


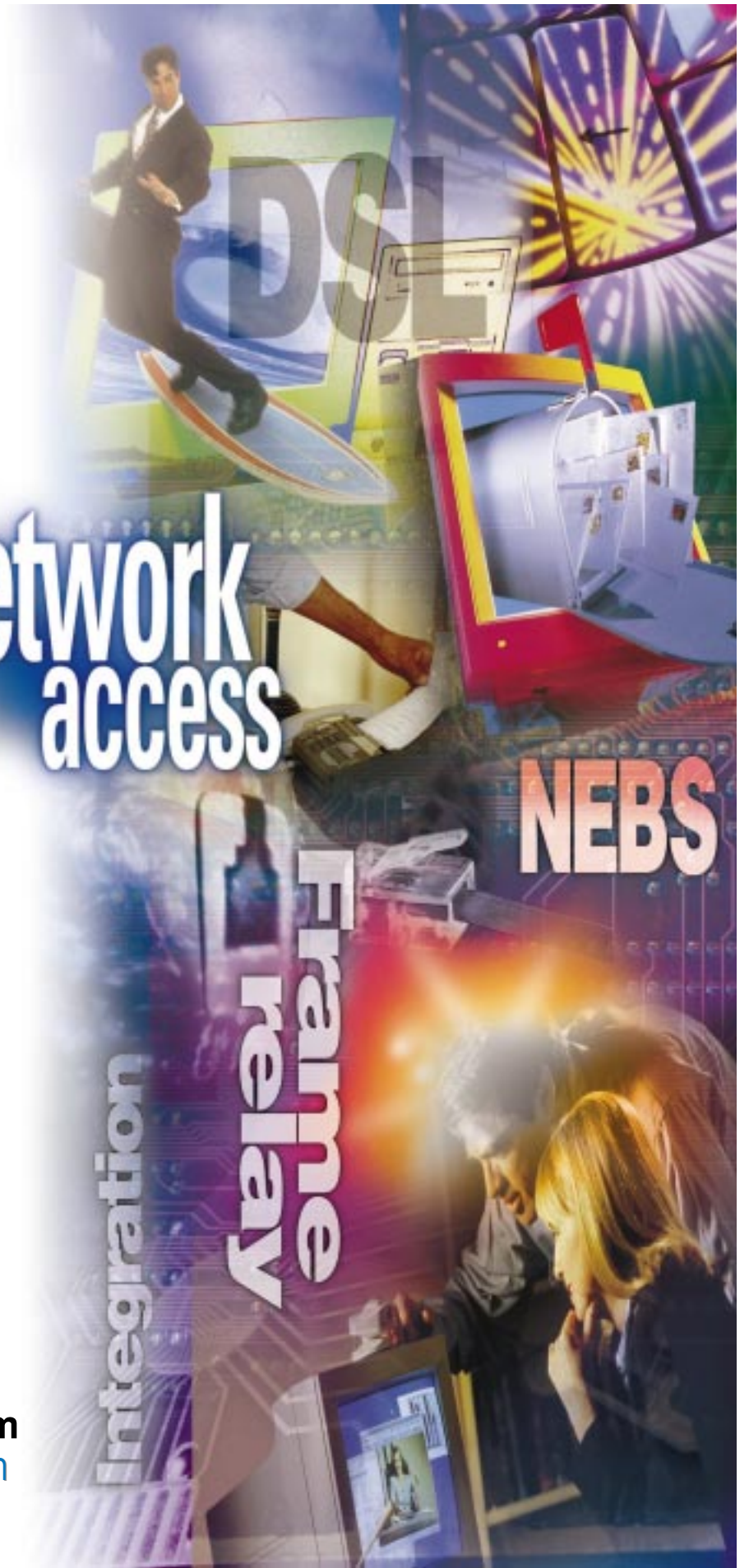
FRAME RELAY ACCESS
THAT OPENS A WINDOW
TO THE POWER OF THE
NETWORK

Network access

innovxTM

PRODUCT OVERVIEW

 **General DataComm**
Network Access Division



Innovx Product Overview

FRAME RELAY ACCESS THAT OPENS A WINDOW TO THE POWER OF THE NETWORK

TABLE OF CONTENTS

| | |
|---------------------------------------|----|
| Preface | 1 |
| Introduction | 2 |
| Product Strategy | 2 |
| Innovx Family | 3 |
| Architecture | 4 |
| Key Features | 6 |
| Network Management | 7 |
| Innovx Frame Manager | 9 |
| Conclusion | 11 |
| Appendix A — Specifications | 12 |
| Appendix B — Glossary | 14 |

PREFACE

Most existing support tools such as portable analyzers, RMON probes, and carrier supplied reports do not provide the sophisticated, robust system needed for the management of today's frame relay networks. Many current network management systems are designed for the circuit switched, not the packet switched world. The *innovx*[™] family of "frame aware" products is one of the first systems to supply a complete network management toolset including performance monitoring, troubleshooting, network baselining and long term planning for frame relay environments. For enterprise users, the *innovx* family quickly pays for itself by allowing users to fully utilize bandwidth, which ultimately controls recurring frame relay costs. For service providers, *innovx* delivers a way to differentiate their frame relay service offerings in the highly competitive frame relay market.

INTRODUCTION

GDC's *innovx*™ is a family of next generation, “frame aware” access products designed to open a window to the power of the network. The overall goals of *innovx* (Figure 1) are to create highly intelligent, “carrier-class” products for packet networks that are built on frame relay, IP, and ATM technology, leveraging the power of the LAN, Internet and PC. *Innovx* has a hardware platform with ample memory that matches the processing power of today’s computer architectures and a Windows/Internet-ready software platform that is familiar to any PC user. The current members of the *innovx* family — the *innovx* 553, *innovx* 553 Plus, and the *innovx* MSP — are highly intelligent, frame relay monitoring probes. As such, they recognize the users’ “right to know” about their frame relay service investment, as well as the carriers’ need for convenient, cost-effective access at the customers’ premises.

PRODUCT STRATEGY

When looking for a service that can efficiently and economically connect multiple enterprise locations, many network administrators and planners are choosing frame relay. The benefits of frame relay for LAN internetworking are increased bandwidth efficiency, with more payload available for primary data and less overhead as compared to T1 ATM. Inherent compatibility with LAN-based, connectionless protocols as compared to connection-oriented T1 services is a plus. It adapts well to bursty traffic from LANs. In addition, since frame relay can interwork with higher order ATM backbones per the FRF.5 and FRF.8 specifications, and more recently per the Frame UNI, it will be an essential component in any broadband networking model.

