



Making Device Networking Easy™

Digi International makes device networking easy by developing products and technologies that are cost effective and easy to use.



www.digi.com

Digi Connect Family

Digi One Family

Digi One IA Family

PortServer TS Family



Spring
2005

Device Server

Solution Guide

Introducing the **Digi Device Server** Family.....



Making Device Networking Easy™

The world is in the early stages of an extraordinary but quiet technology revolution. The advances of personal computers and the Internet have laid the groundwork for the rapidly emerging era of networked devices.

In this post-PC era, billions of electronic devices will work invisibly, collaborating with each other and with people. This world of connected devices will offer new levels of customer service, product maintenance and support through enhanced remote monitoring, control and sharing of information. The revolution is made possible by advances in semiconductor technology and the growth of data networks and the Internet in particular.

The majority of today's electronic devices are not integrated into existing network environments. Instead, most devices primarily use inflexible closed systems, which often do not offer direct access and require manual intervention at the point of use. Today, the same processing technology that powers a desktop computer can be "embedded" into everyday devices or connected to these devices and transform them into intelligent, networked devices.

Digi device server technology combines the inherent benefits of data networking with proven asynchronous connectivity. It turns a previously isolated device with a serial port into a fully network-enabled component.

The benefits are clear: immediate access to information, improved flexibility and a significant reduction of operational cost.

You are now able to directly manage, control and access devices through the network, whether it is your organization's intranet or the ubiquitous Internet. Wherever you are, you are connected. Anytime. All without the time-consuming hassle and additional cost of separate wiring or the setup of campus modems, simply by taking advantage of your existing network infrastructure.

Device Server: What is it Anyway?

A device server is an intelligent and easy-to-use network device in a compact form factor that converts serial data into network data. It consists of all the vital components required to provide full network connectivity to virtually any kind of serial device: a reliable TCP/IP protocol stack, remote

management capabilities, and both serial and network interfaces. The innovative design of Digi's device server products delivers a fully transparent connection without any need for modifications to the existing software or hardware components in your application.

Adding intelligence and network connectivity to devices opens up a world of new possibilities such as:

- Remote monitoring and diagnosing – manufacturers will be able to support products remotely after the sale, diagnose problems and even download repair solutions. If an on-site repair is required, a technician can be notified to arrive with exactly the right equipment and parts.
- Upgrades – manufacturers can offer software upgrades that can be downloaded directly to the product.
- Remote operation – a networked device can be accessible from an Internet browser.

Simply put, the value of networking is rapid access to information. The faster the access to reliable information, the quicker and better the resulting decision or action. The promise of device networking is this: the closer you can place decision-making to the source of information, the faster you can make good decisions. That translates directly into making your business more productive, more competitive and more profitable.

Connect Your World

Digi device servers deliver simple, reliable and cost-effective network connectivity for all your serial devices and address the growing need to connect individual devices to the network over industry-standard Ethernet. They are the ideal choice for a wide variety of applications, including industrial automation, security, transportation, retail or healthcare environments.

Industrial Automation

Productivity improvements. Inventory management. Quality control. All are common challenges found in virtually every manufacturing facility today. From automotive to warehouse environments, the need to attach essential devices (new or legacy) such as PLCs, CNC/DNC equipment, process and quality control equipment, pump controllers, bar-code readers/scanners, operator displays, scales and weighing stations, printers, machine vision systems, and many other types of manufacturing equipment is common. Digi device servers are the solution for all these challenges.

Medical/Healthcare

Today hospitals, clinics and laboratories are facing rapidly growing needs to receive, monitor and access patient and test information quickly, easily and accurately, whether at the bedside, nurse's station, or anywhere in the facility. Device servers can network-enable medical equipment and devices using the hospital's existing network to improve patient care and reduce operating costs. This allows medical staff to easily monitor and control equipment over the network at the point of care, in a laboratory, or somewhere else in the building. The result is improved quality of service and reduced operational cost.

Retail/Point-of-Sale

Having the right product in the store, managing orders and deliveries, and keeping pricing up-to-date are all things device servers can do to make your retail operation more successful. From big to small, one to thousands of stores, Digi device servers can help you focus on running your business by solving the challenges associated with enabling your POS devices to effectively share information across the network. Device servers can be used to quickly network-enable serial devices like card swipe readers, bar code scanners, scales, receipt printers and cash register display poles.

