

# **Protogate Freeway® Ports, Protocols, and Services (PPS)**

**DC 900-2022E**

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## **Protogate Freeway® Ports, Protocols, and Services (PPS): DC 900-2022E**

by Protogate, Inc.

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This Ports, Protocols, and Services (PPS) Document describes the inputs and outputs of a Protogate Freeway® .

The latest version of this document is always available, in a variety of formats and compression options, from the Protogate World Wide Web server (<http://www.protogate.com/support/manuals>).

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# Preface

## Purpose of Document

This Ports, Protocols, and Services (PPS) document identifies the inputs and outputs to/from a Protogate Freeway® .

## Intended Audience

This document should be read by anyone who wants a better understanding about I/O connections to a Protogate Freeway .

## Organization of Document

This document is organized into the following major sections:

### Chapter 1

is an overview of this document and of the Protogate Freeway software.

### Chapter 2

is a list of other documents referenced by this document.

### Chapter 3

describes the Freeway I/O ports.

### Chapter 4

includes general information to aid in understanding this document.

## Protogate References

The following general product documentation list is provided to familiarize you with the available Protogate Freeway and embedded ICP products. Most of these documents are available on-line at Protogate's website (<http://www.protogate.com/>). Additional information about documents which are specifically referenced by this Ports, Protocols, and Services (PPS) document are in Chapter 2 of this document.

### General Product Overview Documents

Freeway 1100 Technical Overview	25-000-0419
Freeway 2000/4000/8800 Technical Overview	25-000-0374
ICP2432 Technical Overview	25-000-0420

ICP6000X Technical Overview 25-000-0522

## Hardware Support Documents

Freeway 500 Hardware Installation Guide	DC-900-2000
Freeway 1100/1150 Hardware Installation Guide	DC-900-1370
Freeway 1200/1300 Hardware Installation Guide	DC-900-1537
Freeway 2000/4000 Hardware Installation Guide	DC-900-1331
Freeway 8800 Hardware Installation Guide	DC-900-1553
Freeway 3100 Hardware Installation Guide	DC-900-2002
Freeway 3200 Hardware Installation Guide	DC-900-2003
Freeway 3400 Hardware Installation Guide	DC-900-2004
Freeway 3600 Hardware Installation Guide	DC-900-2005
Freeway 3110 Hardware Installation Guide	DC-900-2012
Freeway 3210 Hardware Installation Guide	DC-900-2013
Freeway 3410 Hardware Installation Guide	DC-900-2014
Freeway 3610 Hardware Installation Guide	DC-900-2015
Freeway 3112 Hardware Installation Guide	DC-900-2016
Freeway 3212 Hardware Installation Guide	DC-900-2017
Freeway 3412 Hardware Installation Guide	DC-900-2018
Freeway 3612 Hardware Installation Guide	DC-900-2019
Freeway 3114 Hardware Installation Guide	DC-900-2026
Freeway 3214 Hardware Installation Guide	DC-900-2027
Freeway 3414 Hardware Installation Guide	DC-900-2028
Freeway 214 Hardware Installation Guide	DC-900-2030
Freeway 3414/3414R Hardware Maintenance Guide	DC-900-2031
Freeway 3115 Hardware Installation Guide	DC-900-2032
Freeway 3215 Hardware Installation Guide	DC-900-2033
Freeway 3415 Hardware Installation Guide	DC-900-2034
Freeway 215 Hardware Installation Guide	DC-900-2035
Freeway ICP6000R/ICP6000X Hardware Description	DC-900-1020
ICP6000(X)/ICP9000(X) Hardware Description and Theory of Operation	DC-900-0408
ICP2424 Hardware Description and Theory of Operation	DC-900-1328
ICP2432 Hardware Description and Theory of Operation	DC-900-1501
ICP2432 Electrical Interfaces (Addendum to DC-900-1501)	DC-900-1566
ICP2432 Hardware Installation Guide	DC-900-1502
ICP2432B Hardware Installation Guide	DC-900-2009

