PRODUCT OVERVIEW

ForeFront Solutions for DSL

A technical overview of a new service delivery platform for TDM and Packet based Digital Subscriber Line access.

The ForeFront AIS brings next-generation network access to narrowband, broadband,and multimedia services.

With a modular design that provides expendability, flexibility, and multi-service integration, The ForeFront AIS integrates standards-based ITU/ETSI 2.3 Mbps G.SHDSL connectivity and high-speed trunking for both Data and IP access.

Step up to the ForeFront and ahead of the curve with Patton's ForeFront Access Infrastructure Solution.

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ForeFront Solutions for DSL

Product Overview — Table of Contents

What are the features, functions, and key benefits of the new ForeFront Access System?

ForeFront Introduction

PATTON's ForeFront Solutions for DSL offer a platform which combines both the transmission and networking technology required to deliver lower-cost IP, Frame Relay, ATM and Leased-Line services with high-performance. Using industry standard CompactPCI (cPCI) open-systems architecture, the ForeFront AIS allows deployment of carrier-class narrowband, broadband, and multimedia services using any Patton TDM, packet, dedicated, or dial-up system cards into a full redundant and expandable chassis system.

The following Overview focuses on the SHDSL solutions afforded by the ForeFront System. For information regarding ForeFront Solutions for dial-up RAS or other ForeFront Systems visit http://www.patton.com or e-mail marketing@patton.com

ForeFront Solutions for DSL

ForeFront Key System Features

PATTON's ForeFront Access Solutions for DSL address the new Point-of-Presence requirements demanded by today's providers. Using a modular approach, the ForeFront AIS includes all system components needed to provide DSL access. Fully redundant power and integrated cooling enable the lightweight chassis to scale for density and services. DSL line cards offer the latest G.SHDSL technology for true standards based connectivity. Grooming facilities and high speed softswitch allow any-to-any cross-connecting to E1s or STM-1 interfaces. Integrated management gives end-to-end command over the entire system and provides tools for fault detection, isolation, and correction.

The ForeFront System is applied to standardized G.SHDSL Access Solution by utilizing the following equipment.

Infrastructure Solutions

The Forefront Infrastructure Solutions combine a variety of chassis sizes with power supplies, alarm cards, and backplane elements which accept a wide variety of system cards. The system cards allow for the development of universal or fixed network connectivity solutions. For example, the Half-Pipe System includes a 2U 4-slot chassis, the ForeFront Multiservice Backplane, cooling system and a variety of redundant power supply options.

ForeFront Xtreme™
6U-high, 16-slot cPCI-based Chassis Access Mode

Key Features of the ForeFront Infrastructure Solutions:

- **CompactPCI Open System**—Flexible, standards-based, rugged design ensures that it will be a reliable viable platform well into the future.
- **2U, 4U, 6U Platforms**—Scale your service with a best-fit solution. Get 4, 8, or 16 slots for any system card and scale your deployment.
- **High-Availability Hot-Swap**—All components are field replaceable and can be replaced without shutting down the system for maintenance operations.
- **AC or DC Power Options**—Universal AC or Telco DC power modules offer high power with full 1+1 or N+1 redundancy
- **Alarm Management**—Integrated management module monitors fan tachometers, voltage, and temperature.

G.SHDSL System Cards

The ForeFront T-DAC card comprises 16 G.SHDSL modems which link to WAN uplink modules. Each 2.3-Mbps port offers user-selectable nx64 (n=1..36) data rates. With its built-in cross-connect, each data channel, or channel group, can be multiplexed onto any uplink or DSL port-even to ports on other system cards in the same chassis—providing flexible any-to-any DS0 grooming. Cards can be fully managed via SNMP independently or as an element of a the ForeFront Management System.

Key Features of the ForeFront G.SHDSL System Card:

- **Up to 16 Ports per ForeFront Card**—Get high density per card and lower your cost per port. Simply scale with more cards.
- **nx64 kbps Speeds to 2.3 Mbps**—Get speed and distance to 31,000 feet (9,448 meters) with nx64 kbps (*n*=1..36) on each port.
- **Flexible WAN Egress**—Your choice of 4/8/12/16 T1/E1 module, or use the STM-1 uplink for up to 63 E1s over fiber or copper.
- Built-in TimeSlot DACS—Connect any-to-any mapping with its powerful built-in grooming capabilities.

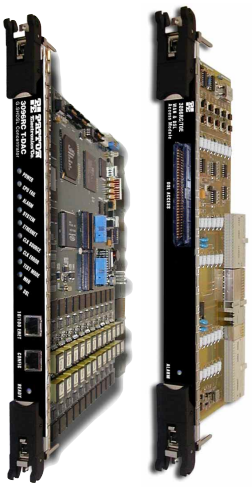
What are the features, functions, and key benefits of the new ForeFront Access System?

ForeFront Key System Features

- **Complete Alarm Facilities**—Configurable alarm reporting via remote SNMP traps, front panel LEDs, 3-contact relay, and NMS.
- **SNMP/HTTP Network Management**—Configure the Model 3086RC and the remote CPE modems from any location in the world.

Switchblade Time Slot Mapper and Packet Switch

The ForeFront Switchblade is an integrated multimedia switching engine complete with a digital access cross-connect, high speed STM-1/OC-3 truck interface, wire-speed Ethernet packet switch, and GUI management system. With full grooming capability the Switchblade allows any-to-any TDM mapping and can place any channel from any card onto any port.



Key Features of the ForeFront Switchblade:

- **Non-Blocking I/O Fabric**—Get dedicated connectivity to every input and every output port while grooming TDM or switching packet data
- **Integrated STM-1/OC-3 DACS**—Resolve traffic down to 64-kbps timeslots, switch any timeslot to any port or loop it back out the same port.
- **Hot Swappable and Redundant**—For critical applications use dual 6511s and get 1+1 redundancy. Hot-swap cards for fast maintenance and quick upgrades.
- **Redundant Packet Switching**—Reliable packet switching architecture ensures redundant paths for deploying mission-critical applications to any port.
- **WEB/SNMP Manageable**—Get fault detection and resolution standard. Use the embedded HTTP/SNMP agent to manage the Model 6511 from anywhere in th world.

G.SHDSL Integrated Access Device

The ipRocketLink enables nx64 (n=1.36) over a single pair of wires while combining standards-based transmission with Synchronous Serial, Ethernet, and high-speed IP routing…*all in one compact package*.

Key Features of the ForeFront IAD:

- **nx64 Speeds to 2.3 Mbps**—User selectable data rates for Sync Serial or Ethernet/IP ports. Use as a standalone or with the ForeFront Access system.
- **User Selectable DCE/DTE V.35/X.21**—Get both interfaces at the same time. Software-selectable with DCE/DTE support without messy crossover cables
- **Built-in Ethernet/IP Router Standard**—With Patton's FlexIP architecture, split the bandwidth and use both interfaces at the same time
- **Get ATM, PPP, and Frame Relay**—Versatile interface options allow for simple deployment into any network environment
- **LEDs and Full V.52/V.54 Diagnostics**—Test the link with built-in test modes with easy-to-access toggle switches. LEDs provide clear status at-a-glance
- **WEB/SNMP Manageable**—Built-in VT-100 console port makes setup a snap, and you can use the embedded HTTP/SNMP agent to manage the Model 3086 from anywhere in the world.

ForeFront for DSL — System Elements

Chassis System—ForeFront 2U, 4U, 6U Chassis and Power Supplies

PATTON's ForeFront Solutions for DSL offer a platform which combines both the transmission and networking technology required to deliver lower-cost IP, Frame Relay, ATM and Leased-Line services with high-performance. Using industry standard CompactPCI (cPCI) open-systems architecture, the ForeFront AIS deploys carrier-class narrowband, broadband, and multimedia services using any Patton TDM, packet, dedicated, or dial-up system cards into a fully redundant and expandable chassis system.