In terms of sophistication and intelligence, frame relay access approaches must now play catch-up with the growth in demand for frame relay services. The traditional FRAD, or Frame Relay Access Device (also

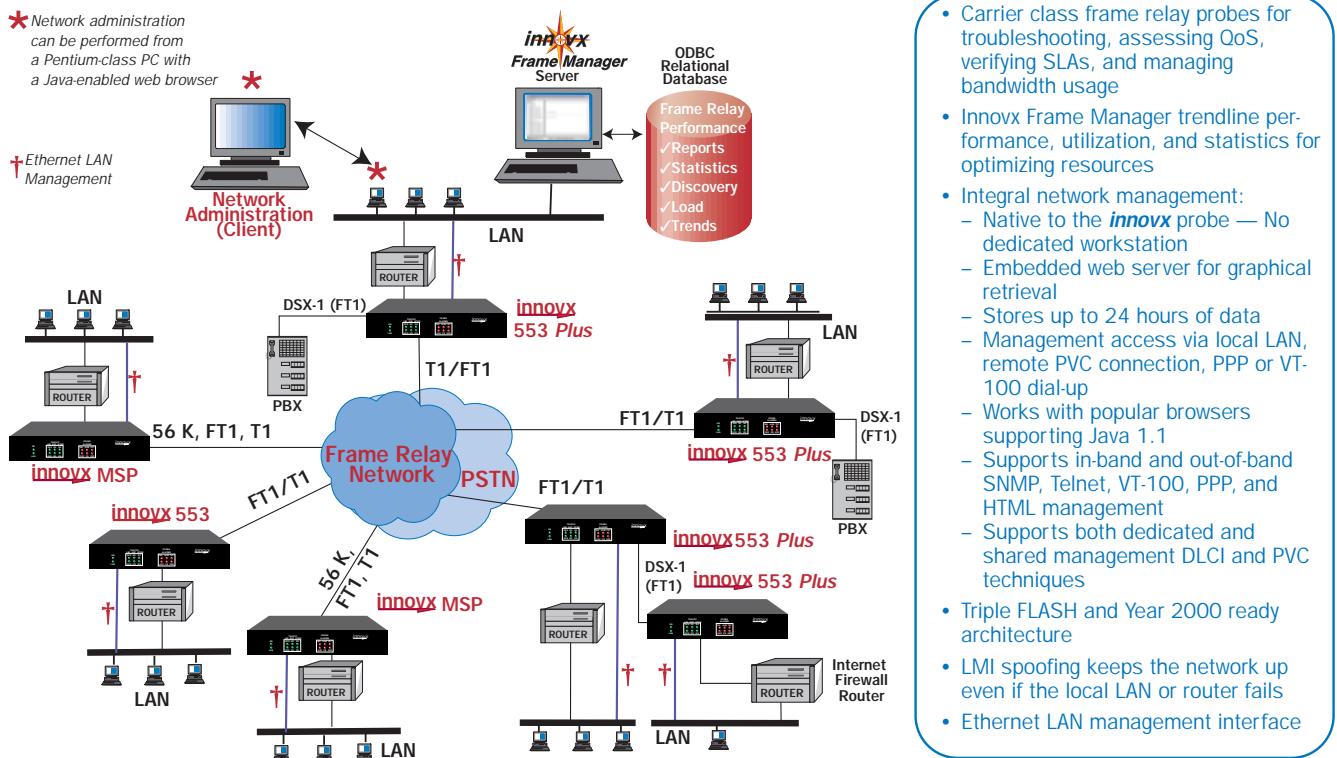


FIGURE 1 — INNOVX OPENS A WINDOW TO THE POWER OF THE NETWORK

referred to as a frame relay assembler/disassembler), whether it is a standalone device or embedded in the router, does little more than provide basic connectivity. This can be a serious limitation when talking about a connectionless service whose protocol transparency and dynamic nature does not leave much to the customer in terms of monitoring, assessing quality of service, and trouble shooting. The passive frame relay probe, while useful as a limited defense mechanism, does not provide the WAN connectivity or the data collection and storage capabilities needed to assess frame relay services and ensure consistent Quality of Service (QoS).

Without insight into the frame relay network, users lose awareness of network performance, line impairment conditions and alarms. SLAs (Service Level Agreements) provided by the carrier cannot be verified. Both carriers and the customer benefit from a means of verifying SLAs, with savings going straight to the “bottom line”:

- Customer Premises — cost-effective network management and planning requires real feedback on service quality
- Carrier — SLA verification can be bundled into new value-added frame relay services.

INNOVX FAMILY

INNOVX MSP

The *innovx* MSP (Multiple Service Platform) supports 56/64 kbps access to frame relay but can be software upgraded to FT1 or full T1 speeds. Customers can use the MSP as an entry-level vehicle to frame relay access, or at specific sites in the network that need 56/64 kbps access only, with the assurance that they will not have to purchase a new piece of hardware when their bandwidth requirements increase. At 56/64 kbps, MSP supports up to 8 Permanent Virtual Circuits (PVCs). With the software service upgrade, the MSP becomes capable of supporting up to 127 PVCs at full T1 rates.

INNOVX 553

The *innovx* 553 contains an integral, GDC carrier-class T1/FT1 CSU/DSU for frame relay service access at N x 56/64 kbps rates from 56 kbps to 1.536 Mbps (where N=1 to 24). Supporting up to 127 PVCs, it is designed for sites where higher speed LAN/router applications demand fractional or full T1 bandwidth.