## Freeway Software Installation and Configuration Support Documents

Freeway User Guide DC-900-1333

Freeway Loopback Test Procedures	DC-900-1533
Freeway Release Addendum: Client Platforms	DC-900-1555
Freeway Message Switch User Guide	DC-900-1588
Freeway Software Requirements Specification (SRS)	DC-900-2021
Freeway Ports, Protocols, and Services (PPS)	DC-900-2022
Freeway Software Version Description (SVD)	DC-900-2023
Freeway Lifecycle Support Plan (LSP)	DC-900-2024
Freeway Security Features User's Guide (SFUG)	DC-908-3004
Freeway Security Target (ST)	DC-908-3005

## **Embedded ICP Software Installation and Programming Support Documents**

ICP2432 User Guide for Digital UNIX	DC-900-1513
ICP2432 User Guide for OpenVMS Alpha	DC-900-1511
ICP2432 User Guide for OpenVMS Alpha (DLITE Interface)	DC-900-1516
ICP2432 User Guide for Solaris STREAMS	DC-900-1512
ICP2432 User Guide for Windows NT	DC-900-1510
ICP2432 User Guide for Windows NT (DLITE Interface)	DC-900-1514

## **Application Program Interface (API) Programming Support Documents**

Freeway Data Link Interface Reference Guide	DC-900-1385
Freeway Transport Subsystem Interface Reference Guide	DC-900-1386
QIO/SQIO API Reference Guide	DC-900-1355

## **Socket Interface Programming Support Documents**

Freeway Client-Server Interface Control Document	DC-900-1303
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## **Toolkit Programming Support Documents**

Freeway Server-Resident Application (SRA) Programmer Guide	DC-900-1325
OS/Impact Programmer Guide	DC-900-1030
Freeway OS/Protogate Programmer's Guide	DC-900-2008
Protocol Software Toolkit Programmer Guide	DC-900-1338
Protocol Software Toolkit Programmer's Guide (ICP2432B)	DC-900-2007

## **Protocol Support Documents**

ADCCP NRM Programmer Guide	DC-900-1317
Asynchronous Wire Service (AWS) Programmer Guide	DC-900-1324

AUTODIN Programmer Guide	DC-908-1558
Bit-Stream Protocol Programmer Guide	DC-900-1574
BSC Programmer Guide	DC-900-1340
BSCDEMO User Guide	DC-900-1349
BSCTRAN Programmer Guide	DC-900-1406
DDCMP Programmer Guide	DC-900-1343
Military/Government Protocols Programmer Guide	DC-900-1602
N/SP-STD-1200B Programmer Guide	DC-908-1359
NASCOM Programmer's Guide	DC-900-2010
SIO STD-1300 Programmer Guide	DC-908-1559
TIMI Programmer's Guide	DC-900-2011
X.25 Call Service API Guide	DC-900-1392
X.25/HDLC Configuration Guide	DC-900-1345
X.25 Low-Level Interface	DC-900-1307

## Document Conventions

In this document, the term "Freeway" refers both to the Freeway software, and generically to all current Freeway models: the Freeway 3115, 3215, 3415 and 215 -- and also to earlier Freeway models such as the Freeway 3114, the Freeway 3214, the Freeway 3414, the Freeway 3112, the Freeway 3212, the Freeway 3412, and the Freeway 3612.

## Revision History

The revision history of the Freeway Ports, Protocols, and Services (PPS), Protogate document DC 900-2022, is recorded below:

**Table 1. Revision History**

Revision	Release Date	Description
DC 900-2022A	October, 2013	Initial Release
DC 900-2022B	November, 2013	Added descriptions of TCP and UDP ports
DC 900-2022C	September, 2015	Updated for Freeway 7.1-2.
DC 900-2022D	October, 2019	Updated for Freeway 8.2-0.
DC 900-2022E	May, 2022	Updated for Freeway 9.0-0.



## **Customer Support**

If you are having trouble with any Protogate product, call us at 1-858-451-0865 (U.S.) Monday through Friday between 8 a.m. and 5 p.m. Pacific time. You can email your questions to us at [support@protogate.com](mailto:support@protogate.com) at any time.

# Chapter 1. Scope

## 1.1. Identification

This document describes the Inputs and Outputs of a Protogate Freeway® .

## 1.2. System Overview

The Protogate Freeway is a data communication system which connects one or more serial link channels of various types to one or more IP (Internet Protocol) networks. The Freeway acts as a gateway, providing serial link channel access to clients on the IP network.