Additionally, use the ForeFront chassis with third-party cPCI system resource cards for additional custom functionality. Select any combination of system, peripheral, media, trunking, and softswitch cards for a total access solution. For network services, choose from a wide variety of system cards–from DSL to RAS; Packet/DSLAM to DACS. For complete flexibility, system cards can be mixed in any combination.

ForeFront Half-Pipe 2U-high, 4-Slot Chassis (Model 6276)

Using a standard 19-inch wide rack form factor, the chassis are available in 2U, 4U, or 6U sizes and have the following features:

- Full dimensional compatibility with CompactPCI (PICMG 2.0 R2.1) and IEEE-1101.10
- EMI shielding on entire assembly, with continuous chassis ground
- Lightweight and durable aluminum construction, suitable for rugged environments
- Only 11.70 in. deep
- Front mounting flanges for 19 in. rack mount environments

The 2U chassis (Model 6276) has four-6U x 160mm slots (on half-cPCI bus segment) at the front of the chassis. The 4U (Model 6476) has eight-6U x 160mm slots. These slots are available for all system cards and can be used interchangeably between differently sized chassis.

ForeFront Full-Pipe 4U-high, 8-Slot Chassis (Model 6476)

The following matrix shows the capabilities of each chassis

Rack Height U	Number of Slots for System Cards	Number of Power Supplies	Notes
2U x 19"	4	2 AC or DC	Allows for redundant power feed
4U x 19"	8	3 AC or DC	Allows for redundant or N+1 Redundancy
6U x 19"	16	4 AC or DC	Allows for redundant or N+1 Redundancy

Integrated Chassis Cooling

Each chassis has integrated cooling standard. The fan trays and filters are field replaceable and can be maintained/replaced without decommissioning the system. 2U and 4U chassis cooling is provided by a specially designed plug-in fan tray. The 2U fan tray utilizes three 12VDC axial cooling fans which are positioned for optimum side-to-side air flow through the chassis. The 4U fan tray uses six 12VDC axial cooling fans that are positioned for side-to-side air flow. The multi-fan assembly will cool effectively even if one or more fans fail. The fan tray is hot-swappable, so air filter replacement and other maintenance will not effect operation.

2U Fan Tray

4U Fan Tray

ForeFront for DSL — System Elements

2U/4U Fan Tray Assembly Specifications

Item	Description
Physical	2U: height 3.36 in. width 1.70 in. depth 10.50 in 4U: height 6.36 in. width 1.70 in. depth 10.50 in.
Power requirements	2U: 0.5A @ 12VDC 4U: 1.0A @ 12VDC
Performance	2U: 50 CFM @ 1 in. H_2O 4U: 75 CFM @ 1 in. H_2O
Reliability	150,000 hours @ 50˚C
Operating environment	-10˚ - +60˚C, 5-95% RH, non-condensing

Power Supply Options

Power supply options allow for 1+1 or N+1 redundant operation with AC, DC, or mixed power requirements. Power supplies are also interchangeable between the 2U, 4U, and 6U chassis allowing for economical redeployment and sparing.

Designed to meet the needs of the telecommunications industry, the architecture focuses on the needs of operational environments and is designed to integrate into a Central Office system with alarms and visual indicators. They are highly reliable with full fault tolerance on all outputs. Front panel LEDs provide the user with a visual indication of the condition of each individual on-board supply. Over-temperature sensing drives local alarm bus.

Each of the power supplies for the ForeFront chassis systems are rated for 36–72 VDC operation. When multiple supplies are installed they load- and current-share to within 5%. The ForeFront Power Supply Module delivers 200 watts in a 3U x 160mm x 8HP CompactPCI format. The 2U chassis accepts up to two Power Supply Modules, and two for this application. The 4U accepts up to three Power Supply Modules, and three are required for DSL applications.

The ForeFront System is also available with dual AC and DC configurations. AC Power supplies support 85-265 VAC universal input with 50/60 Hz support.

Power Supply Specifications

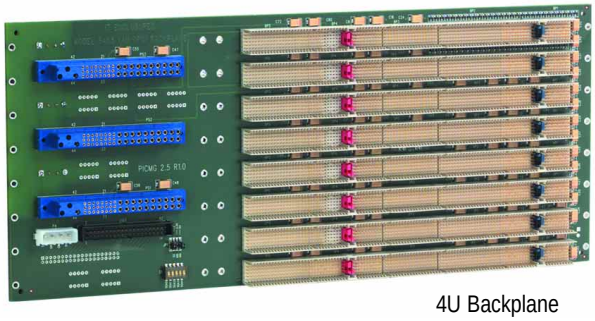
Item	Description
Physical	3U X 160mm x 8HP CPCI module
Power requirements-DC	36 – 72VDC @ 8Amps max
Power requirements-AC	85–265VAC continuous, 47–63HZ,Input Current 9.8A Max, Inrush @50A Peak for 1 ms and OVP at 300vac max.
Reliability	500,000 hours @ 40˚C
Operating Environment	10-60˚C, 5–95% RH, Non-Condensing
Isolation	3000V RMS for 1 Minute
Radiated Emissions	FCC Part 15 Class B, EN55022 Class B
ESD	EN1000-4-2 (IEC 801-4-2)
Safety	Designed to meet UL1950, EN60950
Power	**+5V** 150 Watts; **+3.3V** 75 Watts; **+12V**12 Watts; **-12V** 6 Watts ForeFront Multiservice TDM and Packet Backplane

ForeFront Multiservice TDM and Packet Backplane

The high-speed ForeFront backplane supports TDM and Packet traffic via industry standard buses. TDM traffic is switched using H.110 with full visibility to 4,096 time slots, while packet traffic is aggregated onto the PICMG 2.16 40 Gbps Packet Switched Backplane (PSB). All components are hot-swappable and are designed for high-availability applications.

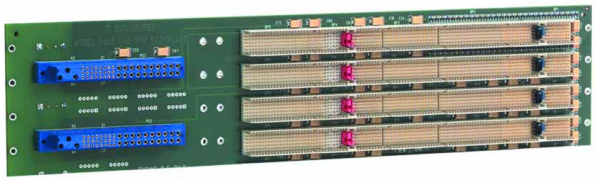
A key feature of a CompactPCI system is its interoperability with off-the-shelf boards that have been designed in compliance with the PICMG CompactPCI 2.0 R2.1 Specification and the PICMG 2.16 Packet Switched Backplane

ForeFront for DSL — System Elements



4U Backplane

The 2U backplane utilizes a standard 4-slot CompactPCI midplane approach supporting the two 3U x 160 mm front entry power supply modules and four 6U x 160 mm System entry modules with associated 6U x 80 mm rear transition modules. The 4U backplane supports 3 front entry power supply modules and eight 6U x 160 mm System cards.



2U Backplane

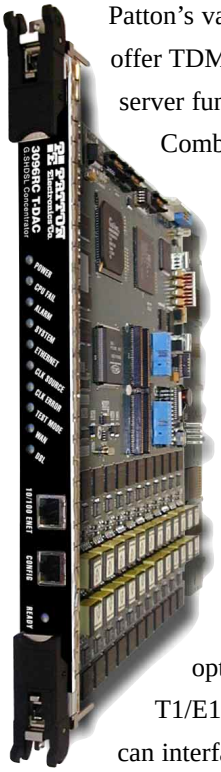
Backplane features:

- Power supply support per PICMG 2.11 R1.0, “Power Interface Specification”, for the 47 position connector.
- 33 MHz, 64-bit CompactPCI bus per PICMG 2.0 R3.0, “Compact PCI Specification”.
- Slot 1 (of 4) supports CompactPCI system slot functionality.
- Slot 2 provides system slot redundancy with the ability support non-system slot modules that do not require H.110 interconnections.
- Slots 3 and 4 supports CompactPCI peripheral slot functionality.
- All slots support H.110 per PICMG 2.5, R1.0, “Computer Telephony Specification” with support for PICMG 2.16 Packet Switched Backplane.
- VIO selection between 3.3VDC and 5VDC for interoperability with third party system cards.
- Fan alarm processing to connector containing form-C outputs. Optionally, the fan alarm processing can occur on an alarm rear transition. An integrated alarm card monitors power supply status, fan tachometer, and system temperature via a local system bus.