INNOVX 553 PLUS

Like the *innovx* 553, the 553 Plus supports T1/FT1 interfaces but with a bonus — a drop-and-insert port that supports a DS1/DSX-1 interface (Figure 2). This means the 553 Plus can accept not only router LAN traffic but voice traffic from a PBX. It also makes pos-

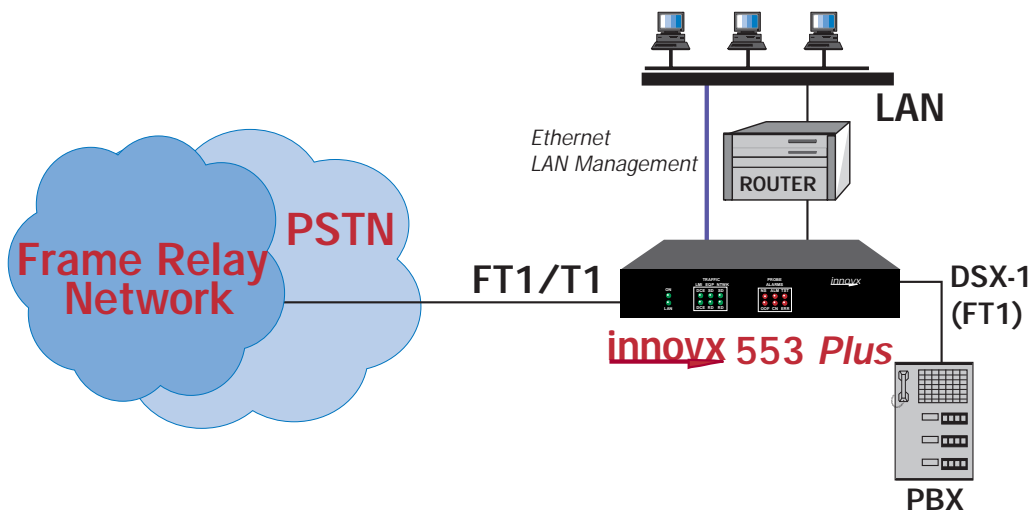


FIGURE 2 — INNOVX 553 IN CASCADE CONFIGURATION

TABLE 1 — INNOVX FAMILY PRODUCT AT A GLANCE

| Model | <i>innovx</i> MSP* | <i>innovx</i> 553 | <i>innovx</i> 553 Plus |
|--------------------|---------------------------------------------------|--------------------------------------------------------|--------------------------------------------------------|
| Data Rates | 56/64 Kbps, upgradeable to T1/FT1* | N X 64 Kbps (FT1) to 1.536 Mbps where N = 1 to 24 DSOs | N X 64 Kbps (FT1) to 1.536 Mbps where N = 1 to 24 DSOs |
| Network Interfaces | DDS/GDS | DS1 or DSX-1 | DS1 or DSX-1 |
| DTE Interfaces | ITU-T V.35, EIA-530, EIA-530A, X.21, V.28, RS-422 | ITU-T V.35, EIA-530, EIA-530A, X.21, V.28, RS-422 | ITU-T V.35, EIA-530, EIA-530A, X.21, V.28, RS-422 |
| PVCs Supported | 8 at 56/64 Kbps Up to 127 at Full T1 | Up to 127 at Full T1 | Up to 127 at Full T1 |

*** Service Upgrades Via Software Download**

innovx MSP 56/64 Kbps to 384 Kbps FT1

innovx MSP 384 Kbps FT1 to Full T1

innovx MSP 56/64 Kbps to Full T1

sible cascade configurations that extend the range and the reach of the probe, bringing remote sites into the network.

Table 1 summarizes the three *innovx* models.

ARCHITECTURE

POWERPC HARDWARE PLATFORM

Innovx features a unique hardware design that allows it to operate independently within the enterprise network, with no need for a separate dedicated management workstation. Inside *innovx* is a powerful computing engine that uses the latest in PowerPC technology with ample memory to achieve high speed digital processing.

Many frame relay probes have higher end-to-end latency because they use a “store-and-forward” method to process frames. *Innovx* processes frames immediately upon entry, so it has very low latency compared to other products in its class. The *innovx* computing platform supports a CPU capable of processing up to 50 MIPS and an abundant Triple FLASH ROM for storing the factory default system, the currently running configuration and for storing new or alternative downloaded software. Also housed in ROM is a Web Server, supporting HTML and Java, for simplified configuration, diagnostics, and graphical retrieval. An equally generous RAM stores up to 24 hours of performance events and traffic statistics.

CARRIER-CLASS CSU/DSU TECHNOLOGY

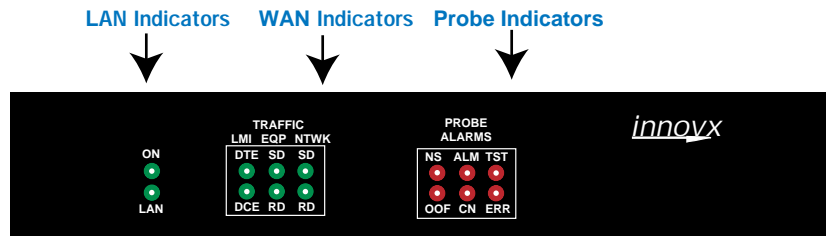
GDC is known for its superior, time-tested digital access technology — technology trustworthy enough for service providers’ critical internal networks for over 20 years. This technology is incorporated in the *innovx* platform. In the 553 and 553 Plus, an internal CSU supports AMI or B8ZS data encoding and D4, AT&T 54016 ESF, and ANSI T1.403 ESF. In the MSP, an internal multiple service DSU features GDC’s renowned Extended Dynamic Range capability that assures trouble-free operation, even over lines with very low signal levels, such as unusually long subscriber loops.

Unlike the competition, *innovx* takes full advantage of the built-in CSU/DSU. Users can utilize the web access or the local LAN management ports to enable Layer 1 physical CSU/DSU test capabilities. *Innovx* fully supports conventional DDS Loop Tests, Line Loopback, Payload Loopback and Channel Loopback, all enabled via an easy to use GUI.

PACKAGING AND POWER

Innovx is packaged in a sturdy, compact enclosure measuring 8.1 inches (205.6 mm) wide by 2 inches (50.8 mm) high by 6.25 inches (158.6 mm) deep that fits on the customer desktop or in the wiring closet. It is powered by an internal power supply, avoiding extra hardware clutter and expense.

Easy to spot LAN, WAN, and Probe LED indicators on the front panel (Figure 3) — which are uniform for all family members — call out status and alarm conditions.