Building Automation/Security

Automating, managing and controlling all aspects of a building is within reach with Digi device servers. Device servers solve the problem of stand-alone control systems that are unable to talk to each other and share important data. Device servers can be used to centrally manage equipment and devices over an existing or new network to improve the comfort, safety and productivity of building occupants while reducing lighting, HVAC and overall energy operating costs.

Traffic Management

Managing cities over the Ethernet is now possible. Device servers provide an easy conversion from serial ports on cameras, billboards and traffic lights to Ethernet. Device servers eliminate the need for long haul modems and provide the management of the traffic equipment over a network. Hardened versions that can withstand the extended operating temperatures commonly required in traffic applications are available.

Console Management

Remote offices can have routers, PBXs, servers and other networking equipment that require remote management from the corporate facility. The device servers easily attach to the serial ports on this networking equipment and provide central, remote monitoring and management capability.

Ways to Use Device Servers

There are three primary ways to apply device servers today:

- Driver-based (a driver is installed on the host computer/machine)
- Tunneling mode (two device servers can share information directly with one another)
- Socket Services (operation relying on socket programming)

Driver-Based Control

Since its inception, Digi has been the leader in the asynchronous market, providing server- and PC-based serial connectivity. Digi has taken serial connectivity to a new level by creating a driver-based control scenario for device servers.

RealPort®

Digi's patented RealPort allows applications to talk to devices across a network as though the devices were attached directly to the host server or PC, when in fact the devices are connected to a Digi device server. RealPort establishes a connection between the host and networked serial device by creating a local COM or TTY port on the host, thereby delivering fully transparent and robust network connectivity for serial devices.

RealPort stands above all other COM/TTY port redirectors by delivering proven stability, operation in applications that require low latency, reliable operation over wide area networks, encryption features and support of the broadest range of operating systems across Windows® and UNIX® platforms. Also, it is the only implementation that allows multiple connections to multiple ports over a single TCP/IP connection. RealPort may be utilized with the Digi One®, Digi Connect® and PortServer® TS families to provide an easy migration path for moving serial device servers to the network – with no application modifications.

RealPort with Encryption

Digi now takes RealPort technology a step further with patent-pending RealPort with encryption,

offering a secure Ethernet connection between the COM/TTY port and a device server. Encryption prevents internal and external snooping of data across the network by encapsulating the TCP/IP packets in an SSL connection and encrypting the data using AES, one of the most efficient security algorithms.

Tunneling Mode

Serial tunneling occurs when two device servers are configured to work together to share or communicate their respective serial device's data. The serial tunnel is established by connecting one device server configured for TCP Server mode to a device collecting data and the other device server configured for TCP Client mode to the field device sending data. This sharing of information is accomplished through a direct connection or serial tunnel that encapsulates the serial data in TCP packets and sends it across the network. This function allows two previously non-networked and isolated devices to communicate information and operate with existing installed software applications of devices on a network, instead of a long serial cable.

Socket Services Control

Sockets can be used to enable a software application to communicate with a serial device that has been network-enabled using a device server, without

installing a driver. Socket communication is usually based on either TCP or UDP.

TCP is the protocol of choice for applications where an end-to-end connection with guaranteed packet delivery is required. The client and server in a TCP based connection need to maintain an open and active link to exchange data. This provides a reliable connection between two endpoints.

UDP does not require an established link to the intended recipient of the data. It is an efficient protocol that is best suited for applications requiring streamlined and fast distribution of information – without the need for guaranteed delivery. UDP also allows for the sending of a data packet to multiple recipients.

Digi device servers provide support for both TCP and UDP based socket communications. By leveraging Socket Services, Digi's device servers can operate in three different ways: TCP Server, TCP Client, or UDP Server/Client.

Flexible and Innovative Solutions

With over 20 million ports shipped worldwide, Digi has been offering the highest levels of performance, flexibility, and quality since 1985. Our device server solutions are available in numerous one-, two- and four-port versions, including embedded, hardened, wireless, Multi-Electrical Interface (MEI), modem and powered series models, for maximum flexibility for your application's unique requirements.