All Protogate Freeways run custom-built software which is written and provided by Protogate, and which completely controls the Freeway. The Freeway software is based on a version of the FreeBSD operating system which has been modified to control one or more Protogate Intelligent Communications Processor (ICP) boards. ICP boards are Protogate-manufactured boards which can be installed into a Freeway chassis, plugged into one or more serial-link channels, and configured to implement a data communications protocol. Each ICP board installed into a Freeway provides 2, 4, or 8 serial link ports.

## 1.3. Document Overview

This document describes the Inputs and Outputs of a Protogate Freeway® . This document is not sensitive or private, and may be disseminated as widely as desired, with no restrictions.

## Chapter 2. Reference Documents

A full list of Protogate documents is in the Preface Section of this document.

Documents referenced by this Ports, Protocols, and Services (PPS) document are listed in Table 2-1.

**Table 2-1. Referenced Documents**

<b>Number</b>	<b>Title</b>	<b>Revision</b>	<b>Date</b>
DC-900-1303	Freeway Client-Server Interface Control Document	C	Dec, 1999
DC-900-1324	Asynchronous Wire Services (AWS) Programmer's Guide	I	Sep, 2011
DC-900-1333	Freeway User's Guide	Q	Sep, 2013
DC-900-1385	Freeway Data Link Interface (DLI) Reference Guide	E	Mar, 2002
DC-900-1386	Freeway Transport Subsystem Interface (TSI) Reference Guide	D	Mar, 2002
DC-900-2016	Freeway 3112 Hardware Installation Guide	A	Sep, 2011
DC-900-2017	Freeway 3212 Hardware Installation Guide	A	Sep, 2011
DC-900-2018	Freeway 3412 Hardware Installation Guide	A	Sep, 2011
DC-900-2019	Freeway 3612 Hardware Installation Guide	A	Sep, 2011
DC-900-2026	Freeway 3114 Hardware Installation Guide	B	Sep, 2015
DC-900-2027	Freeway 3214 Hardware Installation Guide	B	Sep, 2015
DC-900-2028	Freeway 3414 Hardware Installation Guide	C	Sep, 2015
DC-900-2032	Freeway 3115 Hardware Installation Guide	A	Feb, 2021
DC-900-2033	Freeway 3215 Hardware Installation Guide	A	Feb, 2021
DC-900-2034	Freeway 3415 Hardware Installation Guide	A	Feb, 2021
DC-900-2035	Freeway 215 Hardware Installation Guide	A	Feb, 2021

# Chapter 3. Ports, Protocols, and Services

This chapter describes the physical I/O ports available on a Freeway (Section 3.1 through Section 3.6), and the IP (Internet Protocol) ports which Freeways are usually configured to support (Section 3.7).

There are several different types of physical ports: a serial console port, a VGA video port, a PS/2 keyboard port, one or more USB ports, one or more Ethernet (IP) ports, and two or more ICP (serial link) ports. There is also an unused female DB-25 on the rear of each Freeway chassis; this is the connector for a parallel printer port, but it is not supported in any way by the Freeway software, and cannot be read from or written to.

For more information about any of these physical ports on a particular Freeway model, refer to the Hardware Installation Guide for that model:

- *DC-900-2016: Freeway 3112 Hardware Installation Guide*
- *DC-900-2017: Freeway 3212 Hardware Installation Guide*
- *DC-900-2018: Freeway 3412 Hardware Installation Guide*
- *DC-900-2019: Freeway 3612 Hardware Installation Guide*
- *DC-900-2026: Freeway 3114 Hardware Installation Guide*
- *DC-900-2027: Freeway 3214 Hardware Installation Guide*
- *DC-900-2028: Freeway 3414 Hardware Installation Guide*
- *DC-900-2032: Freeway 3115 Hardware Installation Guide*
- *DC-900-2033: Freeway 3215 Hardware Installation Guide*
- *DC-900-2034: Freeway 3415 Hardware Installation Guide*
- *DC-900-2035: Freeway 215 Hardware Installation Guide*

## 3.1. Serial Console Port

Each Freeway model provides one serial console connection, as a male DB-9 on the rear of the Freeway chassis. This connection uses the EIA-232 electrical interface and a standard asynchronous protocol with 8 data bits, no parity bit, and 1 stop bit, full-duplex, at 9600 bits per second. The service provided by this port is direct login access: a serial terminal such as a VT-100 can be connected to this DB-9 connector, and the VT-100 can then be used for console-level access to the Freeway (a login prompt will appear on the VT-100 when the Freeway is booted, and a user can login and execute commands). A software terminal program such as tip (in Unix) or hyperterm (in Windows) can be used instead of a VT-100, if desired. See the *Freeway User's Guide*, Protogate document DC-900-1333, for more details.