What are the features, functions, and key benefits of the new ForeFront Access System?

3096RC Introduction

The 3096RC is a TDM based DSL Access Concentrator (T-DAC) blade for the Forefront cPCI chassis system from Patton Electronics. Patton's ForeFront series of products gives service providers the flexible solution needed to be competitive in today's telecom industry. Utilizing the Compact PCI chassis the ForeFront system ensures users that they have a solution that will grow with them as their needs grow. The advantages of the cPCI chassis approach are undeniable:



- Cost and time savings by using available PCI hardware and software
- Rugged and reliable Euro card-style packaging
- Flexibility by offering an open architecture that can be used with standard or proprietary buses.
- Hot-swap capability to allow boards to be hot-swapped without disrupting operation ensuring system uptime.

With all the pressures that service providers are under, they need solutions that will satisfy their many needs—all in a single integrated platform. The ForeFront series gives providers that solution. By mixing and matching Patton's various cPCI blades, service providers will be able to offer TDM based DSL, packet-based DSL, remote access server functions, concentration services, and so on. Combined with the variety of rear card transition modules, and users will have the chassis based solution to all their service needs.

The 3096RC G.SHDSL TDM Digital Access Concentrator (T-DAC) is a high-speed symmetrical data concentrator. It uses standards-based G.SHDSL to deliver 16 high-speed leased nx64 line data connections (up to 2.3 Mbps) per card and provides a timeslot interchanger to provide users with the ability to map any DS0 to any DSO within the system (including other ports on other cards). With multiple transition module egress options for WAN egress, the 3096RC allows for 4 T1/E1, 8 T1/E1, 12 T1/E1, or 16 T1/E1 interfaces, or it can interface through the bus in the cPCI chassis to use the WAN egress of another card. Offering an end-to-end solution, the 3096RC is compatible with Patton's other G.SHDSL equipment such as 3201 and 3086 G.SHDSL modems.

3096RC T-DAC Key Functional Features

The Model 3096RC is the next step in high-density, modular and economical networking offering the latest technology in DSL technology, G.SHDSL, which is supported by an ITU-T recommendation (G.991.2). In traditional xDSL access rack systems, the xDSL modems, WAN ports, NMS, and multiplexing, are not integrated. The Model 3096RC implements all of the desired networking functions and combines them into a tightly integrated single blade for the cPCI rack chassis system. For ease in management, the entire SNMP/HTTP-based system provides an end-to-end Network Management System (NMS) solution with Patton's family of G.SHDSL modems. To ensure high service-uptime, the Model 3096RC is provided power from the dual-redundant power supplies in the rack chassis with link diagnostics and complete alarm facilities.

The Model 3096RC's flexibility is due to the modularity of the two-piece blades. Each 3086RC comprises a front and a rear section. Using the same front portion, different rear portions containing optional interfaces may be selected for the desired blade application. Hot-swappable blades are software upgradeable for adding new software features without requiring new hardware. They also offer improved performance, and provide management features as networks up-scale.

The T-DAC blades install into the various ForeFront compactCPI chassis (2U, 4U, 6U). With multiple rear card transition modules to integrate T1/E1 WAN egress ports, the T-DAC can map any DS0 to any DS0 within a given blade as well as across the integrated H110 bus within the cPC chassis to other 3096RC blades. This allows mapping of DSL to

3096RC T-DAC Key Functional Features

DSL, DSL to WAN, and WAN to WAN DS0s. This enables the T-DAC to be used in several ways:

- **Concentration**: Map the DS0 from the G.SHDSL ports into the DS0 of the WAN uplink ports to concentrate data from Multiple DSL ports for concentrated and more cost-effective uplink.
- **Segmentation**: Map DS0s to specific WAN uplink to segment data types (i.e. voice/data separation)
- **Local Switching**: Map the DS0 of one G.SHDSL port to another G.SHDSL port to connect two local sites.
- **WAN Mapping**: Map any of the WAN timeslots back to any other WAN timeslot for E1/T1 cross connecting
- **Mapping By-Pass**: Effectively by-pass the cross-connect feature and directly map a DSL port to a WAN port.

Its flexible design and deployment allows for installation in equipment closets, data centers, as well as Service Provider central offices with a clear migration path for future network growth. The 3096RC will consist of a front card with 16 G.SHDSL ports using the Conexant DSL modem chips. An H110 chip provides mapping to route DS0s between the DS0s, the WAN Egress ports and the bus on the cPCI chassis. The T-DAC also incorporates multiple Ethernet connections to provide redundant Ethernet connections over the 2.16 cPCI bus within the chassis as well as an additional input presented on the front of the 3096RC. A complete set of LEDs allow users to easily see the status of the T-DAC at a glance.

Key Features	Product Highlights	Feature Benefits
16 G.SHDSL ports in a single blade	Each G.SHDSL port requires only 2 wires (single pair) for reach and range up to 32,000 ft using TC-PAM line coding and providing data rates of nx64 to 2.3 Mbps with future options for up to 4.6 Mbps on just 2 wires.	The end-User has a full-duplex symmetric data channel for data transfer. With complete TDM mapping of any time slot to any other time slot, the user is not limited to only DSL to WAN time slot mapping.
Programmable Cross-connect capability	User programmable Time Slot Interchanger (TSI) allows any time slot from any access port to be mapped to any time slot on any other access port including timeslots on other cards.	Any combination of G.SHDSL to G.SHDSL, G.SHDSL to WAN, or WAN to WAN is possible giving the user the complete flexibility in time slot mapping
Compact Design	Place up to 16 Blades in the 6U chassis to get 256 DSL ports and 256 T1/E1 ports in a single chassis system.	Providing up to 16 G.SHDSL ports in a 1 U-high chassis provides the highest density available in a standalone unit.
Front mounted LEDs	Front mounted LEDs provide a quick look at the status of the 3096RC at an instant. LEDs provide feedback on Power, G.SHDSL port status, alarms, clock sources, and Trunk status.	Front mounted LEDs provide the user quick and easy instantaneous feedback on the critical features of operation.
Redundant load-sharing Universal AC/DC Power supplies	The Compact CPI chassis provides 2 of 3 redundant AC/DC power supplies to ensure constant system uptime. In the event of a power supply failure, the third supply supplies the power to keep the system running. Combined with dual power input feeds the 3096RC protects against source power disruptions.	With the standard dual redundant power systems, not only is the customer protected from hardware failures, but now he is protected against power delivery failures as well.
Flexible chassis and blade system	Choose the chassis size to fit the application whether its 2U, 4U or 6U. Then determine how many T-DAC blades to populate. Then choose the transition modules need for the rear interface whether its DSL only, or DSL plus 4, 8, or 16 T1/E1 WAN ports.	The modularity provided by the chassis system and the front to rear card modularity with cards that are completely hot-swappable allows users to start with the system to meet their needs and grow as the demand grows.

3096RC T-DAC Key Functional Features

The rear transition module of the 3096RC G.SHDSL T-DAC is available in 4 different options to meet the needs of individual users.

- DSL only transition module
- DSL and 4E1 transition module
- DSL and 8E1 transition module
- DSL and 12E1 transition module
- DSL and 16E1 transition module

The DSL connections will be presented on a 50 pin Telco interface with fuses and surge protection circuitry being integrated within the transition module. The data is then passed to the 3096RC via a P5 tip and ring feedthrough. The E1 ports are terminated and on the transition module and the data is then passed over an 8-bit data bus to the H110 chips on the 3096RC. Additionally the rear transition module provides an alarm LED to provide indication of an alarm condition when looking at either the front or rear of the chassis.

Management of the T-DAC is made simple by using the existing Patton embedded SNMP agent from the 3095. An additional side menu bar allows quick easy links to other 3096RC cards. Initial setup is made through the Rs-232 craft port provided on the front of each 3095RC. The hot-swappable nature of the 3096RC and its transition modules completes the ease of use by allowing the user to easily change cards without interrupting use to any of the other installed cards within the system.