Protocol Summary	TCP Server	TCP Client	UDP Server/Client
Protocol type	Transmission Control Protocol	Transmission Control Protocol	User Datagram Protocol
Established connection required	Yes	Yes	No
Send and receive data	Yes	Yes	Yes
Multicast capability	No	No	Yes
Analogous to	Telephone call	Telephone call	Mailing a letter
Connection initiated by	Host machine	Controlled device/ networked device	Host machine or controlled device
Application characteristics	End-to-end connections requiring guaranteed packet delivery	End-to-end connections requiring guaranteed packet delivery	Fast distribution of information without the need for guaranteed delivery

Digi One Family and PortServer TS Family

The PortServer TS and Digi One families deliver universal, high-performance serial-to-Ethernet connectivity. The device servers are available in a variety of versions – including 802.11b wireless, MEI, modem, hardened and powered solutions – to meet specific application needs.

- Easy configuration via a web interface (HTTP)
- RS-232 or switch selectable RS-232/422/485 for use with virtually any device with a serial port
- Patented Digi RealPort technology for COM or TTY port control which makes it easy to move from serial host adapters to Ethernet-based device servers with no software application changes; patent-pending RealPort with encryption also available to prevent data sniffing over TCP/IP connection
- Additional features include: SSH v2 & SSL/TLS security, port buffering, powered Ethernet (802.3af), flexible 9-30VDC power, optional internal V.90 modem and many more



Digi One SP

Efficient RS-232/422/485 serial-to-Ethernet connectivity for applications requiring simple and cost-effective data communications.



Digi One RealPort® and PortServer TS Family

Standard multiport RS-232/422/485 serial-to-Ethernet connectivity that is ideal for applications requiring low port count and seamless integration into existing application.



PortServer TS MEI Family

Universal, high-performance device servers for RS-232/422/485 serial-to-Ethernet connectivity. Advanced features include SSH v2, SNMP, PPP, port buffering and many more.



PortServer TS H MEI Hardened Series

Hardened solution delivers high-performance RS-232/422/485 serial-to-Ethernet connectivity. Designed specifically for traffic management, pipelines or any application requiring extended operating ambient temperatures of -35° C to +70° C.



PortServer TS W MEI Wireless Series

Universal, high-performance RS-232/422/485 serial-to-wireless connectivity. Advanced features include WEP (64- and 128-bit), SSH, easy management and many more.

MEI = Multi-Electrical Interface (RS-232/422/485)

PortServer TS Family



PortServer TS M MEI Modem Series

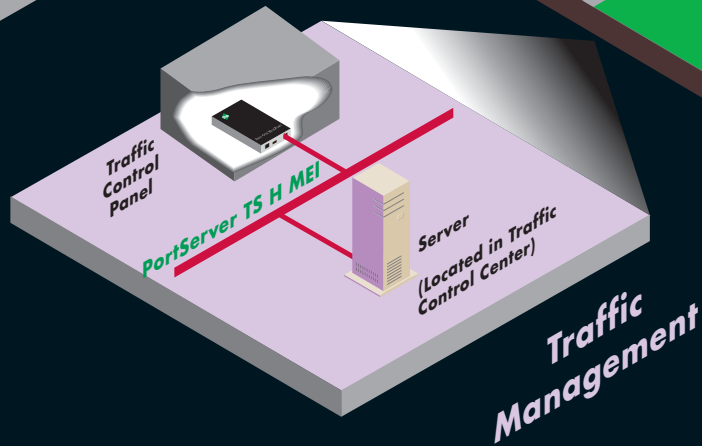
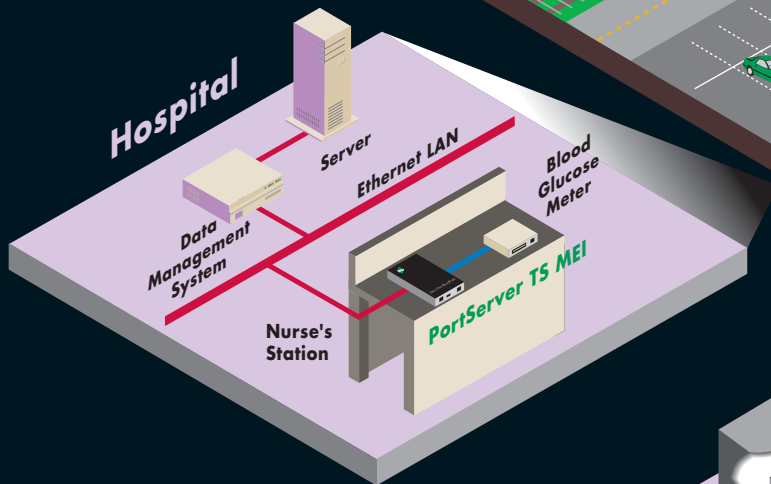
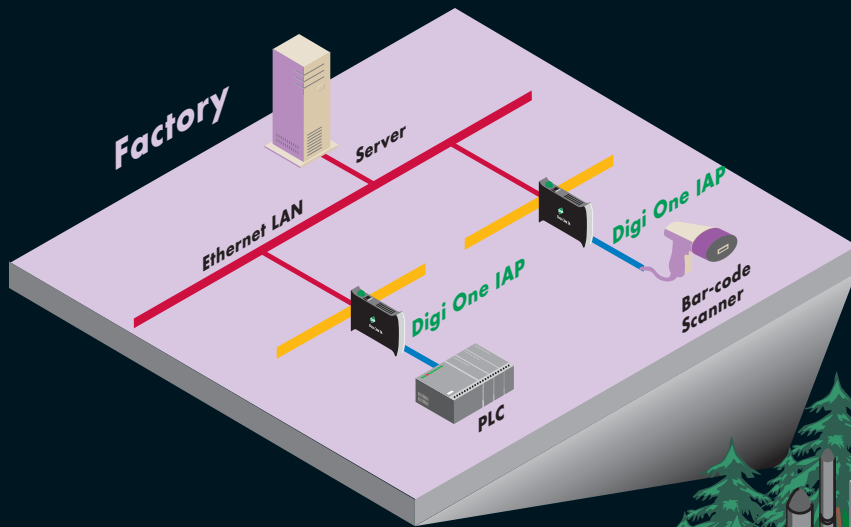
Device server with internal modem provides both IP networking and standard phone line dial-up connectivity for remote access to RS-232/422/485 serial devices.

