general system information for the device and device statistics. See "Display System Information" on page 125.
- Reboot: For rebooting the device. See "Reboot the Device" on page 126.

In addition to these choices, you may also need to perform these administrative tasks, which are organized elsewhere in the web interface:

- Enable and disable network services. See "Enable or Disable Network Services" on page 84.
- Enable security for the device by creating a username and password for logging on to it. See "Configure Security Features" on page 96.

File Management

The File Management page of the default web interface allows you to upload a custom applet index to HML as well as the respective applet files. Custom applets give you the flexibility to alter the interface either by adding your logo, changing colors, or moving information to different locations. If you do not use a custom applet or the sample applet, you do not need this feature.

Upload Files

Click **Browse** to select a file to upload to your Digi device server and then click **Upload**.

Delete Files

Select any files you would like to delete from your Digi device server and click **Delete**.

Custom Files Are Not Deleted By Device Reset

Any files uploaded to the device's file system via the File Management page are not deleted by restoring the device configuration to factory defaults, or by pressing the Reset button on the device (see "Restore Device Configuration to Factory Defaults" on page 122) This deletion is prevented so that customers with custom applets and factory defaults

can retain them on the device and not have them deleted by a reset. Such files can only be deleted by the Delete operation, as described above.

Backup/Restore Device Configurations

Once you have a device configured, you should back it up. Backup/Restore will save your configuration in case you have problems later if you upgrade your firmware or add additional hardware. If you have multiple devices to configure, you can backup the first device then download the configuration onto the other devices.

This procedure shows you how to backup or restore the configuration to a server and to download a configuration from a server to a file or TFTP.

Prerequisite

If you intend to use TFTP, ensure that the TFTP program is running on a server before you begin this procedure.

Procedure

1. Open a web browser and enter the Digi Connect device's IP address in the URL window.
2. If security is enabled for the device, a login prompt is displayed. Enter the user name and password for the device. If you do not know the user name and password, contact the system administrator who initially set up the device.
3. Click **Backup/Restore** from the main menu.
4. Choose the appropriate option (Backup or Restore) and select your file.

Update Firmware and Boot/POST Code

The following procedures shows how to update the device server's firmware and/or boot/POST code from a file on your PC or through TFTP. The recommended method is to download the firmware to your local hard drive. TFTP is supported for those using UNIX systems. Both the firmware and the boot/POST code are updated using the same set of steps. The device server will automatically determine what type of image you are uploading.

Before uploading the firmware or the boot/POST code, it is very important to read the Release Notes that are supplied with the firmware to check if the boot/POST code must be updated before updating the firmware.

Prerequisites

These procedure assume that:

- You have already downloaded the firmware file from the Digi web site.
- If you are using the TFTP option, that TFTP is running.

Update Firmware from a File on Your PC

1. Open a web browser and enter the device server's IP address in the URL window.
2. If security is enabled for the device, a login prompt is displayed. Enter the user name and password for the device. If you do not know the user name and password, contact the system administrator who initially set up the device.
3. Click **Upgrade Firmware** from the main menu.
4. Select **Firmware**.
5. Click **Browse** to select the file.
6. Click **Update**.

   Important: DO NOT close your browser until the update is complete and you have been prompted to reboot.

Update Firmware from a TFTP Server

Updating firmware from a TFTP server is done from the Command-Line Interface using the boot command. It cannot be done from the default web interface. For details, see "Administration from the Command-Line Interface" on page 129.

Restore Device Configuration to Factory Defaults

There are two ways to restore the device configuration to the factory default settings:

- Restore the configuration from a web browser which will clear all current settings except the IP address settings and administrator password. This is the best way to reset the configuration because you can also back up the settings (which provides a means for restoring it after you have worked through

configuration issues). See "Backup/Restore Device Configurations" on page 121 for more information.

- Restore the configuration using the reset button on the device server. Use this method if you cannot access the device from a web browser.