## 3.2. VGA Video Port

Each Freeway model provides one VGA connection, as a 3-row female DB-15 on the rear of the Freeway chassis. A VGA monitor can be plugged into this connector, and used to view status displays of the early boot sequence

processing of the Freeway. In addition, the VGA monitor will display a login prompt when the Freeway is booted, and if a keyboard is plugged into either the keyboard connector or one of the USB connectors, then a user can login and execute commands, using the keyboard and VGA monitor. See the *Freeway User's Guide*, Protogate document DC-900-1333, for more details.

### 3.3. PS/2 Keyboard Port

Each Freeway model provides one PS/2 keyboard connection, which is a round 6-pin mini-DIN connector on the rear of the Freeway chassis. A PS/2 keyboard can be plugged into this connector, and used to login to the Freeway (a VGA monitor must also be plugged into the Freeway to see the results of what is typed on the keyboard). See the *Freeway User's Guide*, Protogate document DC-900-1333, for more details.

### 3.4. USB Keyboard Port

Each Freeway model provides one or more USB ports, which can be used to connect a USB keyboard (the BIOS is normally configured to deny use of anything other than a keyboard, in all USB ports). These USB ports are on the rear of the Freeway chassis, and some Freeway models also include USB ports on the front of the chassis. When a USB keyboard is plugged into this connector, that keyboard can be used to login to the Freeway (a VGA monitor must also be plugged into the Freeway to see the results of what is typed on the keyboard). See the *Freeway User's Guide*, Protogate document DC-900-1333, for more details.

### 3.5. Ethernet (IP) Ports

Each Freeway model has one or more Ethernet connections. These are RJ-45 sockets, in the rear of the Freeway chassis. These provide 802.3-standard Ethernet ports for the Freeway, at 10baseT/UTP (half-duplex or full-duplex), 100baseTX (half-duplex or full-duplex), 1000baseSX (full-duplex only), or 1000baseTX (full-duplex only). These RJ-45 Ethernet sockets can be configured as IP connections to the Freeway, either with their own IP address, or as failover connections, which become active only when another, primary IP connection, fails or is disconnected. See Section 3.7 for descriptions of the TCP/IP and UDP/IP ports and services which may be implemented on a Freeway's IP network.

### 3.6. Serial Link Ports

Freeways can be built to include one or more ICP (Intelligent Communications Processor) boards. When installed into a Freeway, each ICP board adds support for 2, 4, or 8 serial data communication ports. These ports are configured by the Freeway to support one of a variety of serial-link protocols; the Freeway configures each ICP board by downloading software into it which implements the desired protocol.

Once downloaded and initialized, each serial link port on an ICP board can be individually configured for a wide variety of electrical interfaces, data rates, encoding types, etc., and is then available to be used by clients to send or receive data, via whatever methods the protocol allows. The clients which send and receive data through the ICP

board ports may reside within the Freeway, or they may reside on another machine on the network, and connect to the Freeway across the Ethernet (IP) network, using the service described in Section 3.7.8. See the *Freeway User's Guide*, Protogate document DC-900-1333, for general information about the ICP serial link ports, and any of Protogate's specific protocol documents (for example, the *Asynchronous Wire Service (AWS) Programmer's Guide*, Protogate document DC-900-1324), for details about a particular protocol.

## 3.7. IP Ports

Freeways usually have several IP (Internet Protocol) ports open, with one or more daemons listening for clients to connect on those ports. Some Freeways also have processes which use the IP network to connect to IP ports on other servers. This section describes those IP ports and the services that use them.