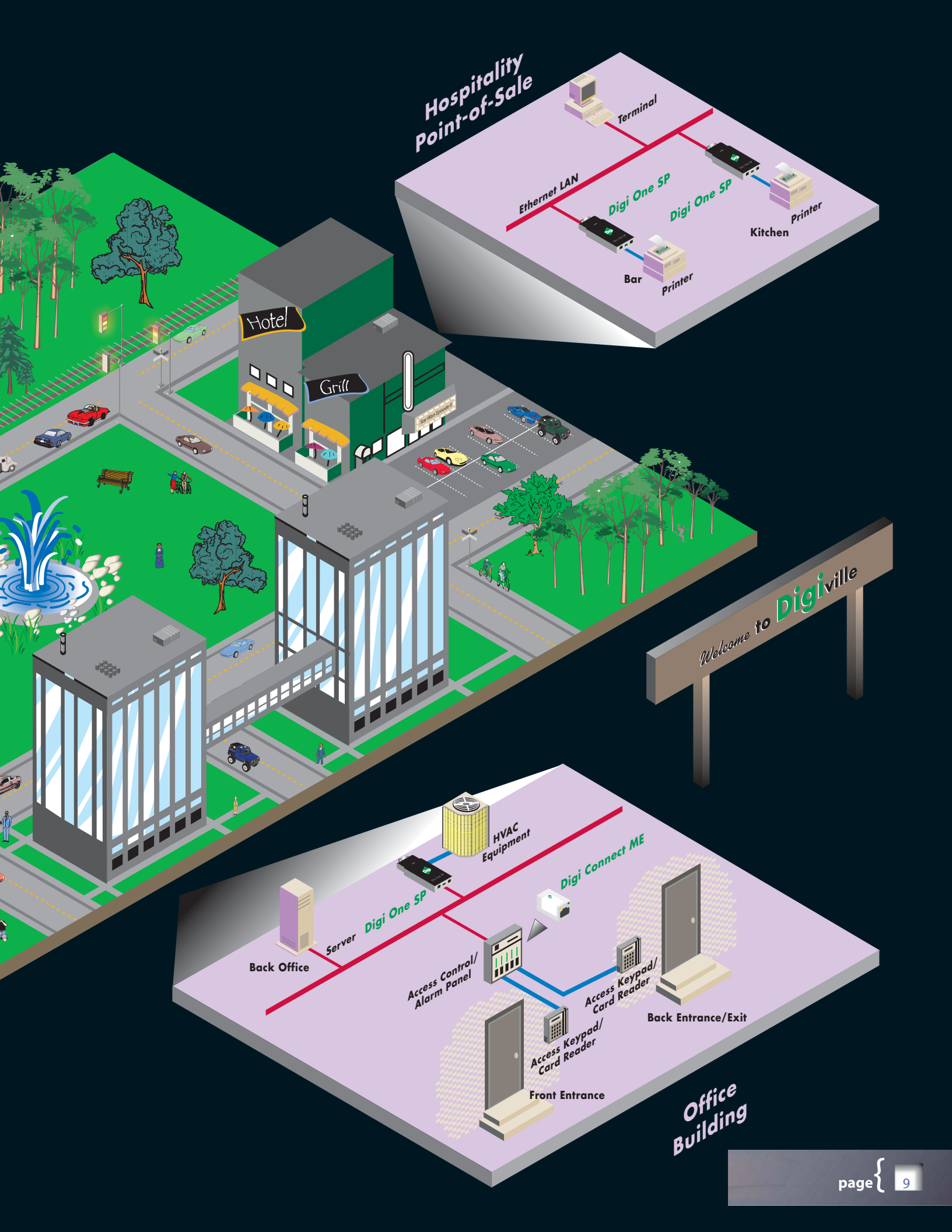


PortServer TS P MEI Power Series

Designed for universal, high-performance RS-232/422/485 serial-to-Ethernet where traditional power alternatives such as powered Ethernet and powered serial are required.

Product/Feature	Digi One SP	Digi One RealPort PortServer TS Family	PortServer TS MEI Family	PortServer TS H MEI Hardened Series	PortServer TS W MEI Wireless Series	PortServer TS M MEI Modem Series	PortServer TS P MEI Power Series
Number of serial ports	1	1/2/4	1/2/4	1/2/4	1/2/4	1/3	1/2/4
RS-232/422/485	DB-9		RJ-45	RJ-45	RJ-45	RJ-45	RJ-45
RS-232		RJ-45					
Powered via Ethernet & serial ports							•
802.11b (wireless)					•		
10/100Base-T	•	•	•	•	•	•	•
DHCP, RARP, Static IP, ARP-Ping	•	•	•	•	•	•	•
UDP/Multicast	•	•	•	•	•	•	•
Telnet/Reverse Telnet	•	•	•	•	•	•	•
Modbus/TCP			•	•	•	•	•
HTTP	•	•	•	•	•	•	•
SNMP			•	•	•	•	•
PPP		•	•	•	•	•	•
SSH v2 Server			•	•	•	•	•
SSL/TLS/HTTPS			•	•	•	•	•
Port buffering			•	•	•	•	•
Internal V.90 modem						•	
Extended temp. (-35° C to +70° C)				•			
COM/TTY driver	RealPort	RealPort	RealPort with encryption	RealPort with encryption	RealPort with encryption	RealPort with encryption	RealPort with encryption
North America part number	(1-port) 70001851	(1-port) 70001749	(1-port) 70001805	(1-port) 70001917	(1-port) 70001954	(1-port) 70001898	(1-port) 70001988