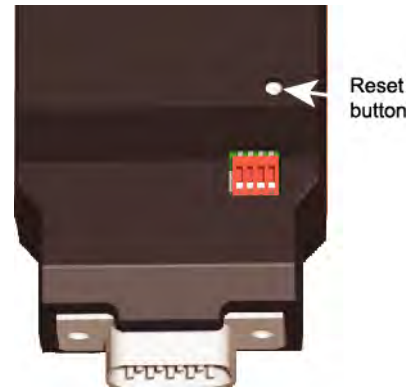
⇨⇨⇨ **Restoring a Digi Connect device to its factory default settings will clear all current configuration settings except the IP address settings and the administrator password. Any files such as custom-interface files and applet files that were loaded into the device through the File Management page are retained. See "File Management" on page 120 for information on loading and deleting files.**

Restore the Configuration from a Browser

1. Open a web browser and enter the device server's IP address in the URL window.
2. If security is enabled for the device, a login prompt is displayed. Enter the user name and password for the device. If you do not know the user name and password, contact the system administrator who initially set up the device.
3. Click **Factory Default Settings** from the main menu.
4. Click **Restore.**

Restore the Configuration Using the Reset Button on the Digi Connect SP and Digi Connect Wi-SP

1. Power off the device server by unplugging the power.
2. Use a non-conducive, small diameter tool (such as wood or plastic) with a blunt end (NOT SHARP or the button could be damaged) to press gently and hold down the reset button. The flashing sequence of LEDs may take several seconds. The following figures help you locate the reset button.



3 While holding the reset button, power up the unit.

4 Hold the button for 20 seconds and then release it.

The default configuration is restored. When the restoration is complete, the device flashes a code (1-5-1).

Restore the Configuration by Resetting the Digi Connect ME and Digi Connect Wi-ME

To restore the configuration on a Digi Connect ME or Digi Connect Wi-ME, perform a hard or soft reset. *See the Digi Connect ME Hardware Reference* for details on hard and soft resets.

Restore the Configuration Using the Reset Button on the Digi Connect EM or Digi Connect Wi-EM

1 Power off the device server.

2 Locate the reset switch between P3 and CR1.

3 Power on the device while holding the reset switch down. (Hold it down for about 20 seconds.)

Restore the Configuration Using the Reset Button on the Digi Connect WAN or Digi Connect RG

1 Power off the device by unplugging the power supply.

2 Press the rest button gently (shown in the illustration below) with a non-conducive, small diameter tool (such as wood or plastic) with a blunt end (NOT SHARP or the button could be damaged) to hold down the reset button.

3 Power on the device while holding the rest switch down (about 20 -40 seconds.)

Display System Information

Display system information gives the model, MAC address, firmware version, boot version, and POST version of your Digi Connect device. You can also check your memory available -total, used, and free. It also tracks CPU percent utilization and the uptime.

Under Administration click System Administration. and select General, GPIO, Serial or Network for the appropriate information.

Reboot the Device

Some changes require you to save and reboot. Click Reboot and the Reboot button and wait approximately 1 minute for the reboot to complete.

Enable/Disable Access to Services

As needed, you can enable and disable access to various network services, such as ADDP, RealPort, SNMP, and Telnet. For example, you may want to disable those services that are not necessary for running or interfacing with the Digi Connect device. In the default web interface, enabling and disabling network services is done on the Network Configuration page for a device. See "Enable or Disable Network Services" on page 84.

Administration from the Java Applet Interface

In the Java applet device interface, administration tasks are also organized under Administration in the main menu. There are fewer choices than in the default Web interface:

- Backup/Restore: For backing up or restoring a device configuration.
- Restore Factory Defaults: For restoring a device's configuration to factory defaults.
- System Information: For displaying system information for the device, including general device information, current GPIO pin settings, serial line signals and statistics, and network statistics.
- Reboot: For rebooting the device.

You cannot perform file management tasks or update firmware from the Java applet interface. If you need to perform such tasks, switch the device interface to the default Web interface.

Additionally, over time, you may need to enable and disable device access to network services. See "Enable or Disable Network Services" on page 84.

Backup/Restore Device Configurations

Prerequisite

If you intend to use TFTP, ensure that the TFTP program is running on a server before you begin this procedure.

Procedure

1. Open a web browser and enter the Digi Connect device's IP address in the URL window.
2. If security is enabled for the device, a login prompt is displayed. Enter the user name and password for the device. If you do not know the user name and password, contact the system administrator who initially set up the device.
3. Click **Backup/Restore** from the main menu.
4. Choose the appropriate option (Backup or Restore) and select your file.