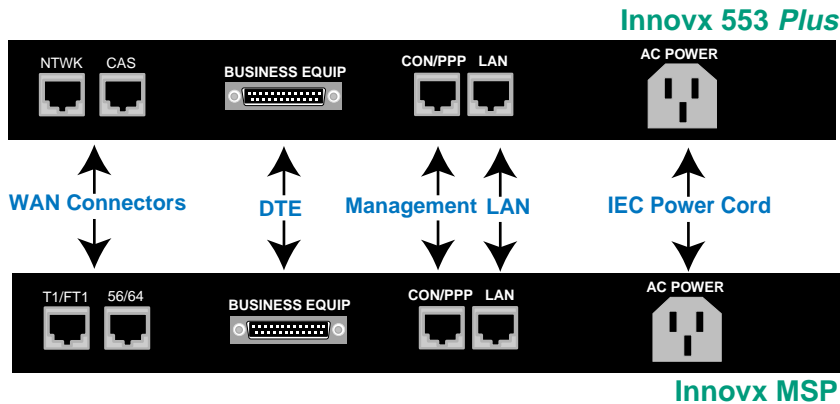


| FRONT PANEL INDICATORS | | | |
|------------------------|--------------------------------------------------|-------|-----------------------------------------------|
| LAN = | LAN Ethernet interface status LED | TST = | Test condition active |
| LMI DTE = | Data LMI poll/resp. from DTE equipment to Innovx | ALM = | Alarm condition active |
| LMI DCE = | Data LMI poll/resp from innovx to network | OOF = | T1/FT1 circuit out of frame condition |
| EQP SD = | Data originating from DTE interface | NS = | No signal indicator |
| EQP RD = | Data presented to DTE interface | CN = | Frame Relay FECN/BECN congestion notification |
| NTWK SD = | Data presented to network circuit | ERR = | Error indicator |
| NTWK RD = | Data originating from network circuit | | |

FIGURE 3 — INNOVX FRONT PANEL

The rear panel connectors (Figure 4) include two RJ45 connectors for WAN connection, a DB25 connector for serial business equipment DTE physical interfaces, an RJ45 connector for local management using a VT-100 style terminal or for out-of-band

management via PPP; an RJ45 connector for Ethernet LAN attachment (IEEE 802.3), and an IEC power connector.



| REAR PANEL CONNECTORS | |
|----------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| CON/PPP — The CON/PPP Port is an RS-561-compatible RJ45 jack supporting 9600 bps asynchronous data and providing terminal interface control | CAS — The Cascade Port interface is an RJ48C jack supporting T1 connectivity used to accept PBX or LAN traffic |
| LAN — The LAN Port supports 10Base-T connectivity for out-of-band SNMP management | BUSINESS EQUIP — The Business Equipment Port interface is a universal DB-25 connector. Users can select from the following supported protocols: V.35, EIA-530A, X.21, RS422/RS449, V.28 |
| NTWK — The Network Port interface is an RJ48C jack supporting T1 connectivity | |

FIGURE 4 — INNOVX REAR PANELS

KEY FEATURES

FRAME RELAY VERIFICATION

Frame Relay WAN downtime includes not only hard downtime in the traditional sense, when connections are not operational or are unavailable to the user, but also service degradation, where a severe decrease in performance results in reduced availability. In terms of lost productivity and revenue loss, service degradation may have as severe an impact as hard downtime but is much harder to predict or detect.

Innovx Takes the Mystery Out of SLAs

Frame Relay Service Level Agreements (SLAs) are sold by the service provider as part of the frame relay service and offered by IT management to corporate users. *Innovx* probes can be a source of real feedback on service quality — but only if you have access to the right performance data to measure them. Each *innovx* probe records the necessary performance information on a per PVC basis: Service providers can verify that SLAs are being delivered and enterprise users can determine if the service received meets the SLA. As a result, users can potentially renegotiate the SLA, lowering the overall cost of the Frame Relay Service.

Innovx supports an expanded SLA paradigm that embraces the basics:

- network availability
- PVC availability
- network delay
- PVC throughput

As well as the finer points:

- end-to-end frame loss
- Forward and Backward Explicit Congestion Notifications (FECNs and BECNs,)
- Discard Eligibility (DE) frames
- Local Management Interface (LMI) statistics (timeouts and no responses)
- bandwidth utilization
- Committed Information Rate (CIR) utilization.

EARLY WARNING SYSTEM FOR FT1/T1

Innovx probes are also early warning watchdogs of physical layer, DDS/GDS or FT1/T1 network troubles



- ✓ Frame Relay and T1 Alarm Screens for Channel and the LMI Interface, plus Alarm Summaries

and performance problems. Internal to each *innovx* is a rapid-response alarm system, fully customizable to up to 25 events. For T1/FT1 lines, “Near Simultaneous” ESF performance reporting complies with both ANSI T1.403 and TR 54016 specifications. Front panel alarm indicators report instantaneously — via the web-based management facility — any and all alarm conditions, ensuring fast pinpointing of the exact location of system problems, with no need to dispatch a technician to a remote site.

LOCAL STATISTICS STORAGE

The *innovx* probe stores up to 24 hours of information, providing ample information of performance degradation without taxing memory or platform resources. *Innovx* leaves the more extensive history gathering to the separate Innovx Frame Manager software, if and when you need more reporting power and reach. Even if the network is unavailable, *innovx* probes continue to collect and store crucial information regarding network availability, performance, faults, errors, etc. Since *innovx* does not require a separate network management station for data collection, statistics can be gathered — regardless of the condition of the frame relay service — directly from the probe through a user’s choice of access methods.

BUILT-IN LMI POLLING

A typical FT1/T1 frame relay network application involves a router and the frame relay access device located between a router and the network. Frame relay's Local Management Interface (LMI) is a management protocol where special management frames containing status inquiry messages are passed between the network and the router to determine the status of the connection. Frame relay access solutions must supply an efficient way of handling LMI polls in order to bring the service up with as little delay as possible, while still providing a response to LMI inquiries — even if the router fails. The *innovx* responds to LMI polls from the network by acting as a frame relay DCE device on the customer side and also behaving as a DTE on the network interface. *Innovx* puts an end to “finger pointing” between router and circuit issues.

PLUG AND PLAY, EASY TO INSTALL

For all their sophistication, *innovx* probes are plug-and-play devices that are designed for easy installation and reliable remote operation. Each unit is LAN-attachable with its own IP address, so that diagnostic packets can be routed to and from the device.

VERSATILE FRAME RELAY ACCESS

The *innovx* product line is structured to enable both DDS/GDS and FT1/T1 frame relay access. The products are adaptable for future protocols and transports via simple downloads. This enables a migration path that fits current and future network needs with a smooth transition and easy upgrade to higher speeds.