		(2-port) 70001750	(2-port) 70001806	(2-port) 70001918	(2-port) 70001956	(3-port) 70001899	(2-port) 70001989
		(4-port) 70001751	(4-port) 70001807	(4-port) 70001919	(4-port) 70001958		(4-port) 70001990
International part number	(1-port) 70001851	(1-port) 70001752	(1-port) 70001832	(1-port) 70001917	(1-port) 70001954	(1-port) 70001895	(1-port) 70001991
		(2-port) 70001753	(2-port) 70001833	(2-port) 70001918	(2-port) 70001957	(3-port) 70001896	(2-port) 70001992
		(4-port) 70001754	(4-port) 70001834	(4-port) 70001919	(4-port) 70001959		(4-port) 70001993





Hospitality Point-of-Sale

Ethernet LAN

Digi One SP

Digi One SP

Bar

Printer

Kitchen

Printer

Terminal

Hotel

Grill

Star Wars Experience

Welcome to Digiville

Back Office

Server

Digi One SP

Access Control/
Alarm Panel

Digi Connect ME

Front Entrance

Access Keypad/
Card Reader

Back Entrance/Exit

Access Keypad/
Card Reader

HVAC
Equipment

Office
Building

Digi One IA Family

The Digi One IA family provides specific features and a unique form factor for the industrial automation market. The Digi One IA device server delivers efficient serial-to-Ethernet connectivity for applications requiring TCP Socket, UDP Socket or UDP multicast functionality. It offers advanced features, such as industrial protocol conversion and Digi's patented RealPort technology for COM/TTY port management.