Restore Device Configuration to Factory Defaults

There are two ways to restore the device configuration to the factory default settings:

- Reset the configuration from a web browser which will clear all current settings except the IP address settings and administrator password. This is the best way to reset the configuration because you can also back up the settings (which provides a means for restoring it after you have worked through configuration issues). See "This procedure shows you how to backup or restore the configuration to a server and to download a configuration from a server to a file or TFTP." on page 121 for more information.
- Reset the configuration using the reset button on the device server. Use this method if you cannot access the device from a web browser.

⇨⇨⇨ **Restoring the Digi Connect device to its factory default settings will clear all current settings except the IP address settings and the administrator password. Any files such as custom-interface files and applet files that were loaded into the device through the File Management page are retained. See "File Management" on page 120 for information on loading and deleting files.**

Restore the Configuration from a Browser

1. Open a web browser and enter the device server's IP address in the URL window.
2. If security is enabled for the device, a login prompt is displayed. Enter the user name and password for the device. If you do not know the user name and password, contact the system administrator who initially set up the device.
3. Click **Factory Default Settings** from the main menu.
4. Click **Restore.**

Display System Information

Display system information gives the model, MAC address, firmware version, boot version, and POST version of your Digi Connect device. You can also check your memory available–total, used, and free. It also tracks CPU percent utilization and the uptime.

Under Administration, click System Administration, and select General, GPIO, Serial or Network for the appropriate information.

Reboot the Device

Some changes require you to save and reboot. Click Reboot and the Reboot button and wait approximately 1 minute for the reboot to complete.

Enable/Disable Access to Services

As needed, you can enable and disable access to various network services, such as ADDP, RealPort, SNMP, and Telnet. For example, you may want to disable those services that are not necessary for running or interfacing with the Digi Connect device. In the Java applet interface, enabling and disabling network services is done on the Network Services tab of the Network Configuration page for a device. See "Configure Network Settings" on page 102.

Administration from the Command-Line Interface

Administration of Digi Connect devices can also be performed from the command line. The following table summarizes device-administration tasks and the commands used to perform them. For descriptions of these commands, see the *Digi Connect Family Command Reference*.

Administrative Task	Command
Backup/restore a configuration from a TFTP server on the network	backup
Update firmware	boot 1 Telnet to the device server's command line interface using a telnet application or hyperterm. 2 If security is enabled for the device, a login prompt is displayed. If you do not know the user name and password, contact the system administrator who initially set up the device. 3 Issue the command: #> boot load=<tftp-server-ip>:<filename.bin> where <tftp-server-ip> is the IP address of the TFTP server that contains the firmware and where <filename.bin> is the name of the filename to upload.
Reset configuration to factory defaults	revert or boot action=factory
Display system information and statistics	info
Reboot the device	boot

Administrative Task	Command
Enable/disable network services	set service

Customizing the User Interface

To customize the user interface, enter `ipaddress`/admin/customization.htm to access a hidden page for customizing the interface. Launch a tutorial from the Help button for more information.

Administration from the Connectware Manager

On the Devices home page, you can delete or edit a device or filter for specific device types.

You can search by Device ID, Device Type, Last Used Dates, or Status.

You can also restrict, unrestrict, redirect, reboot, backup or restore, import or export device configurations.

Refresh view - . Refreshes the Servers page.
Restart - . Re-starts the server. This is required for some configuration changes. This is shown in the 'Restart' column, when necessary.

Stop - . Stop the server from providing service without shutting down the entire service.

Start - . Starts the server.

Shutdown - . Shuts down the web server and the running services.
Warning: After a managed server is shut down, it cannot be started from the DMS. It must be started from the managed server's host machine

Port Config - . Allows setting of the ports that server uses.

Server Info - . Lists which plugins are running on a server. These fields cannot be changed and are for information only.

SMTP Server - . Allows a SMTP (Simple Mail Transfer Protocol) server to be specified. Web Server -Allows setting of the parameters used by the web server.

Console Logging - . Settings for determining if log messages are shown on the console, and which ones you want displayed.

Database Logging - . Settings for determining if your server logs messages to the database. You can choose what severity and the type of messages to log.

Email Logging Alerts - . Settings for determining if a list of users are emailed server log messages. You can choose the severity level and the type of messages to log. All associated email addresses will receive the same messages. You will be required to set up your mail server properties.

Database -. Controls database settings. The updated settings will be effective after the server is shutdown and started up again.