3096RC Product Highlights

The 3096RC resource card provides blade in the scalable Forefront system with 16 G.SHDSL ports and several options for WAN egress including quad-T1/E1/octal-T1/E1/x16 T1/E1 interfaces. The 3096RC will allow complete TDM mapping of any channel to any other channel allowing complete flexibility within each blade and allowing for mapping across the H110 Bus of the cPCI chassis for intercard mapping.

The PTT infrastructure is typically in place and this new platform must connect to the existing PTT T1/E1 nx64 data network. The 3096RC presents a high-speed interface to the network allowing for a lower cost-per-port. The 3096RC offers an integrated & managed solution whether used alone or with a higher management card. It provides a complete set of leased line services within each single blade and grows as a complete solution with STM-1 blades and management of management cards. Until now, these services have been provided using large expensive racks with a fragmented approach to deployment. The delivery of these services were simply done in piece-meal fashion. The 3096RC T-DAC in the Forefront system provides a complete solution with a clear migration path for future growth.

Combined with Patton's 3086 and 3201 G.SHDSL modems, Patton presents the carrier with a complete end-to-end solution.Using the existing SNMP web-based management solution, the 3096RC will address the provider's desire for simple network management systems which make their services easier to control from anywhere in the world. The existing SNMP web-based management solution will be implemented to provide customers an easy to use and familiar network management framework. This gives the user the ability to be managed across the Internet or from any workstation or PC. Training and deployment will be seamless as the 3096RC uses the same web pages and structure as the current 1001MC, familiar to carriers around the world.

3096RC Elements

The NetLink 3096RC Digital Cross Connect combines the efficiencies of DSL transmission technology with the simplicity of traditional DS0 time-division multiplexing and the flexibility of a standard cPCI chassis solution. The G.SHDSL TDM Digital Access Concentrator is used as an adaptation, concentration and line extension device for remote users of Leased-Line networks. The G.SHDSL T-DAC resides in the data center/collocation facility between the service delivery platforms (switches, routers, muxes, etc.) and the transmission equipment (cross connect switches). It may also reside in remote multi-dwelling units, such as hotels, office buildings, campuses and office parks.

G.SHDSL Modems

The 16 G.SHDSL ports of user data traffic enter the chassis through a 64-pin Telco connector on the rear transition module. Each 2-wire G.SHDSL port is capable of transmitting/receiving data simultaneously at Nx64 rates from 64 Kbps up to 2.3 Mbps (4.6 Mbps options will be available in the future). The desired user data rate is determined and configured by the operator through the NMS.

- **Interface Connector**: 64 Pin Telco connector
- **Line Interface**: 2-wire interface per ITU G.991.2 and ETSI TS 101524 with G.994.1 Handshake
- **Interface Speed**: Up to 2.304 Mbps 2-wire operation; up to 4.608 Mbps 2-wire operation on future release
- **Line Coding**: Symmetrical, TC-PAM encoding to ITU G.991.2
- **G.SHDSL Distance**: From 32,000 feet at 192kbps to 18,000 feet at 2.312. Payloads are nx64 where 3>=n<=36. 26 AWG.
- **G.SHDSL Standards**: T1.413 ANSI ADSL DMT issue 2 G.991.2 ITU G.SHDSL Annex A and Annex B G.994.1 Handshake
- **Isolation**: The DSL line will be transformer isolated and shall withstand surge & power-cross events described by UL1950 TNV.
- **Clocking:** The DSL port always provides clocking to the remote CPE.

E1 WAN Ports

The DSL Connector and Channelized T1/E1 network ports are presented on the rear transition module and are allow the capability to multiplex the data from the DSL access ports onto multiple T1/E1 network ports using DS0 boundaries.

- **Line Interface (Speed):** E1 (2.048Mbps) support in accordance with ITU-T G.703 and Fractional E1 (nx64kbps) support in accordance with ITU-T G.704/G.732. T1 (1.544Mbps) support in accordance with ANSI T1.403 and AT&T TR54016 specifications
- **Transmission Distance**: Limited to 6,000 ft/1.1mi./1.8km
- **Interface Connector**: 120 W (E1) or 100 W (T1) Balanced interface presented on an RJ48C Female connector.
- **Line Coding/Framing**: For E1/G.703 HDB3 or AMI coding and G.704/G.732 framing with/without Multiframe/CRC-4. T1 circuits, AMI coding/D4 framing or B8ZS coding/ESF framing.
- **Error Counts**: Bipolar violations & Frame Errors
- **Alarm Reporting**: Local annunciation, Front Panel LEDs, rear panel LED, and Remote SNMP NMS
- **Loopbacks**: Enabled or disabled by Software as per ITU-T G.703 (E1), ANSI T1.403 and AT&T TR54016 (T1) specifications
- **Data Inversion**: Inverted or Not Inverted (Software Selectable)
- **Test Pattern**: 511/511E Test Pattern Generation
- **Line Isolation**: In accordance with CTR12/13 for E1/G.703 and FCC Part 68 for T1

3096RC Elements

System Timing Synchronization

The 3096RC has three clocking modes: Primary, secondary and slave and will have three clocking sources: internal, external and cPCI bus.

- **Primary Clock Mode**: The 3096RC will be capable of accepting clocking options to establish a primary clock source. In normal operation the clocking is derived from the primary source.
- **Secondary Clock Mode**: The 3096RC will be capable of accepting clocking options to establish a secondary clock source. In normal operation the clocking is derived from the primary source, in the result of a failure or loss of the primary clock source, the secondary clock source will automatically be used for system clocking.
- **Slave Clocking Mode**: The 3096RC can be set to slave mode to receive its clocking from another card.
- **Internal Clocking Source**: The unit's oscillator will drive clocks to the DSL access, T1/E1, E3, and Fiber ports.
- **Network Clocking Source**: The unit will derive the system clock from one of the T1/E1, serial, E3, or Fiber ports. It will drive the DSL ports using this clock.
- **Computer telephony (CT) System Timing Source**: The T-DAC can also derive its timing from the H110 bus on the cPCI chassis. This is how all other timing options are provided to the card.

Time Slot Interchanger

Network Management

Also running on the processor is an SNMP software agent that communicates with the central-site NMS. If the operator prefers a simple interface with the DSL Digital Cross Connect, the Access Module provides a built-in HTTP Web Server as a management interface into the product. With the resident HTTP server, the operator can interface with the module using a standard, off-the-shelf Web browser. No other management software is required.

Ethernet Interface

Supporting SNMP/HTTP management, the Ethernet port is presented on the front of each 3096RC Blade. In addition the Ethernet interface is presented to the 2.16 interface on the cPCI chassis to be integrated and presented through the STM-1 Switchblade card when used within the same chassis

- **Interface Speed**: 10Base-T / 100Base-TX 10/100 Mbps (Auto-sensing) with support for full duplex operation
- **Interface Connector**: Eight contact shielded RJ-45F, Pins 1,2 & 3,6
- **Multiple Ethernet Interfaces**: The Ethernet will use a 5 port hub to allow the multiple interfaces;
  Resource module: One 10/100 port will be presented to the Front panel of the 3096RC.
  2.16 cPCI bus: Two Ethernet connections will be run across the 2.16 bus within the cPCI chassis to provide dual redundant Ethernet interfaces to a management blade

Craft Port

EIA-561 RJ-45 supporting external RS-232 VT-100 CLI configuration. The factory default speed is 19.2 kbps with user configurable speed to 115,200kbps. This console port shall have the capability to drive and respond to modem control signals.

Rack Chassis System (containing the Power Source System)

- **Powered through midplane bus of cPCI chassis.**
- **Redundant**: May be 1-to-1 redundancy or n-to-1 redundancy.
- **Hot Swappable**: Both the Resource and Transition Modules are hot swappable. The Resource module

3096RC Elements

Software Features

Diagnostic Traffic

Before any traffic is put on the network ports or during normal operation, diagnostic measurements and traffic events for each G.SHDSL port are recorded and stored by the onboard CPU. Traffic measurements include line characteristics, line alarms, BERT results and statistics. These measurements and events are recorded and stored in RAM and Flash for transmission to the SNMP/HTTP network management system where it is available for operator review and action.