- Switch selectable RS-232/422/485 for use with virtually any device with a serial port
- Extended input voltage of 9-30VDC with screw terminal connections
- 32° F to 140° F (0° C to 60° C) operating temperature to meet the demands of the factory floor
- An industrial strength, ergonomic enclosure designed to mount vertically on a standard 35 mm DIN rail, saving valuable cabinet space
- Industry-leading low latency to meet the strict data throughput requirements for CNC/DNC equipment and other applications
- Pass-through port functionality to connect additional serial devices locally, without disconnecting the PLC from the network (Digi One IAP only)

Product/Feature

	Digi One IAP	Digi One IA	Digi One SP IA
RS-232/422/485	•	•	•
DIN rail mounting	•	•	•
9-30VDC	•	•	•
10/100Base-T	•	•	•
Industrial Ethernet protocol translation (Modbus/TCP, EtherNet/IP, Allen-Bradley Ethernet)	•		
Industrial serial protocol conversion (DF1, OMRON, Modbus, ASCII)	•		
Pass-through port	•		
Multi-master/Multi-protocol	•		
Socket Services	•	•	•
Telnet/Reverse Telnet	•	•	•
HTTP	•	•	
PPP	•		
SNMP	•		
DHCP, RARP, Static IP, ARP-Ping	•	•	•
UDP/Multicast	•	•	•
Powered Ethernet	•		
Monitoring & diagnostic utility	•	•	•
COM/TTY driver	RealPort with encryption	RealPort	RealPort
North America part number	70001777	70001862	70001999
International part number	70001777	70001862	70002000

Digi Connect® Family

The Digi Connect family offers the industry's first interchangeable wired and wireless embedded modules. The solutions make it easy to build future-proof products based on a single design supporting wired 10/100Base-T and 802.11b wireless Ethernet connectivity. Built on leading NetSilicon 32-bit NET+ARM technology, Digi Connect® EM, Digi Connect® Wi-EM, Digi Connect ME® and Digi Connect® Wi-ME combine true plug-and-play functionality with the flexibility of complete software customization.

- Ideal for any embedded application where cost-effective serial connectivity over Ethernet is needed
- Fully network-configurable single component solutions in compact form factors with robust TCP/IP stack and Ethernet controller onboard
- Reduce costs and time to market typically associated with developing custom solutions
- Integration kits and royalty-free NET+Works® development platform available for custom application development



Please contact us at 1-877-OEM-DIGI (or +49 231-9747-0 internationally) to discuss your application specific requirements.

Product/Feature	Digi Connect ME	Digi Connect Wi-ME	Digi Connect EM	Digi Connect Wi-EM
Number of serial ports	1	1	2	2
TTL serial interface	•	•	•	•
Max. data rate	230 Kbps	230 Kbps	230 Kbps	230 Kbps
10/100Base-T	•		•	
802.3af power pass-through	•		•	
802.11b		•		•
GPIO	5	5	9	9
Static IP	•	•	•	•
SNMP	•	•	•	•
SPI interface			•	•
DHCP, ARP-Ping	•	•	•	•
UDP/Multicast	•	•	•	•
Encryption (SSL/TLS)	•	•	•	•
HTTPS customizable web interface	•	•	•	•
Integration and Development Kit	•	•	•	•
HTTP	•	•	•	•
Telnet/Reverse Telnet	•	•	•	•
COM/TTY driver	RealPort with encryption	RealPort with encryption	RealPort with encryption	RealPort with encryption
Form factor	36.7 x 19.05 x 18.67 mm	49.4 x 19.05 x 18.67 mm	40 x 49 mm	49.15 x 47.12 x .58 mm
Part number (worldwide)	DC-ME-01T	DC-WME-01T	DC-EM-02T	DC-WEM-02T

10/100Base-T

Ethernet running on Unshielded Twisted Pair (UTP) cable transmitting data between two points, reaching throughput between 10 Mbps and 100 Mbps.

AES

The Advanced Encryption Standard (AES) is an encryption algorithm that uses 128-, 192- and 256-bit keys to secure sensitive data. Originally developed for unclassified U.S. Government materials, it has gained popularity in the private sector for applications such as online banking and credit card transactions.