NETWORK MANAGEMENT

MANAGEMENT VIA THE INTERNET

There is nothing more frustrating and time and resource consuming than having to learn a new network management system or re-engineer your existing system when you introduce a new service such as frame relay. Like older legacy management approaches, many competitor's frame relay management systems still require a separate, dedicated management console with a custom software package. Meanwhile, users at their PCs have an easy way to window into IP devices via TCP/IP and the Web. *Innovx* leverages this readily available web access power by:

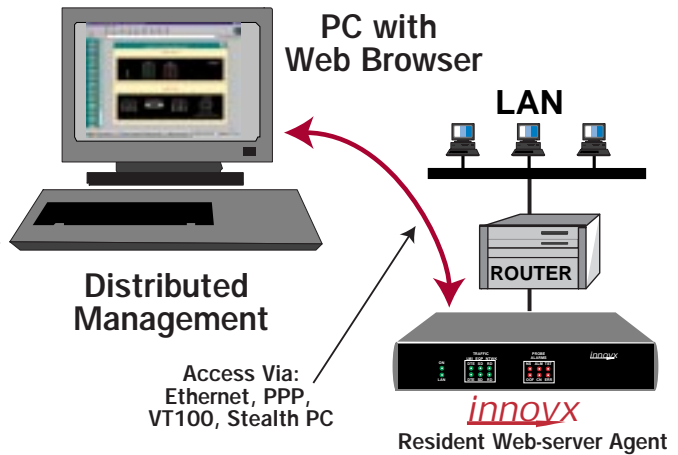


FIGURE 5 — MANAGEMENT VIA THE INTERNET



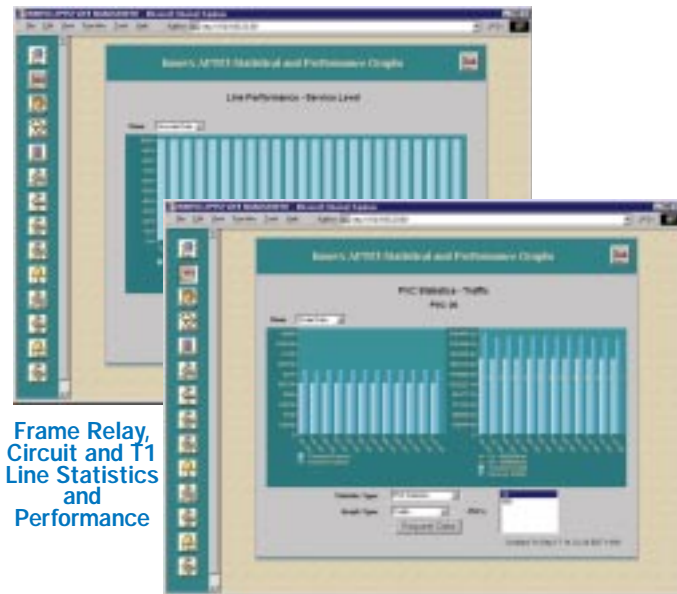
Innovx Home Web Page

- ✓ A front and rear Panel graphic depiction of the *innovx* unit with real-time status indicators for displaying alarm conditions, etc.
- ✓ SNMP and Frame Relay management that is native to each *innovx* unit
- ✓ Use of an out-of-band distributed, client/server management model
- ✓ Built-in Web server for each *innovx* probe
- ✓ Use of the Internet for instant access to management tools and data

Here's how it works (Figure 5). Management data is collected and processed not by a management station but by the “server” *innovx* units in the network. Information gathered ranges from line and channel statistics all the way to individual PVC statistics. A Web server agent resident in each *innovx* probe allows

Table 2 – *Innovx* Report Categories

| Category | Description/Graph Choices |
|----------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------|
| Line Performance Availability, Throughput/Utilization, Service Level | T1 performance data for previous 24 hour period |
| Line Statistics Error Counts, Errored Seconds | T1 statistics for previous 24 hour period |
| Channel Performance Availability, Load | Aggregate frame relay performance data for aggregate frame relay channel |
| Channel Statistics Traffic, LMI, BECN and FECN, IP Management Polls, Keep Alive Polls | Aggregate frame relay statistics for aggregate frame relay channel |
| PVC Performance Average Round Trip Delay, DTE Availability, Load, Excess CIR and EIR, Frame Delivery | Individual PVC performance data for previous 24 hour period |
| PVC Statistics Traffic, DE Frames, BECN and FECN, Keep Alive Polls | Individual PVC statistics for previous 24 hour period |

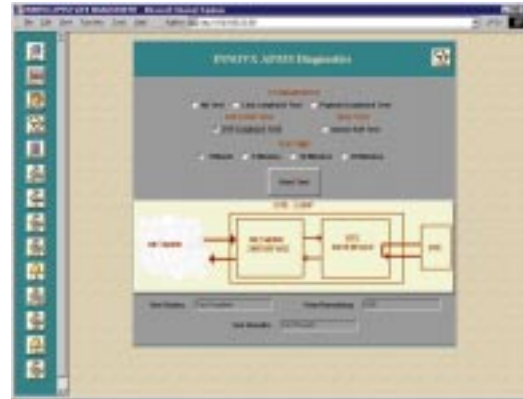


Frame Relay, Circuit and T1 Line Statistics and Performance

- ✓ Frame Relay and T1 Statistics Screens featuring up-to-the-minute, real-time reporting for the last 24 hours, last four hours, last hour, down to the most recent 15 minute interval. Throughput, utilization, congestion, bursting, and errors are just a few of the items that can be monitored both in real-time and historically. (Table 2)
- ✓ Drill-down fault isolation starting at the physical layer and traversing into each individual PVC.

ordinary web browsers to view configurations and reports via popular web browsers on the user's PC. All network administrators have to do is connect to the Internet, open a web browser application, such as Microsoft's Internet Explorer or Netscape's Navigator, and enter the IP address of the unit. The *innovx* home page appears with tool bar buttons for access to HTML screens for configuration, diagnostics and alarm reporting.

FIGURE 6 — INNOVX SCREENS



Diagnostics

- ✓ Diagnostic Screens featuring standard self test and loopback testing to isolate system troubles.



Configuration

- ✓ Configuration Screens for PVC Options

Drill down screen design not only helps the user to quickly gain information on the global network environment, but allows precise analysis whenever needed. Access can be via the local LAN or through a remote TCP/IP connection. Figure 6 shows sample screens as they appear on the web browser.

INNOVX FRAME MANAGER STAY THE COURSE...