Alarm Facilities

The 3096RC comes with a complete set of alarm facilities that monitor Power, each of the G.SHDSL access ports, the operation of the Mezzanine Egress Card being used, and the temperature of the unit. The Alarms are provided in the form of alarm contacts, visual indication, SNMP traps, and web page indication.

LED Display

The T-DAC comes with a complete set of LEDs to make it easy to get a quick read on the overall status of the system. With 11 different LEDs providing information on power to alarms, all it takes is a glance and you know the status of the system.

- **Power LED**: Green – Indicates if power is being applied and whether the 3096RC has detected a power failure with one of the supplies.
- **CPU Fail LED**: Red – provides information on the ability of the CPU to access software.
- **Alarm LED**: Red – Indicates if any minor or major alarms are being detected.
- **System LED**: Green – Provides a quick status that the 3096RC is operating normally.
- **Ethernet LED**: Green – Provides Ethernet Link status information
- **Test Mode LED**: Green – Indicates that one or more of the DSL ports is in test mode.
- **DSL LED**: Green – Indicates if the DSL ports have linked up successfully and provides information on whether there are any errors present.
- **WAN LED**: Indicates activity at each of the T1/E1/PRI links to provide information on normal activity, errors, and synchronization.
- **Ready LED**: Blue – Card ready for removal from cPCI chassis.

G.SHDSL – The new International Standard

Digital Subscriber Line (DSL) technology transforms traditional inexpensive copper lines into high-speed data connections and delivers the access guaranteed. DSL is particularly valuable as it addresses the immediate needs of business and consumers alike. For high-speed Internet access and LAN-to-LAN internetworking, DSL has proven to be cost effective and quickly provisioned. DSL has proven to be a reliable technology for carriers wishing to provide leased line, data, and Internet services.

There are several forms of DSL, each designed around specific goals and needs of the marketplace. Some forms of DSL are proprietary, some are simply theoretical models and some are widely used standards. For example, ADSL was first developed in 1980's as the telecommunications industry's answer to the support video on demand.

Today, the preferred choice by providers is the new G.SHDSL (ITU/ETSI 991.2) Digital Subscriber Line standard. G.SHDSL is the new international standard for symmetric DSL and is known as G.991.2. This new standard moves data farther and faster than legacy solutions while improving spectral compatibility to preexisting services.

G.SHDSL can be used with existing single twisted-pair and dual twisted-pair wired network installations. It offers a variable data-transmission rate whose range differs according to the data transmission media used. When operating G.SHDSL with single twisted-pair wiring, the data-transmission rate ranges from 192 kbps to 2312 Mbps. The payload can be divided into increments of 8 kbps. When used with dual twisted-pair wiring, the data-transmission rates range from 384 kbps to 4624 Mbps.

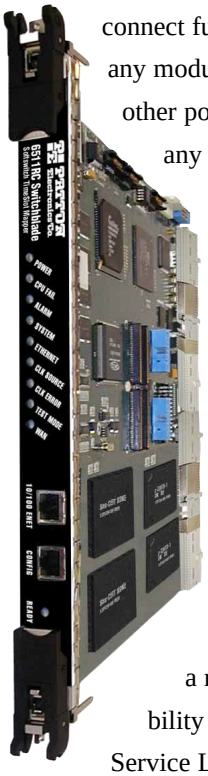
G.SHDSL is designed for guaranteed delivery of service with a Bit Error Rate (BER) of 10e-7 at worst-case noise conditions on the line. A very important feature is the reduced latency of G.HDSL. The latency time of G.SHDSL is less than 1.2 ms (versus ADSL 20 ms), which makes the transport system suitable for real-time video conferencing, digital voice transfer, and time-critical application links. Additionally, G.SHDSL offers a standards based transmission method and allows the interoperability of third-party equipment within a system.

6511 Switchblade Introduction

The 6511 Switchblade is a flexible and powerful switching engine and up-link module for the Patton Forefront AIS. It has been carefully designed to simultaneously support both TDM and Ethernet switching at wire-speed for complete no-latency operation, enabling true any-media-to-any-media convergence.

The architecture of the Switchblade guarantees total non-blocking operation for any TDM application over the TDM bus and for Packet switching applications over the redundant 40 Gigabit Packet Switching Bus (PSB). With the ability to simultaneously transmit and receive on both full-duplex 10/100 Ethernet up-link ports and the STM-1/STS-3 port as well as on the redundant PSB and TDM busses, the Switchblade offers unparalleled switching dynamism to any media requirements.

Advanced functionality within the Switchblade facilitates the any-to-any switching of DS0s. Use the cross



connect functionality to accept any DS0 from any port on any module and switch this DS0 to any other DS0 on any other port on any other module. Groom DS0 traffic from any Forefront AIS module and multiplex them efficiently into any virtual container or virtual tributary (DS1, DS3, E1, and E3) on the SONet/SDH port or onto any other DSL or T1/E1 port.

LAN extension and Internet Access applications will greatly benefit from the Ethernet switching capabilities of the Switchblade. Non-blocking inter-card communications can occur at wire-speed, full-duplex Gigabit rates, reducing latency, increasing performance, and guaranteeing end-user satisfaction. Dual 10/100 full-duplex Ethernet ports on the Switchblade rear card and a redundant, switched backplane provide the reliability and performance required by operators to offer Service Level Agreements (SLAs).

6511 Switchblade Rear Card Up-link Options

A flexible up-link port architecture allows the 6511 Switchblade to fit into any environment. Numerous rear card options exist for the 6511 Switchblade with others on the way:

- Dual port 10/100 Ethernet and single port optical STM-1/SONet
- Dual port 10/100 Ethernet and single port electrical STM-1/STS-3

Additional rear card options will add DS3/E3 ports, Gigabit Ethernet ports and APS features for the STM-1/STS-3 ports.

6511 Switchblade Reliability

Reliability was built into the 6511 Switchblade as well as the entire Forefront AIS architecture. When deployed in a 1+1 redundant configuration, the 6511 delivers complete fail-over protection for both inter-card and up-link communications. Unlike other equipment, a redundant spare 6511 Switchblade holds the complete switching database in low latency flash in order to effect a near instantaneous cut-over should the primary Switchblade be removed or become unavailable. With the distributed architecture of the Forefront AIS modules, switching can continue between modules even in the absence of a Switchblade.

Key Features	Feature Benefits
Full M01 and M13 multiplexing	Efficiently aggregate and groom traffic prior to up-linking DS0s on the any interface
Digital Cross Connect	Perform any-to-any DS0 mapping between ports
Redundant, non-blocking high-speed PSB Backplanes	Switch up to 40 Gigabits of full-duplex Ethernet between modules with no processing delays
Concurrent TDM and Ethernet operation	Use the Switchblade to simultaneously support TDM switching and Packet based applications both across the backplane and through the up-link ports
HTTP/SNMP Management	Turn any workstation or PC with a browser into a management station. Save on NMS costs.
Flexible Up-link Modules	Select the up-link module that is right for you – STM-1/STS-3, Gigabit Ethernet, DS3/E3, 10/100 Ethernet
1+1 Redundancy	Protect your mission critical applications

6511 Switchblade Management

Numerous management options provide maximum flexibility in the day-to-day administration of the 6511. Use the RS-232 Console/Craft port for quick, on-site setup. Telnet to the Switchblade directly, use an SNMP MIB browser or just take advantage of the built in HTTP server via your web browser to manage the Switchblade from anywhere in the world. Connect to any module out-of-band or route management traffic through available time slots in-band.

Software upgrades can be performed via FTP from any FTP server. For additional piece of mind, save the operating configuration both locally on flash and onto a remote host. Use RFC standard Syslog to record and store significant module events.