ARP-Ping

ARP-Ping is an easy and universal method to assign an IP address to an unconfigured Digi device server. The network administrator manually creates an entry for the particular device in the ARP table of a router or host system in order to map the physical address of the device to a specific IP address. After the ARP entry has been successfully created, the administrator simply pings the device server, which in turn automatically assumes the IP address provided in the packets generated by the ping command.

DHCP

The Dynamic Host Configuration Protocol (DHCP) is a standardized communications protocol that enables network administrators to centrally manage and automate the assignment of IP addresses in an organization's network.

RS-232

An electrical standard that ensures reliable communication of serial devices produced by different manufacturers.

RS-422

An electrical standard based on RS-232 that provides greater noise immunity and longer transmission distances (up to 1000 feet) by balancing signals.

RS-485

Similar to RS-422, RS-485 permits multi-drop capabilities along with greater noise immunity and longer transmission distances.

HTTP

The HTTP protocol is a basic set of rules for exchanging files on the World Wide Web. It is used by web browsers to request information, such as a web page or a file, from a web server. Web pages are created using the Hypertext Markup Language (HTML), which describes the actual layout and content of a page.

Based on HTTP and HTML, Digi device server products provide Web-based management functionality that enables users to control and monitor the device server using a standard Web browser.

Industrial Ethernet Protocol

Industrial Ethernet Protocols define how the serial data of an industrial device is transferred over the network to a host machine server such as an HMI system. Digi supports the following protocols on the Digi One IAP:

- Modbus/TCP
- Allen Bradley Ethernet
- EtherNet/IP

Industrial Serial Protocols

Industrial Serial Protocols define the rules for serial/industrial device communication between Digi device servers and PLCs or other equipment with a serial port. The Digi One IAP supports the following serial protocols:

- Modbus ASCII
- Modbus RTU
- Omron: FINS, CompoWay/F and Hostlink
- DF1 (full- and half-duplex)
- Custom/user-defined
- ASCII

MEI (Multi-Electrical Interface)

Digi term meaning the serial interface supports RS-232, 422 and 485.

Modbus/TCP

Modbus is a family of vendor-neutral communication protocols for the supervision and control of automation equipment. Modbus/TCP is a specific variant covering the use of Modbus messaging in a TCP/IP network environment, such as the intranet or the Internet.

Multi-Master

Multi-master is the ability for the Digi device server to handle multiple network masters for the serial device. The multiple masters can run different protocols. For example, one PLC could have an HMI system as a master using RealPort, while an administrator uses TCP sockets to download configuration information.

Port Buffering/Logging

Port buffering allows data from each port to be captured and stored within the Digi device server to allow a future examination of the events that occurred on a specific port prior to an alarm or failure. Port logging can save buffer contents to network drives for review and analysis.

Powered Ethernet

The Powered Ethernet standard (IEEE 802.3af) provides power to network devices by utilizing the existing Ethernet and eliminates the need for additional external power supplies.

PPP

The Point-to-Point Protocol (PPP) is a standard method for transporting multi-protocol network data including TCP/IP over asynchronous or synchronous point-to-point links such as analog modems or ISDN. Using PPP, remote devices can be easily connected to a company's network or the Internet.

RARP

Reverse Address Resolution Protocol (RARP) is a protocol by which a physical device in a local area network can request to learn its IP address from another network system's internal Address Resolution Protocol (ARP) table. A network administrator manually creates entries for each device in the table of a router or other network system to map the physical device addresses to the corresponding IP addresses. RARP-based configuration is widely used in Linux® and UNIX operating systems.

RealPort®

Digi's unique and patented RealPort COM/TTY port software allows seamless integration into existing application environments such as Windows, UNIX, and Linux by making network-enabled serial devices available through the standard COM/TTY interfaces.

RealPort with Encryption

This patent-pending technology takes RealPort a step further by offering a secure connection between the COM/TTY port and a device server. TCP/IP packets are encapsulated in an SSL connection and encrypted via AES to prevent data snooping across the network.

RFC 2217

RFC 2217 is an extension of the Telnet protocol used to access serial devices over the network. It enables 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.

SNMP

SNMP (Simple Network Management Protocol) is a model governing management and monitoring of network devices and their functions.