**FIGURE 7 —
FRAME
MANAGER
STARTUP**

RESOURCE MANAGEMENT AND PLANNING

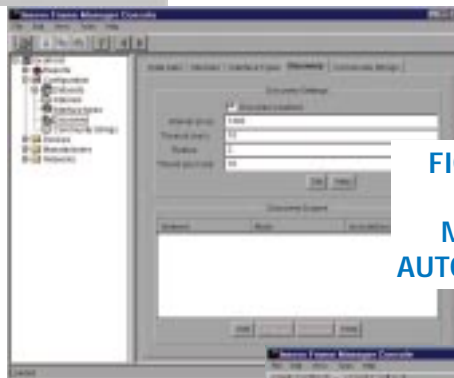
Standard on-board *innovx* management gives you the support data you need to keep afloat in the waters of new services and technologies. *Innovx* Frame Manager — GDC's optional Windows NT-based enterprise network management software application — allows you to steer your network in the right direction. Especially useful in large enterprise networks, it provides long range planning tools for ensuring efficient management of bandwidth and other network resources, anticipating usage change in the network, and cost-justifying network changes and growth.

The platform for *Innovx* Frame Manager is a Windows-NT based PC equipped with Innovx Frame Manager software. Because the Innovx Frame Manager runs under Windows NT and has a built-in installation Wizard utility, network managers who are familiar with PCs will find it very easy to install, configure, and operate. The application is Internet ready, with an integrated Web browser.

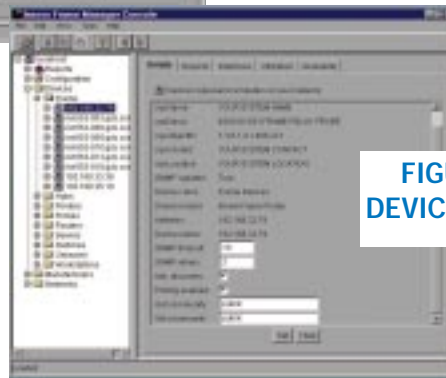
When running the Frame Manager application, the initial screen (Figure 7) introduces the application and shows a complete discovered-network hierarchy. An auto-discovery capability (Figure 8) finds and lists a

hierarchy of all the *innovx* devices in the network. Clicking on a device icon within the hierarchy reveals a device profile screen displaying information about the device including IP address and SNMP settings. (Figure 9)

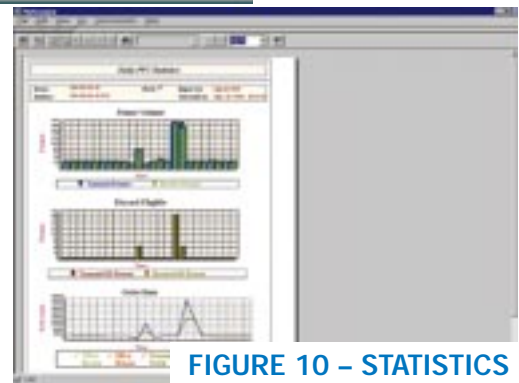
Frame Manager pulls data from each *innovx* probe at pre-defined intervals for up to 2,500 PVCs per management application license, processes it, and stores it in a relational database that provides a single point of access to valuable, long-term archives about network performance. Using this database, Frame Manager can generate detailed graphical reports either on-demand or in an automated fashion, in a variety of line, bar, and other graph formats (Figure 10). Reports can be implemented as a single grouped report or a series of reports.



**FIGURE 8 —
FRAME
MANAGER
AUTODISCOVERY**



**FIGURE 9 –
DEVICE PROFILE**



**FIGURE 10 – STATISTICS
AND PERFORMANCE
REPORTS**

Table 3 summarizes the *Innovx* Frame Manager Report categories. Network managers can use these reports to:

- ✓ Verify that frame relay Service Level Agreements (SLAs) are being met
- ✓ Audit network performance and establish normal performance ranges
- ✓ Assess efficiency of bandwidth usage
- ✓ Spot network trouble spots before they threaten performance and QoS
- ✓ Plan for and cost-justify network upgrades and enhancements

Table 3 — Frame Manager Report Categories

| Category | Description |
|---------------------------------------------------------|----------------------------------------------------------------------------------------|
| Line Performance | |
| Availability Graph | Percent of network availability on a daily, monthly or quarterly basis |
| Utilization | Percent of line utilization |
| Throughput | Throughput measure in bps |
| Service Level | Number of hours WAN interface has been error free |
| Line Statistics | |
| Errored Seconds | Number of seconds frame relay interface in an errored state, daily, monthly, quarterly |
| Errored Seconds Breakdown | By error category |
| Error Counts | Number of coding errors, number of circuit errors |
| Channel Performance | |
| Local and Remote Availability | Percent of time DTE and DCE unavailable, hourly, daily, monthly, quarterly |
| Transmit and Receive Load | For Average Load and for Total Load |
| Channel Statistics | |
| Channel Traffic | Total frames and octets |
| LMI | Management information transmitted for a given period |
| Congestion Indicators | BECN and FECN rates |
| IP Packets | IP Transmit and Receive Packet Rates |
| Keep Alive Polls | Number of keep-alives sent and received from a given probe |
| PVC Performance | |
| Average Round Trip Time | Average round trip delay between DLCI pairs |
| Local and Remote DTE Availability | Amount of time a PVC was unavailable due to remote or local DTE faults |
| Load | Average Transmit/receive load, total transmit/receive load over an hourly period |
| Excess CIR and EIR | Amount of time load exceeded CIR |
| Frame Loss | Percentage of transmit/receive frames lost compared to total transmit/receive frames |
| Real-time Round Trip Delay | Average of data captured on each 15 minute poll interval |
| PVC Statistics | |
| PVC Traffic | Total frames and octets |
| DE Frames | Number of frames detected by the probe and marked with Discard Eligible |
| BECN and FECN | Forward and Backward network congestion |
| Keep Alive Polls | Poll response performance from a local and remote standpoint |
| Other Reports (Congestion, Throughput, Bursting) | |
| Top 10 Busiest DLCIs | DLCIs with the highest utilization |
| Top 10 Errored DLCIs | DLCIs with greatest number of BECN/FECN congestion indicators |
| Top 10 Discard Eligible | DLCIs with the highest rate of frames detected to be discard eligible |

CONCLUSION

Innovx enables enterprise users and service providers alike to realize the clear benefits of frame relay. An investment in *innovx* will pay for itself quickly by optimizing Frame Relay network services. *Innovx* probes have built-in, proven GDC digital CSU/DSU technology and reliability — plus a state-of-the-art architecture for fast processing and storage of network data. *Innovx*' key claim to distinction is its ability to ensure QoS and verify Frame Relay SLAs. The key differentiator is a unique approach to management that is self contained and Internet-based. Downsizing to a passive probe minus CSU/DSU functions is also a possibility, giving customers even broader configuration options. *Innovx* scales from DDS/GDS to full T1 and will be protocol intelligent and ATM-cell aware as the family feature set expands. Finally, *innovx* is only one of GDC's standards-based access systems, which include V.34/V.90 modems; Line-by-Line and Integrated DDS, FT1, T1, T3 access products; and a Windows NT 4.0 RAS for Remote LAN access.