6511 Switchblade Elements

The 6511 Switchblade combines the TDM switching and aggregation capabilities of both a multiplexer and a cross-connect with the packet aggregation and switching capabilities of an Ethernet switch. It is designed to reside either in data center/collocation facilities between the service delivery platforms or in remote multi-dwelling units. In either deployment, the 6511 Switchblade, with its high-speed TDM and Ethernet ports is a superior access concentration card for the ForeFront AIS Architecture.

TDM Support

The following features are supported on the switchblade:

- **Line Speed**: 155.52Mbps per STM-1 and STS-3
- **Line Framing**: DS1 – SF, SLC-96, ESF; E1 – G.704 basic, CRC-4 multi-frame (G.706 framing); DS3 – M23, C-bit parity formats; E3 – G.751, G.832 E3; STM-1 – G.707; SONet/STS-3 – Per ANSI T1.105-2001
- **Mapping**: DS0 – into any DS1 or E1; DS1 – VT1.5 -> STS-1 SPE, TU-11 -> STM1/VC3, TU-11 -> TUG3 -> STM1/VC4, TU-12 -> STM1/VC3, TU-12 -> TUG3 -> STM1/VC4; E1 – VT-2 -> STS1 SPE, TU-12 -> STM-1/VC3, TU-12 -> TUG3 -> STM-1/VC4; DS3 – DS3 -> VC3 -> AU3 -> STS-1 SPE; STM-1 – G.707; SONet/STS3 – Per ANSI T1.105.02-2001, T1.105.07-1996, T1.105.07a-1997
- **Switching Capacity:** Non-blocking up to 4,096 channels
- **Clocking**: External (per STM-1 – G.813 or STS-3 - ANSI T1.101-1999, T1.105.09-1996, GR1244) via the STM-1/STS-3 interface or via the H.110 bus; Internal Stratum-4/4E clock via oscillator
- **Error Counts**: G.821 & G.826 ((Errored Seconds (ES), Severely Errored Seconds (SES), Unavailable Seconds (US), Errored block (EB), and Background Block Error (BBE)); T1.231 & GR-253-CORE (Errored Seconds (ES), Severely Errored Seconds (SES), Unavailable Seconds (US), and Severely Errored Frame Seconds (SEFS))
- **Diagnostics & Loopback modes**: DS3 and E3 Diagnostic Loopback; DS3 and E3 Line Loopback; DS2 Demultiplex loopbacks; T1/E1 diagnostic loopback; T1/E1 line loopback; PRBS at the DS3, E3, E1, DS1 and NxDS0 levels

Single Port Optical Interface

- **Bit Rate**: 155.52
- **Distance**: 40 km
- **Line Code**: NRZ
- **Peak wavelength range**: 1280 … 1335 nm
- **Jitter tolerance**: Per ITU G.825 (§4.1)
- **Connector Type**: SC

Single Port Electrical Interface

- **Bit Rate**: 155.52 Mbit/s ± 20 ppm
- **Line Code**: CMI
- **Distance**: 150 m
- **Nominal Impedance**: 75 W
- **Jitter Tolerance**: G.825 (§ 4.1)
- **Connector type**: BNC

Ethernet Support

The Switchblade supports high-speed communications over the PCB to any other module on a Forefront AIS system via industry standard 10/100/1000 Mbps Ethernet. The rear transition modules of the Switchblade currently support two (2) 10/100, full-duplex Ethernet ports as well. These two external ports are presented on a standard RJ-45 interface and conform to 10/100BaseT specifications. Additional specifications for the Switchblade are as follows:

- 24 10/100 + 2 1G ports Single Chip Switch with On-chip Memory for Packet Buffer and Address Tables.
  - 12Mb of embedded DRAM for Packets, for up to 1000 Packets

6511 Switchblade Elements

- Up to 8K MAC Address Entries with Auto Learning and Aging

- L2 Switching with L2+Packet Processing
  - Generic Pattern Recognition Engine with 16 User Programmable Patterns. Search for Pattern Match within first 64B of packet data.
  - Can be used to detect Control Packets such as IGMP (IP Multicast) and GVRP (VLAN Membership).
  - Lookup Results Used to Filter and/or Monitor Packets, Change Destination, Modify Priority, and Collect Statistics.
- Tag and Port based VLANS
  - 802.1Q compliant
  - 1k Active VLANS
- Wire-Speed Performance on All Ports
  - Fast Ethernet Ports Support 10/100 Mbps
  - Gigabit Ethernet Ports Support10/100/1000 Mbps
  - Half/Full Duplex Support on All Ports at 10/100 Mbps, Full duplex only for 1000 Mbps
  - Auto-speed negotiation Support for All Ports
  - 802.3x compliant Flow Control on Full Duplex Ports, Congestion-based Flow Control On Half Duplex Ports
- Port Trunking
  - 2,4 or 8 10/100 Mbs Ports or 2 1000 Mbs Ports can be trunked

General Front System Card Features

Craft Port

Via Asynchronous Serial EIA-561, RJ-45 supporting RS-232 with VT-100. The factory default speed is 9.6kbps with user configurable speed to 115,200kbps.

Front Panel LEDs:

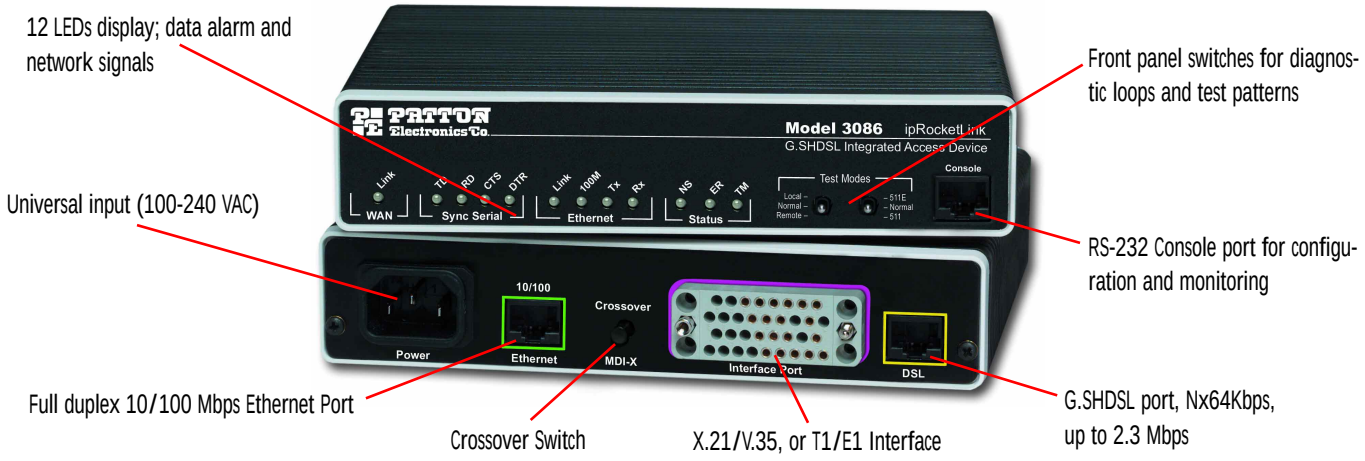
- **POWER:** Green/[ON] if power is being applied. [OFF] if unit has no power.
- **CPU FAIL:** Red/[ON] if CPU fails. [OFF] if operating normally.
- **ALARM:** Yellow/[ON] if unit is reporting an alarm. [OFF] if operating normally.
- **TEST MODE:** Yellow/[ON] if the up-link interface or sub-channel is in loop-back/diagnostic mode including when running PRBS test patterns. [OFF] if no tests are being performed.
- **CLOCK**: Green/[ON] if primary clock source. Flashing green if secondary clock source. [OFF] if not a clock source.
- **SYSTEM**: Flashing when MyOS is running. [OFF] when MyOS is hung.
- **ETHERNET A**: Green/[ON] for link indication.
- **ETHERNET B**: Green/[ON] for link indication.