Device Protocol Security -. Settings for device security.

Warning: Setting these parameters incorrectly may make it impossible for devices to connect with the server. Make sure that your device security settings match the server's security settings.

MDH Server - . These settings control the MDH ((Message Over Device-Initiated HTTP) Server.

Server Statistics - . These settings control the timing and intervals for collecting server statistics.

System Performance - . These settings control how many devices may be connected, the overload threshold, and report generation.

Glossary

802.11

The IEEE standard for wireless Local Area Networks. It uses three different physical layers, 802.11a, 802.11b and 802.11g.

alarms

In Digi Connect devices, alarms are used to send emails or issue SNMP traps when certain device events occur. These events include changes in General Purpose I/O (GPIO) signals, and particular data patterns detected in the serial stream.

ADDP

See Advanced Device Discovery Protocol.

Address Resolution Protocol (ARP)

A protocol for mapping an Internet Protocol address (IP address) to a physical machine address that is recognized in the local network.

Advanced Digi Discovery Protocol (ADDP)

A protocol that runs on any operating system capable of sending multicast IP packets on a network. ADDP allows the system to identify all ADDP-enabled Digi devices attached to a network by sending out a multicast packet. The Digi devices respond to the multicast packet and identify themselves to the client sending the multicast.

ARP

See Address Resolution Protocol.

autoconnection

A network connection initiated from a Digi device that is based on timing, serial activity, or serial modem signals.

Automatic Private IP Addressing (APIPA)

A standard protocol that automatically assigns an IP address from a reserved pool of standard Auto-IP addresses to the computer on which it is installed. The device is set to obtain its IP address automatically from a Dynamic Host Configuration Protocol (DHCP) server. But if the DHCP server is unavailable or nonexistent, Auto-IP will assign the device an IP. If DHCP is enabled or responds later or you use ADDP, both will override the Auto-IP address previously assigned. Also referred to as Auto-IP.

Auto-IP

See Automatic Private IP Addressing (APIPA).

CDMA

CDMA (Code-Division Multiple Access) protocols used in wireless communications. CDMA is a form of multiplexing, which allows numerous signals to occupy a single transmission channel, optimizing the use of available bandwidth. The technology is used in ultra-high-frequency (UHF) cellular telephone systems in the 800-MHz and 1.9-GHZ bands and through an analog-to digital conversion enhances privacy and makes cloning difficult..

CLI

Command-line interface.

COM port redirection

The process of establishing a connection between the host and networked serial devices by creating a local COM or TTY port on the host. See also RealPort.

configuration applet

See Java applet interface.

configuration management

For Digi Connect devices, configuration management involves managing the files and settings that contain device configuration information. Configuration management tasks include copying device configuration files to and from a remote host, upgrading device firmware, and resetting the device configuration to factory defaults.

CTS

Clear to Send.

default web interface

The Web-based interface for configuring, monitoring, and administering Digi Connect devices that is provided for Digi Connect devices by default.

device server

A one- or two-port intelligent network device that converts serial data into network data.

DHCP

See Dynamic Host Configuration Protocol.

Digi Device Setup Wizard

A wizard for configuring Connect devices that is provided on the CD shipped with each device. The Digi Device Setup Wizard is available in Microsoft Windows or UNIX platforms. It assigns an IP address for the device, configures the device based on your description of the device environment, and determines whether you need to install RealPort. Using the Digi Device Setup Wizard is the recommended and preferred method for configuration.

DSR

Data Set Ready.

DTR

Data Terminal Ready.

Dynamic Host Configuration Protocol (DHCP)

An Internet protocol for automating the configuration of computers that use TCP/IP. DHCP can be used to automatically assign IP addresses, to deliver TCP/IP stack configuration parameters such as the subnet mask and default router, and to provide other configuration information.

EIA

See Electronics Industry Association.

Electronics Industry Association (EIA) and Electronics Industries Alliance (EIA)

1) The Electronic Industries Association (EIA) comprises individual organizations that together have agreed on certain data transmission standards such as EIA/TIA-232 (formerly known as RS-232).

2) The Electronics Industries Alliance (EIA) is an alliance of trade organizations that lobby in the interest of companies engaged in the manufacture of electronics-related products.

encryption

The conversion of data into a form, called a ciphertext, that cannot be easily understood by unauthorized people. Decryption is the process of converting encrypted data back into its original form, so it can be understood.