APPENDIX A — SPECIFICATIONS

Specifications

| Functional | Innovx 553/Innovx 553 Plus | Innovx MSP* |
|-----------------------------------|-------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------|
| Data Rates: | N x 56/64 Kbps to 1.536 Mbps, where N = 1 to 24 DS0s | 56/64 Kbps, synchronous Software upgradeable to FT1/T1 |
| Data Encoding: | AMI or B8ZS | Bipolar Return to Zero |
| Framing/Format: | D4, AT&T 54016 ESF, ANSI T1.403 ESF | Serial, synchronous, binary |
| Network Interface: | DS1 or DSX-1 | Conventional DDS; DDS/SC |
| Cascade Interface: | <i>Innovx 553 Plus</i> Only; DS1 or DSX-1 | N/A |
| DTE Interfaces: | V.35, EIA-530A, X.21, RS422/RS449, V.28 | IV.35, EIA-530A, X.21, RS422/RS449, V.28 |
| Dial-up Diagnostic Port: | EIA/TIA-232-E (DTE PPP Port) | EIA/TIA-232-E (DTE PPP Port) |
| Diagnostic Tests: | Line Loop, Payload Loop, Channel Loop | Conventional DDS Loops, Line Loop, Channel Loop |
| Number of PVCs Supported: | 127 | 8 (Up to 127*) |
| Network Management: | Locally via Ethernet; remotely via in-band PVC or dial-up PPP; from any SNMP compliant manager | |
| Logical Link Management: | Annex A, Annex D | |
| Monitoring: | Built-in 24 hour reports, sampled every second and accumulated in 15 minute increments | |
| LMI: | Spoofs LMI polls by acting as a frame relay DCE device on the customer side and as a DTE device on the network interface side | |
| Statistics | | |
| Line : | Errored Seconds, Error Counts, Error Free % Percentage | |
| Channel: | Channel Traffic, LMI, BECN and FECN, IP Packets, Keep Alive Polls | |
| PVC: | PVC Traffic, DE Frames, BECN and FECN, Keep Alive Polls | |
| Performance | | |
| Line: | Availability, Throughput/Utilization | |
| Channel: | Local and Remote Availability, Load | |
| PVC: | Average Round Trip Time, Local and Remote DTE Availability, Load, Excess CIR and EIR, Frame Loss, Real-time Round Trip Delay | |
| Physical and Environmental | | |
| Dimensions: | 8.1in. (205.6 mm) W x 2 in. (50.8 mm) H x 6.25 in. (158.6 mm) D | |
| Power Requirements: | 100-240 VAC 50/60 Hz; 8 Watt total power consumption at full load (4 on average) | |
| Operating temperature: | 32° to 104° F (0° to 40° C) | |
| Humidity: | 0 to 90% non-condensing | |
| Electrical: | FCC class A EMI certification | |
| Safety Protection: | UL/CUL 1950 3RD edition | |

* *Innovx* MSP can be upgraded to T1/FT1 via software download.

Innovx Frame Manager

| | |
|------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Platform: | One (1) <i>Innovx</i> Frame Manager license supporting up to 2,500 PVCs (average 100 probes) Windows NT – 450 Mhz Pentium II processor, 256 MB RAM, 4 Gbytes of disk space. (Dedicated application and monitoring platform with a minimum of other application usage.) |
| MIBs: | SNMP MIB II and enterprise MIB for <i>innovx</i> |
| Discovery: | <i>Innovx</i> devices only; automatic configuration of appropriate polling instances for each device, interface, and Data Link Connection Identifier (DLCI) |
| Reports: | Line Performance – Availability, Throughput and Utilization, Service Level Report Line Statistics – Errored Seconds, Error Counts Channel Performance – Local and Remote Availability, Transmit and Receive Load Channel Statistics – Channel Traffic, LMI, BECN and FECN, IP Packets, Keep-Alive Polls PVC Performance – Average Round-Trip Time, Local and Remote DTE Availability, Load, Excess CIR and EIR, Frame Loss, Real-time Round Trip Delay PVC Statistics – PVC Traffic, DE Frames, BECN and FECN, Keep Alive Polls Other Reports – Top 10 Busiest DLCI, Top 10 Errored DLCIs, Top 10 Discard Eligible |

Ordering Information

| <i>Product Description</i> | <i>GDC Part Number</i> |
|------------------------------------------------------------------------------------|------------------------|
| <i>Innovx</i> 553 | 058A169-001 |
| <i>Innovx</i> 553 Plus | 058A169-002 |
| <i>Innovx</i> MSP | 058A170-001 |
| 56/64 K DDS to 385 K Service Upgrade | 058U652-C01A |
| 384 K to Full T1 Service Upgrade | 058U653-C01A |
| 56/64 K DDS to Full T1 Service Upgrade | 058U654-C01A |
| <i>Innovx</i> Frame Manager sold separately: | 058U650-C01A |
| <i>Innovx</i> Frame Manager sold concurrently with 25 or more <i>Innovx</i> units: | 058U651-C01A |