The following list of IP ports includes those which are commonly open or used on Freeways. However, this list is not exclusive or exhaustive; any or all of the ports listed here may be disabled or blocked on any specific Freeway, and other ports not listed here may be enabled. The specific configuration of each Freeway must be checked to determine which ports are open and useable on that Freeway. To discover directly which IP ports are open or in use on a specific Freeway, login to the Freeway and run the `sockstat` command. And to find which IP ports are blocked by the Freeway firewall, run the `ipfw show` command.

Some Freeway systems have custom-written SRA (Server Resident Application) daemons running. SRAs usually open and listen on one or two TCP/IP ports, which are used by clients to connect to that SRA to send commands to it, and to send and receive data. Those TCP/IP ports are specific to those Freeway systems, and are not included or described here.

### 3.7.1. FTP (TCP/IP Port 21)

**Note:** TCP/IP port 21 is open on most Freeway systems, though on secured Freeways the FTP daemon is configured to allow only RFC2228-compliant FTP-TLS or FTP-SSL encrypted connections.

Most Freeways are configured to listen on TCP/IP port 21. When a program such as an FTP client (for unsecured Freeway) or SFTP client (for secured Freeway) connects to that port, an FTP server daemon in the Freeway accepts FTP requests, and returns the results of those requests to the requesting client.

### 3.7.2. SSH (TCP/IP Port 22)

Most Freeways are configured to listen on TCP/IP port 22. When a user uses an SSH (Secure Shell) client to connect to that port, that client can use the SSH protocol to establish a secure, encrypted connection, allowing the user to login to the Freeway.

### 3.7.3. telnet (TCP/IP Port 23)

**Note:** TCP/IP port 23 is open on most unsecured Freeway systems, and is closed (disallowed) on most secured Freeways. On secured Freeways, users are expected to use SSH (TCP/IP port 22) for login access (see Section 3.7.2).

Some Freeways are configured to listen on TCP/IP port 23. When a user uses a telnet client to connect to that port, that client can use the telnet protocol to establish a session, allowing the user to login to the Freeway.

### 3.7.4. Webserver (TCP/IP Port 80)

**Note:** TCP/IP port 80 is open on some unsecured Freeway systems, but is closed (disallowed) on most secured Freeways. On secured Freeways, users are expected to use HTTPS (TCP/IP port 443) for web access. (see Section 3.7.6).

Some Freeways are configured to listen on TCP/IP port 80. When a client such as a webbrowser connects to that port, a webserver daemon in the Freeway accepts HTTP webpage requests, and returns webpages to the requesting client. See also Section 3.7.6.

### 3.7.5. SMUX (TCP/IP Port 199)

**Note:** TCP/IP port 199 is open on most unsecured Freeway systems, and is closed (disallowed) on most secured Freeways, because most secured Freeway systems have SNMP disabled.

Some Freeways are configured to enable an SNMP daemon. When that daemon is running, it listens on TCP/IP port 199 for SNMP Mux requests (and also on UDP/IP port 161 for SNMP requests, as described in Section 3.7.10). When a process connects to the SMUX port, that process can use the SMUX protocol to communicate with the SNMP agent in the Freeway.

### 3.7.6. Secure Webserver (TCP/IP Port 443)

Some Freeways are configured to listen on TCP/IP port 443. When a client such as an https-capable webbrowser connects to that port, it can use the HTTPS protocol to establish a secure, encrypted connection with the webserver daemon in the Freeway. The webserver daemon in the Freeway will then accept HTTPS webpage requests from the client, and return webpages to it, following the HTTPS protocol. See also Section 3.7.4.

### 3.7.7. rlogin (TCP/IP Port 513)

**Note:** TCP/IP port 513 is open on most unsecured Freeway systems, and is closed (disallowed) on most secured Freeways. On secured Freeways, users are expected to use SSH (TCP/IP port 22) for login access (see Section 3.7.2).

Some Freeways are configured to listen on TCP/IP port 513. When a user uses an rlogin client to connect to that port, that client can use the rlogin protocol to establish a session, allowing the user to login to the Freeway.