Software Operating System

Patton Electronics MyOS*

3086 G.SHDSL CPE IAD Introduction

The 3086 ipRocketLink IAD redefines access and sets the new standard for customer premise equipment. Based on ETSI and International Telecommunications Union (ITU) G.SHDSL G.991.2 standards, the Patton 3086 ipRocketLink enables nx64 (*n*=1..36) over a single pair of wires while combining standards-based transmission with Synchronous Serial, Ethernet, and high-speed IP routing…all in one compact package. With Patton's FlexIP™ architecture, The Model 3086 offers V.35/X21 Sync Serial or T1/E1 interfaces interfaces and 10/100 Ethernet ports. The sync serial port is user configurable for either V.35 or X.21. Integrated software selectable DCE/DTE support eliminates messy crossover cables. The Ethernet port gives access to any IP network via ATM, PPP, or Frame Relay. Both interfaces can be simultaneously selected with user-defined bandwidth for each port. The 3086 boasts easy installation with DIP switch, Telnet, and WEB/SNMP management. It provides bridging and routing functionality along with advanced IP features like NAT and Firewall and optional IPSec-based VPN. As part of Patton's family of ipDSL products, the Model 3086 offers a complete, managed, end-to-end system when used with Patton's central site access Concentrators.



3086 Key Product Features

The Patton Model 3086 ipRocketLink Series set of hardware and software features enables user quick up time. The 3086 offers hassle free power, terminal, and network installation, while an intuitive built-in web server allows complete command and control of your unit.

Key Features	Product Highlights	Feature Benefits
Dual Ethernet/IP Router and Sync serial Interfaces	With Patton's FlexIP architecture, split the bandwidth and use both interfaces at the same time	Double the functionality. The 3086 complete suite of multiplexing/routing protocols, allows for simultaneous transport of packetized data to the Ethernet port, and serial synchronous data on its X.21/V.35 port over a single DSL link
Connect to ATM, PPP, and Frame Relay	Versatile interface options allow for simple deployment into any network environment	Multiprotocol capable unit enables secure and reliable WAN data link connections. Using widely used standards based services, the 3086 presents to the user the choice of connecting to ATM, PPP, or Frame relay

What are the features, functions, and key benefits of the new ForeFront Access System?

Key Features	Product Highlights	Feature Benefits
Advanced WEB/SNMP/TELNET Management Features	Built-in VT-100 console port makes setup a snap, and you can use the embedded HTTP/SNMP agent or built-in TELNET server to manage the Model 3086 from anywhere in the world	The most friendly configuration system- have your customer's connection up and running today. Intuitive menus, via VT-100 terminal port and HTTP/SNMP browser via built-in web server, allows fast and simple configuration of DSL, routing, DLC protocol, and diagnostics options
nx64 Speeds to 2.3 mbps	User selectable data rates for either Sync Serial or Ethernet/IP ports. Use as a standalone or with the ForeFront Access System	Bandwidth selection allows complete provisioning flexibility. Start at any nx64kbps, and as your customer's bandwidth demand increases, simply switch on more 64kbps channels (locally or remotely) without service interruptions or additional equipment
User Selectable DCE/DTE V.35/X.21	Get both interfaces at same time. Software selectable with DCE/DTE support without messy crossover cables	Avoid the hassle and headache of finding the right cable or adapter during installation. The 3086 user configurable X.21/V.35, and easy installation, testing, and reconfiguration
T1/E1 drop and insert port	T1/E1 port allows convenient connection to PBX at the customer locations	Complete Data and Voice solution for small to medium size bussineses all in one box
Interoperable with Third-Party DSLAMS	Take advantage of Patton reliability whether you connect back-to-back or to a third-party DSLAMs	Patton 3086 standards based IAD, does not lock the user into a single proprietary solution. Compliant with ETSI/ITU G.991.2 standard, the Model 3086 connects to another Patton 3086, 3096RC, or a third party compliant device
LEDs and Full V.52/V.54 Diagnostics	Test the link with built-in test modes with easy-to-access toggle switches. LEDs provide clear status at-a-glance	Minimize or avoid downtime with the most complete, user-friendly diagnostics suit. The Model 3086 comes equipped with a full set of diagnostics including V.54 local/remote loops, and V.52 compliant 511/511E BERT patterns. All diagnostics are accessible via front panel switches, VT-100 menus or SNMP/HTTP browser. LEDs present at-a-glance alarms and other data signals
Universal Input Power	Full range Internal Universal Input (100-240 VAC, 50-60Hz) power supply	Power this unit at any standard voltage level and frequency range, anywhere in the world. Sturdy IEC-320 compliant AC, fully grounded, power entry connector securely connects and filters power to an internal power supply module

3086 IAD Product Highlights

- IP access via ATM, PPP, or Frame relay.
- Complete routing and bridging core including Firewall and optional IPSec-based VPNs.
- Dual Serial (X.21/V.35) or T1/E1 and 10/100 Ethernet interfaces can be used simultaneously over a single, high speed DSL link.
- User configurable X.21 or V.35 interface, and DTE/DCE selection.
- Configure with VT-100 console, HTTP/SNMP Web browser, Telnet, or dip-switches.
- Built-in Ethernet crossover
- Built-in Local/Remote loops and 511/511 BERT initiated via switches or software menus.
- Complete alarm facilities monitor Serial, Ethernet, and DSL link.

3086 IAD Product Highlights

- 12 easy to read front panel LEDs display status information at-a-glance.
- Internal Universal (100-240VAC, 50-60Hz) Power Supply.
- Compact case (7.3 x 6.6 x 1.62 in.) can be easily installed in any equipment closet.

3086 Competitive Summary

The Patton Model 3086 ipRocketLink IAD delivers all the advanced features for secure, reliable, and high-speed data connections. By combining sync serial access with Ethernet/IP, the 3086 IAD makes next generation connectivity simple, easy, and cost effective. Available with a single V.35 or X.21 sync serial interface or with user selectable V.35/X.21 or T1/E1inter-faces, the 3086 is a potent NTU for any network connection. With it's 10/100 Ethernet/IP interface, the 3086's routing capabilities are ready for the task: included are NAT, DHCP, Firewall, and Filtering. Future integration allows both sync serial and Ethernet ports to be used at the same time. The 3086 IAD can be used back-to-back applications or with the Patton ForeFront Access Infrastructure System. Additionally, the 3086 IAD can be used with any other G.SHDSL TDM or Packet system. Patton's 3086 is easily configured and managed via VT-100 console SNMP or its built web or TELNET servers–different user-friendly ways to get the system on-line quickly. Complete configuration and management capabilities are available through the integrated Click-and-Go GUI or customized by directly downloading the SNMP MIB from the 3096. The Web management screens can be managed from any location in the world via the internet. All software upgrades are free and easily downloaded via FTP for immediate upgrades. The model 3086 can connect at DSL speeds of Nx64Kbps up to 2.3Mbps, and can reach distances up to 32,000 feet. In most applications, users take advantage of the dual port capabilities of the model 3086 to assign part of the DSL bandwidth to the Ethernet port for IP centric services, and part of the bandwidth to the sync serial port for connection to routers or multiplexer in campus environments.