Encryption/decryption is especially important in wireless communications. This is because wireless circuits are easier to tap than their hard-wired counterparts.

factory defaults

The default configuration values that are set in a device at the factory.

File Transfer Protocol (FTP)

A standard Internet protocol that specifies the simplest way to exchange files between computers on the Internet.

FTP

See File Transfer Protocol.

General Purpose I/O (GPIO)

On Digi Connect devices, pins that are used for serial communications. In normal operation, the GPIO pins are used for the serial CTS, DCD, DSR, DTR, and RTS. For Digi Connect EM and Wi-EM devices, there are GPIO pins for the TXD and RXD signals. GPIO pins can be configured for different purposes, and alarms can be configured to alert users of a change in GPIO pin state.

GPIO

See General Purpose I/O.

GSM

GSM (Global System for Mobile communication) is a digital mobile telephone system that digitizes and compresses data, then sends it down a channel with two other streams of user data, each in its own time slot. It operates at either the 900 MHz or 1800 MHz frequency band.

GSM together with other technologies is part of an evolution of wireless mobile telemmunication that includes High-Speed Circuit-Switched Data (HCSD), General Packet Radio System (GPRS), Enhanced Data GSM Environment (EDGE), and Universal Mobile Telecommunications Service (UMTS).

HTTP

See HyperText Transfer Protocol.

HTTPS

See HyperText Transfer Protocol over Secure Socket Layer.

HyperText Transfer Protocol (HTTP)

An application protocol in the TCP/IP suite that defines the rules for transferring files (text, graphic images, sound, video, and other multimedia files) on the World Wide Web (WWW).

Hypertext Transfer Protocol over Secure Socket Layer (HTTPS)

A secure message-oriented communications protocol designed for use in conjunction

with HTTP. HTTPS encrypts and decrypts user page requests as well as the pages that are returned by the Web server. HTTPS uses the Secure Socket Layer (SSL) as a sublayer.

ICMP

See Internet Control Message Protocol.

IGMP

See Internet Group Management Protocol.

Internet Control Message Protocol (ICMP)

A message control and error-reporting protocol between a host server and a gateway to the Internet. ICMP uses Internet Protocol (IP) datagrams, but the messages are processed by the IP software and are not directly apparent to the application user.

Internet Group Management Protocol (IGMP)

Internet Group Management Protocol (IGMP) provides a way for an Internet computer to report its multicast group membership to adjacent routers. Multicasting allows one computer on the Internet to send content to multiple other computers that have identified themselves as interested in receiving the originating computer's content. Multicasting can be used for such applications as updating the address books of mobile computer users in the field, sending out company newsletters to a distribution list, and "broadcasting" high-bandwidth programs of streaming media to an audience that has "tuned in" by setting up a multicast group membership.

I/O

Input/Output.

IP filtering

A network configuration that can be enabled to establish rules allowing devices to permit or deny specific IP addresses, networks, or devices from connection access.

Java applet interface

An optional Java-applet based Web interface for configuring, monitoring, and administering Connect devices.

MAC address

A unique network identifier. All network devices are required to have their own unique MAC address. The MAC address is on a sticker on your Digi device server. The number is displayed as 12 hexadecimal digits, usually starting with 00:40:9D.

Management Information Base (MIB)

A formal description of a set of network objects that can be managed using the Simple Network Management Protocol (SNMP).

MIB

See Management Information Base.

modem emulation

A serial port configuration where the port acts as a modem. The Digi device emulates modem responses to a serial device and seamlessly sends and receives data over an Ethernet network instead of a Public Switched Telephone Network (PSTN). The advantage for a user is the ability to retain legacy software applications without modification and use a less expensive Ethernet network in place of public telephone lines. Also known as pseudo-modem or pmodem.

NAT

NAT (Network Address Translation) is the translation of an Internet Protocol address (IP address) used within one network to a different IP address known within another network through a NAT table that does the global-to-local and local-to-global IP address mapping.This increases security since each outgoing or incoming request must go through a translation process that also authenticates the request or matches it to a previous request. NAT can be statically defined or it can be set up to dynamically translate from and to a pool of IP addresses. NAT also conserves on the number of global IP addresses needed and it uses a single IP address in its communication with the world.