Warranty

Innovx: 5 Years *Innovx* Frame Manager: 90 Days

NOTE: Some products, features and options described may still be in development

APPENDIX B — GLOSSARY

| | | | |
|-----------------|---------------------------------------------------------------------------------------------------------------------------------|-------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| AMI | Alternate Mark Inversion | FRAD | Frame Relay Access Device; Frame Relay Assembler Disassembler |
| ANSI | The American National Standards Institute | FRE.5 | The Frame Relay Forum Implementation Agreement on PVC network interworking between Frame Relay and ATM technologies. |
| ANSI T1.403 ESF | The standard for DS1 electrical interfaces for network and customer telecommunication. | FRE.8 | The Frame Relay Forum Implementation Agreement on PVC service interworking between Frame Relay and ATM technologies |
| AT&T 54016 ESF | The AT&T standard that defines the requirements for interfacing DTEs to services employing the Extended Superframe Format (ESF) | FT1 | Fractional T1 |
| ATM | Asynchronous Transfer Mode | HTML | Hypertext Markup Language |
| B8ZS | Binary 8 Zero Substitution | IP | Internet Protocol |
| BECN | Backward Explicit Congestion Notification | Java | Java is a programming language from Sun Microsystems designed primarily for writing software to leave on world wide web sites and downloadable over the Internet. |
| CIR | Committed Information Rate | kbps | Kilobits per second |
| CSU/DSU | Channel Service Unit/Data Service Unit | LAN | Local Area Network |
| DCE | Data Communications Equipment | LED | Light Emitting Diode |
| DDS/GDS | Digital Data System/Generic Data System | LMI | Local Management Interface |
| DE | Discard Eligible | Mbps | Megabits per second |
| DLCI | Data Link Connection Identifier | MIPS | Millions of Instructions Per Second |
| DS1 | Digital Service, Level One (1.544 Mbps in North America, 2.048 Mbps elsewhere) | MSP | Multiple Service Platform |
| DSX-1 | Digital Signal Cross-connect Level one, The set of parameters for cross connecting DS-1 lines | ODBC | Open Database Connectivity |
| DTE | Data Terminal Equipment | PBX | Private Branch Exchange |
| ESF | Extended Super Frame | PC | Personal Computer |
| FECN | Forward Explicit Congestion Notification | PPP | Point to Point Protocol |
| FLASH ROM | Flash Read Only Memory | PSTN | Public Switched Telephone Network |
| | | PVC | Private Virtual Circuit |
| | | QoS | Quality of Service |

| | |
|--------|-----------------------------------------------------------|
| RAM | Random Access Memory |
| RMON | Remote Network Monitoring Specification |
| SLA | Service Level Agreement |
| SNMP | Simple Network Management Protocol |
| T1 | A digital transmission link with a capacity of 1.544 Mbps |
| TCP/IP | Transmission Control Protocol/Internet Protocol |
| WAN | Wide Area Network |

ABOUT GENERAL DATACOMM

General DataComm Industries, Inc. is an acknowledged leader in the design, manufacture and marketing of advanced wide area networking systems for telecommunications service providers and enterprise markets worldwide. The company's products include the new convergence switch family called NexEra™, GDC APEX® family of ATM switching platforms, a broad range of Advanced Network Access devices including DSL technologies, integrated analog products and network management software.

GDC's carrier-class products for multi-service broadband, multimedia, wide area network access and the administration and maintenance of global networks, support some of the world's leading public and private telecomm infrastructures. These products share a common goal: To provide reliable, cost-effective, and standards-compliant communications solutions to both service providers and corporate enterprise networks.

The company is structured in four product and service divisions.

Broadband Division engineers, markets and supports a full family of carrier-class broadband products providing multi-service ATM concentration and switching capabilities. The NexEra convergence switch family, GDC APEX multi-service switching platform and the ProSphere® Network Management platform reside in this division.

Multimedia Division engineers, markets and supports integrated, scalable and service-provider class solutions. The multimedia product family consists of the MAC 500 and GDC APEX ATM access platforms and the Multimedia Multipoint Server.

The Network Access Division engineers, markets and supports a broad range of advanced NEBS-compliant, carrier-class network access products providing Universal Access DSL solutions; integrated analog, DDS and T1/E1/T3 access products; and Frame Relay network monitoring for private and public networks.

VITAL Network Services provides network data services to GDC and other companies worldwide. VITAL's services encompass all mainstream network equipment protocols and high-speed WAN technologies.

A leader in the standards-setting community, GDC actively participates in the ITU-T, ANSI, TIA, and the ATM Forum among others. GDC's active standards participation helps ensure that our products designed to accommodate regulatory and technological changes.

World Headquarters

Middlebury, Connecticut USA 06762-1299 • Tel: 1-203-574-1118 • Fax: 1-203-758-9468 • 1-203-758-9518 (GDC International) • www.gdc.com

U.S. Sales Offices

Broadband Division

To locate the Broadband representative nearest you, call: 1-877-298-0819 (toll free in North America)

Network Access Division

To locate the Network Access representative or Distributor nearest you, call: 800-523-1737 • For 24-hour delivery, call 1-800-435-8064

U.S. Government Sales Tel: 703-658-4052 Fax: 703-658-4058

Atlanta, GA 770-955-0682 • Chicago, IL 630-261-0670 • Dallas, TX 972-406-4800 • Denver, CO 303-782-3600 • Detroit, MI 248-540-4110
Honolulu, HI 808-235-2319 • Houston, TX 713-779-7879 • Minneapolis, MN 612-935-7381 • New York, NY 212-248-7220 • Oakland, CA 510-382-9400
Washington, DC 301-595-0300 •

Subsidiaries

Canada Tel: 905-415-0705 Fax: 905-415-9316 • France Tel: 33-1-47-62-62-00 Fax: 33-1-47-62-96-96 • Mexico Tel: 52-5-645-2238 Fax: 52-5-645-5976
Russia Tel: 7-812-325-1085 Fax: 7-812-325-1086 • United Kingdom Tel: 44-1189-774868 Fax: 44-1189-774871

International Regional Offices

Asia Singapore Tel: 65-735-2123 Fax: 65-735-6889 Hong Kong Tel: 852-2526-5511 Fax: 852-2525-9944 China Tel: 86-10-6621-1815 Fax: 86-10-6621-1814
Japan Tel: 81-3-5473-7890 Fax: 81-3-5473-7895

Canada Montreal Tel: 514-336-5454 Fax: 514-335-2160 Multimedia Division Tel: 514-335-3015 Fax: 514-335-1614 Ottawa Tel: 613-234-4005 Fax: 613-234-4685

Vancouver Tel: 604-430-5772 Fax 604-435-8181

Europe/Middle East/Africa Austria Tel: 43-1-599-99-675 Fax: 43-1-599-99-678 Belgium Tel: 32-2-529-5848 Fax: 32-2-529-5911

Italy Tel: 39-06-3987-0265 Fax: 39-06-3987-0287

Latin America Brazil Tel: 55-11-535-0232 Fax: 55-11-542-0547 Miami, Florida Tel: 1-954-733-8501 Fax: 1-954-733-8119

All specifications subject to change without notice. © General DataComm (2000) All Rights Reserved © General DataComm, GDC, the GDC logo and FastPro are registered trademarks and ™ innovx is a trademark of General DataComm, Inc. Other product names mentioned are used for identification purposes only and may be registered trademarks of their respective owners.

NAD-1199EO