The SNMP model consists of four basic components:

- **SNMP Protocol**
The SNMP protocol defines how the Network Management Station (NMS) and the Management Agent communicate with each other.
- **Management Information Base**
A Management Information Base (MIB) is a formal description of specific network objects, such as the data rate of an interface or error counters, that can be set and/or monitored using an NMS.

Digi provides both standard MIB support and device server specific ("private") support for the Digi One RealPort and PortServer TS product lines.

- **Network Management Station**
The NMS provides a software application, like HP OpenView or Tivoli NetView, which enables the network administrator to control and monitor network components (device servers, routers, bridges). The communication between the NMS and the Management Agent is based on the SNMP protocol.
- **Management Agent**
The Management Agent is located in the actual network device, such as the Digi One RealPort, and provides information control and monitoring services to the NMS as defined in the corresponding MIB.

Socket Services

Sockets are a simple method of communication between a client and a server on a network. The client actively initiates a connection to a server and the server accepts the connections from the client.

The programming interface used for socket communication is called Socket Services and is available in most network operating systems, including Linux, UNIX and Microsoft® Windows.

Socket services can be used to enable a software application to communicate with a serial device that has been network-enabled using a device server. The actual specifics of the client/server relationship are dependent on the application. In other words, a device server can act as client and a software application as a server, and vice versa.

SSH

Secure Shell (SSH) provides highly secure network communications based on command shell, data tunneling, and file transfer services. Like SSL, the privacy and integrity of the transmitted data is achieved by utilizing both strong encryption and sophisticated authentication methods.

SSL

Secure Sockets Layer (SSL) provides message privacy, message integrity and authentication services to transfer information privately and securely across data networks, such as the Internet. In fact, SSL secures the vast majority of online purchases and browser-based monetary transactions on the Internet.

Static IP

Static IP refers to an IP address that has been explicitly assigned to a specific device or system in its network configuration. The change of a statically assigned IP address requires manual reconfiguration of the network device or system.

Telnet/Reverse Telnet

Reverse Telnet (sometimes called Direct Telnet) is the initiation of a Telnet session from a computer system to one of its remote users/clients. A user/client who wishes to access a remote system initiates a Telnet session to the networking system. The user must have permission and is prompted to provide a user name and password. Reverse Telnet is used to monitor a serial device, such as a console port of a router from another networked computer system.

UDP/Multicast

Digi Multicasting feature sends out a data packet to multiple destinations on a network. Digi products support up to 64 recipients. The packets are sent out one at a time to each recipient listed on the table.



Digi International Inc. Sales

11001 Bren Road East
Minnetonka, MN 55343
PH: 1-877-912-3444
1-952-912-3444
OEM PH: 1-877-OEM-3444
FX: 1-952-912-4952
Email: info@digi.com
www.digi.com

Digi International GmbH

Joseph-von-Fraunhofer Str. 23
D-44227 Dortmund
Germany
PH: +49-231-9747-0
FX: +49-231-9747-111
www.digi.de

Digi International (HK) Limited

Suite 1703-05, 17/F
K Wah Centre
191 Java Road
North Point
Hong Kong
PH: +852-2833-1008
FX: +852-2572-9989

Digi International

Rm 16B12, 16F, Han Wei Plaza
No. 7 Guang Hua Road,
Chao Yang District
Beijing 100004, China
PH: +86-10-6561-8310
FX: +86-10-6561-8152
www.digi.net.cn

Digi International Denmark

Naverland 2
2600 Glostrup, Denmark
PH: +45-49-17-70-90
FX: +45-49-17-70-91

Digi International N.V.

Keizersgracht 62-64
1015 CS Amsterdam
Netherlands
PH: +31-20-5207-566
FX: +31-20-5207-972

Digi International (UK) Ltd

Ashwood House, Almondsbury
Business Center Woodlands
Bradley Stoke, Bristol
BS32 4QH
PH: +44(0)1454-643444
FX: +44(0)1454-619048

Digi International

2 Rue de L'Eglise
92200 Neuilly sur Seine, France
PH: +33-1-55-61-98-98
FX: +33-1-55-61-98-99

NetSilicon

411 Waverley Oaks Road #304
Waltham, MA 02452
PH: 1-800-243-2333
1-781-647-1234
FX: 1-781-893-1338
Email: info@netsilicon.com
www.netsilicon.com

www.digi.com



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Making
DEVICE NETWORKING
easy™