PEAP

See Protected Extensible Authentication Protocol.

port forwarding

A serial port configuration that sends data directly to a specific port instead of the path determined by the router based on traffic.

POST

See Power-On Self Test.

Power-On Self Test (POST)

When power is turned on, POST (Power-On Self-Test) is the diagnostic testing sequence that a computer's basic input/output system (or "starting program") runs to determine if the computer keyboard, random access memory, disk drives, and other

hardware are working correctly.

If the necessary hardware is detected and found to be operating properly, the computer begins to boot. If the hardware is not detected or is found not to be operating properly, the BIOS issues an error message which may be text on the display screen and/or a series of coded beeps, depending on the nature of the problem.

Protected Extensible Authentication Protocol (PEAP)

A protocol proposed for securely transporting authentication data, including passwords, over 802.11 wireless networks. PEAP makes it possible to authenticate wireless LAN clients without requiring them to have certificates, simplifying the architecture of secure wireless LANs.

RCI

See Remote Command Interface.

RealPort

RealPort is patented Digi software for COM port redirection. RealPort makes it possible to establish a connection between the host and networked serial devices by creating a local COM or TTY port on the host. The COM/TTY port appears and behaves as a local port to the PC or server. This process of COM port redirection allows existing software applications like DNP3 and Modbus to work without modification. Unlike other COM port redirectors, RealPort offers full hardware and software flow control, as well as tunable latency and throughput. These features ensure optimum performance, since data transfer is adjusted according to specific application requirements.

Remote Command Interface (RCI)

A programmatic interface for configuring and controlling Connect family devices. RCI is an XML-based request/response protocol that allows a caller to query and modify device configurations, access statistics, reboot the device, and reset the device to factory defaults.

Unlike other configuration interfaces that are designed for a user, such as the command-line or browser interfaces, RCI is designed to be used by a program. A typical use of RCI is in a Java applet that can be stored on the Connect device to replace the browse interface with a custom browser interface. Another example is a custom application running on a PC that monitors and controls an installation of many Connect devices.

remote login (rlogin)

A remote login to a Digi Connect device's Command-Line Interface (CLI). rlogin is a Unix command that allows an authorized user to login to other UNIX machines (hosts) on a network and to interact as if the user were physically at the host computer. Once logged in to the host, the user can do anything that the host has given permission for, such as read, edit, or delete files.

remote shell (rsh)

A Berkeley Unix networking command to execute a given command on a remote host, passing it input and receiving its output. Rsh communicates with a daemon on the remote host.

rlogin

See remote login.

RSH

See remote shell.

RTS

Ready to Send.

RXD

Receiving Data.

Secure Sockets Layer (SSL)

A commonly-used protocol for managing the security of a message transmission on the Internet. SSL has recently been succeeded by Transport Layer Security (TLS), which is based on SSL.

serial bridge

A connection between two serial devices over a network that acts as if they were connected over a serial cable. Also known as serial tunneling.

serial tunneling

See serial bridge.

Setup Wizard

See Digi Device Setup Wizard.

Simple Mail Transfer Protocol (SMTP)

A TCP/IP protocol used in sending and receiving e-mail. Since it is limited in its ability to queue messages at the receiving end, it is usually used with one of two other

protocols, POP3 or IMAP, that let the user save messages in a server mailbox and download them periodically from the server.

SMTP usually is implemented to operate over Internet port 25. An alternative to SMTP that is widely used in Europe is X.400. Many mail servers now support Extended Simple Mail Transfer Protocol (ESMTP), which allows multimedia files to be delivered as e-mail.

Simple Network Management Protocol (SNMP)

A protocol for managing and monitoring network devices. The SNMP architecture enables a network administrator to manage nodes--servers, workstations, routers, switches, hubs, etc.--on an IP network; manage network performance, find and solve network problems, and plan for network growth. Digi devices support SNMP Version 1.

SNMP

See Simple Network Management Protocol.

SMTP

See Simple Mail Transfer Protocol.

SSL

See Secure Sockets Layer.

static IP address assignment

The process of assigning a specific IP address to a device. Contrast with assigning a device through Dynamic Host Configuration Protocol (DHCP), or Automatic Private IP Addressing (APIPA or Auto-IP).

TCP

See Transmission Control Protocol.