### 3.7.8. Freeway Daemon (TCP/IP Port 8208)

Most Freeways are configured to listen on TCP/IP port 8208 (hex 0x2010) for connections to the Freeway daemon. (That port number is the default, but it might be different on a particular Freeway if an administrator has changed the `wellknownport` parameter of the `/tmp/boot/muxcfg` configuration file.) Client programs which connect to this port can use Protogate's DLI/TSI packet commands to configure, enable, completely control, and send and receive data through the serial link ports on the ICP boards installed in that Freeway. See the *Freeway Client-Server Interface Control Document*, Protogate document DC-900-1303, the *Freeway Data Link Interface (DLI) Reference Guide*, Protogate document DC-900-1385, and the *Freeway Transport Subsystem Interface (TSI) Reference Guide*, Protogate document DC-900-1386, for more details.

### 3.7.9. NTP (Network Time Protocol; UDP/IP Port 123)

Some Freeways are configured to listen for datagram packets on UDP/IP port 123. That allows NTP (Network Time Daemon) processes on any systems within network reach of that Freeway to use the NTP protocol to communicate with the NTP daemon in the Freeway. Those NTP daemons can share information with the Freeway, and with their pooled resources; together all the NTP systems (including the Freeway) can determine the best possible estimate of the correct time, even if some of the hardware clocks in some of those systems are not accurate.

### 3.7.10. SNMP (UDP/IP Port 161)

**Note:** UDP/IP port 161 is open on most unsecured Freeway systems, and is closed (disallowed) on most secured Freeways, because most secured Freeway systems have SNMP disabled.

Some Freeways are configured to enable an SNMP daemon. When that daemon is running, it listens on UDP/IP port 161 for SNMP requests (and also on TCP/IP port 199 for SMUX requests, as described in Section 3.7.5). By sending SNMP datagram packets to a Freeway's SNMP port, an SNMP client can communicate with the SNMP agent in that Freeway.



### **3.7.11. syslogd (UDP/IP Port 514)**

Some Freeways are configured to enable a syslogd daemon, which may be configured to listen for syslog request datagrams on UDP/IP port 514. By sending datagram packets containing syslog commands to a Freeway's syslog port, another system can communicate with the Freeway's syslogd daemon, and write log entries into the Freeway's log files.

# Chapter 4. Notes

This chapter contains general information to aid in understanding this document.

**Table 4-1. Acronym definitions**

<b>Acronym</b>	<b>Definition</b>
DLI	Data Link Interface
FTP	File Transfer Protocol
HTTP	HyperText Transfer Protocol
HTTPS	HyperText Transfer Protocol, Secure
ICP	Intelligent Communication Processor
IP	Internet Protocol
NTP	Network Time Protocol
PPS	Ports, Protocols, and Services
SFTP	Secure File Transfer Protocol
SMUX	SNMP Multiplex protocol
SNMP	Simple Network Management Protocol
SRA	Server Resident Application
SSH	Secure SHell
TCP/IP	Transmission Control Protocol / Internet Protocol
TSI	Transport Subsystem Interface
UDP/IP	User Datagram Protocol / Internet Protocol

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(see DLI)

FTP (File Transfer Protocol)

(see FTP)

HTTP (HyperText Transfer Protocol)

(see HTTP)

HTTPS (HyperText Transfer Protocol, Secure)

(see HTTPS)

ICP (Intelligent Communications Processor)

(see ICP)

IP (Internet Protocol)

(see IP)

NTP (Network Time Protocol)

(see NTP)

PPS (Ports, Protocols, and Services)

(see PPS)

SFTP (Secure File Transfer Protocol)

(see SFTP)

SMUX (SNMP Multiplex protocol)

(see SMUX)

SNMP (Simple Network Management Protocol)

(see SNMP)

SRA (Server Resident Application)

(see SRA)

SSH (Secure Shell)

(see SSH)

TCP/IP (Transmission Control Protocol/Internet Protocol)

(see TCP/IP)

TSI (Transport Subsystem Interface)

(see TSI)

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# Customer Report Form

## Customer Report Form

We at Protogate are constantly striving to improve our products. If you have any suggestions or problems you would like to report regarding our hardware, software, or documentation, please complete the following form and mail it to us at Protogate, Inc., 12225 World Trade Drive, Suite R, San Diego, CA, 92128, USA. Or email a PDF or a plain text copy of the form to <support@protogate.com> , or call us at (US) (858) 451-0865. Please also include the document title or number and the section and page number, if applicable.

Your Name and Phone Number:

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Company:

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Address:

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Product:

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Problem or Suggestion:

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Thank you.