Telnet

A user command and an underlying TCP/IP protocol for accessing remote computers. On the Web, HTTP and FTP protocols allow you to request specific files from remote computers, but not to actually be logged on as a user of that computer. With Telnet, you log on as a regular user with whatever privileges you may have been granted to the specific application and data on that computer.

Temporal Key Integrity Protocol (TKIP)

Part of the IEEE 802.11i encryption standard for wireless LANs. TKIP is the next generation of the Wired Equivalent Privacy (WEP), which is used to secure 802.11

wireless LANs. TKIP provides per-packet key mixing, a message integrity check and a re-keying mechanism, and addresses several design shortcomings of the original WEP.

TFTP

See Trivial File Transfer Protocol (TFTP).

TLS

See Transport Layer Security.

Transmission Control Protocol (TCP)

A set of rules (protocol) used along with the Internet Protocol (IP) to send data in the form of message units between computers over the Internet. While IP handles the actual delivery of the data, TCP handles keeping track of the individual units of data (called packets) that a message is divided into for efficient routing through the Internet.

For example, when an HTML file is sent to you from a Web server, the Transmission Control Protocol (TCP) program layer in that server divides the file into one or more packets, numbers the packets, and then forwards them individually to the IP program layer. Although each packet has the same destination IP address, it may get routed differently through the network. At the other end (the client program in your computer), TCP reassembles the individual packets and waits until they have arrived to forward them to you as a single file.

TCP is known as a connection-oriented protocol, which means that a connection is established and maintained until such time as the message or messages to be exchanged by the application programs at each end have been exchanged. TCP is responsible for ensuring that a message is divided into the packets that IP manages and for reassembling the packets back into the complete message at the other end. In the Open Systems Interconnection (OSI) communication model, TCP is in layer 4, the Transport Layer.

Transport Layer Security (TLS)

A protocol that ensures privacy between communicating applications and their users on the Internet. When a server and client communicate, TLS ensures that no third party may eavesdrop or tamper with any message. TLS is the successor to the Secure Sockets Layer (SSL).

Trivial File Transfer Protocol (TFTP)

An Internet software utility for transferring files that is simpler to use than the File Transfer Protocol (FTP) but less capable. It is used where user authentication and

directory visibility are not required. TFTP uses the User Datagram Protocol (UDP) rather than the Transmission Control Protocol (TCP). TFTP is described formally in Request for Comments (RFC) 1350.

TTY port redirection

The process of establishing a connection between the host and networked serial devices by creating a local TTY port on the host. The TTY port appears and behaves as a local port to the PC or server.

See also RealPort.

TXD

Transmit eXchange Data.

UDP

See User Datagram Protocol.

User Datagram Protocol (UDP)

A communications protocol that offers a limited amount of service when messages are exchanged between computers in a network that uses the Internet Protocol (IP). UDP is an alternative to the Transmission Control Protocol (TCP) and, together with IP, is sometimes referred to as UDP/IP. Like the Transmission Control Protocol, UDP uses the Internet Protocol to actually get a data unit (called a datagram) from one computer to another. Unlike TCP, however, UDP does not provide the service of dividing a message into packets (datagrams) and reassembling it at the other end. Specifically, UDP does not provide sequencing of the packets in which the data arrives, nor does it guarantee delivery of data. This means that the application program that uses UDP must be able to make sure that the entire message has arrived and is in the right order. Network applications that want to save processing time because they have very small data units to exchange (and therefore very little message reassembling to do) may prefer UDP to TCP. The Trivial File Transfer Protocol (TFTP) uses UDP instead of TCP.

UDP provides two services not provided by the IP layer. It provides port numbers to help distinguish different user requests and, optionally, a checksum capability to verify that the data arrived intact.

In the Open Systems Interconnection (OSI) communication model, UDP, like TCP, is in layer 4, the Transport Layer.

WEP

See Wired Equivalent Privacy.

Wired Equivalent Privacy (WEP)

A data encryption method used to protect the transmission between 802.11 wireless clients and APs. See also Temporal Key Integrity Protocol (TKIP).

Wi-Fi Protected Access (WPA)

A data encryption/ user authentication method for 802.11 wireless LANs. WPA uses the Temporal Key Integrity Protocol (TKIP).

WPA

See Wi-Fi Protected Access.

WPA2/802.11i

WPA with AES-based encryption (CCMP)

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