3086 Competitive Positioning

		Patton 3086	Cisco 828	ZyXel 782
Connectivity	Line Type	**G.SHDSL**	G.SHDSL	G.SHDSL
	ATM Encapsulation	**YES**	Yes	YES
	Native PPP/Frame Relay	**YES**	NO	NO
	Bridging/PPPoE/IPoATM	**YES**	Yes	Yes
	NAT/MultiNAT/DHCP	**YES**	Yes	Yes
	Statefull Firewall/ACL	**YES**	Yes	Yes
	V.35/X.21	**YES**	NO	NO
	T1/E1	**YES**	NO	NO
Ease of Use	Status LEDS	**12**	10	6
	ENET Cross-Over Switch	**YES**	Yes	NO
	10/100 Ethernet	**YES**	NO	Yes
	Built-In Web Mgmt	**YES**	NO	NO
	Tech Support	**FREE**	$$$	included
	Software Upgrades	**FREE**	$$$	included
	Compact Unit	**Compact**	Large	Large
	Best Value	**YES**	$$$	$$$

3086 Applications

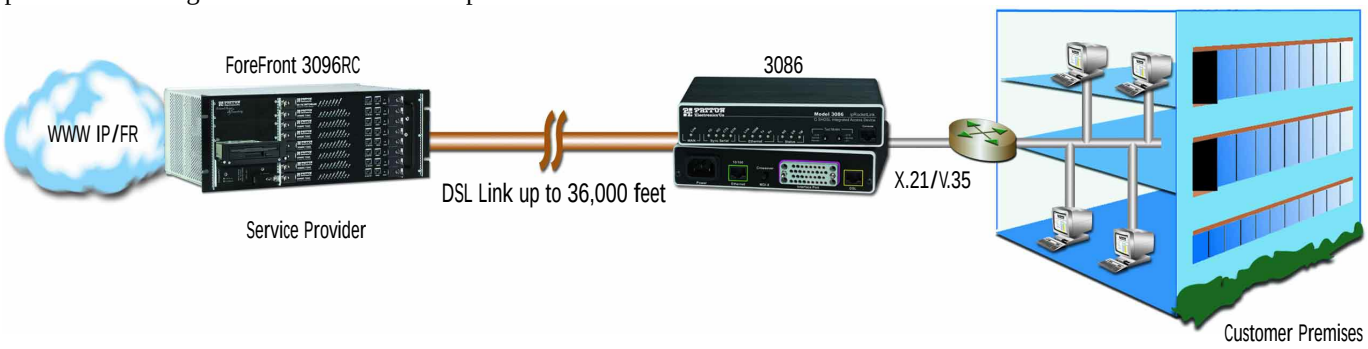
The increasing convergence and expansion of local loop data and voice services, along with shrinking budgets, demands the efficient use of new and current equipment and infrastructure. The model 3086 IAD responds to the needs of medium and small enterprise by offering an economical way to connect intranets, and PBX voice connections to the Internet via a single-pair, high speed DSL link. The 3086 IAD connects to FR/ATM/PPP links and provide routing features for small to medium enterprise costumer, including NAT, DHCP, and Firewall. The 3086 IAD also connects to sync serial or E1/T1 drop and insert interfaces to provide complete, one-box solutions in IP, TDM, or voice connectivity.

Application 1

TDM Data Internet Access

For customers who already have a router but need access to the data network, the Model 3086 is the ideal solution to provide a fast, scalable, and long-reach solution.

In TDM data application, the Model 3086 primary function is for network access over DSL, and to provide interface conversion to X.21, or V.35 for connection to the local router. On the terminal side the model 3086 easily connects to any outer via a DB-9, DB-25, or M34 connector. In addition, the serial port can be configured as a DTE or DCE operation. In TDM applications, the 3086 provides physical access to a router running IP over any WAN protocol such as ATM/FR/PPP, the 3086 is protocol transparent. On the DSL network side, the 3086 runs at user selectable increments of nx64kbps, from 192kbps to 2.3Mbps, and can connect at distances up 36,000 feet (5km). At the data network's edge, the 3086 connects to a Patton ForeFront 3096RC system, another 3086, or to a third party G.SHDSL compliant device.



3086 Applications

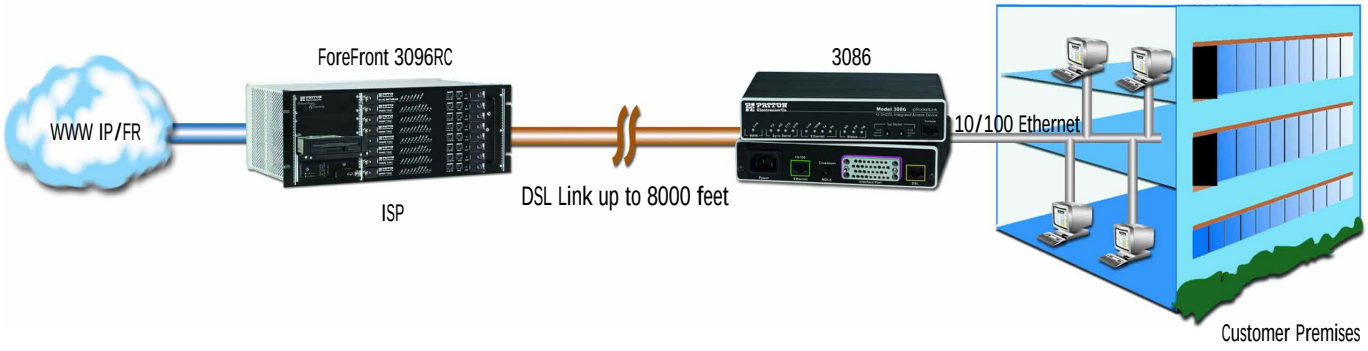
Application 2

IP/FR Access

With a powerful business class router core, and scalable Nx64k DSL standards based links, the Model 3086 securely connects small/branch offices directly to IP/FR services. The 3086 is equipped with ip routing protocols and FR/ATM/PPP links for high speed customer connections in Internet access or point-to-point deployments.

In Internet access applications, the ISP installs a 3086 at the customer premises, and connects directly to the customer LAN switch via a 10/100 10Base-T Ethernet interface. The 3096 provide all routing and security facilities for full duplex low latency packet traffic from and to the customer LAN. At the ISP end, the remote 3086 connects to a local 3086, 3096RC ForeFront concentrator, or a compliant third party device. ISP personnel can conveniently configure and monitor the local and remote Model 3086 from any PC in their main office.

In a IP/FR application, Network access translation features in the 3086 takes a single dynamic IP address for use by all devices in the customer LAN.

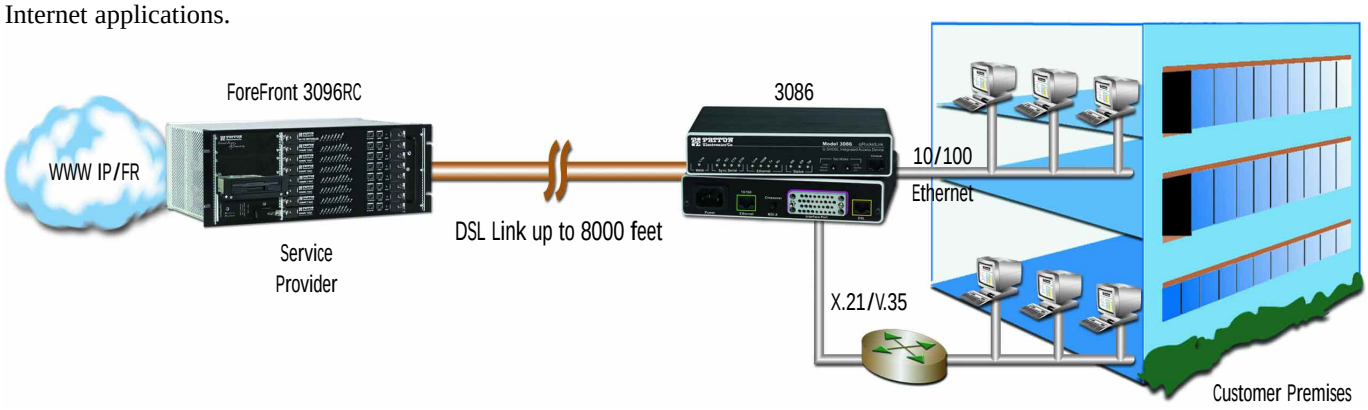


Application 3

IP/FR and TDM Data Access

The 3086 IAD dual sync serial and IP connectivity offers the most cost effective aggregation solution for small to medium size business users**.** With a powerful business class router core combined with an IP based 10/100 Base-T and versatile sync serial X.21/V.35 interface, the model 3086 provides the ideal solution for IP based and serial data in extranets and Internet applications.

The Model 3096 Ethernet interface connects directly to a 10/100 LAN switch or Hub, while the X.21/V.35 interface connects typically to a router or multiplexer at scalable Nx64kps speeds. The router core comes equipped with all standards routing, WAN, Management, security features, and more!

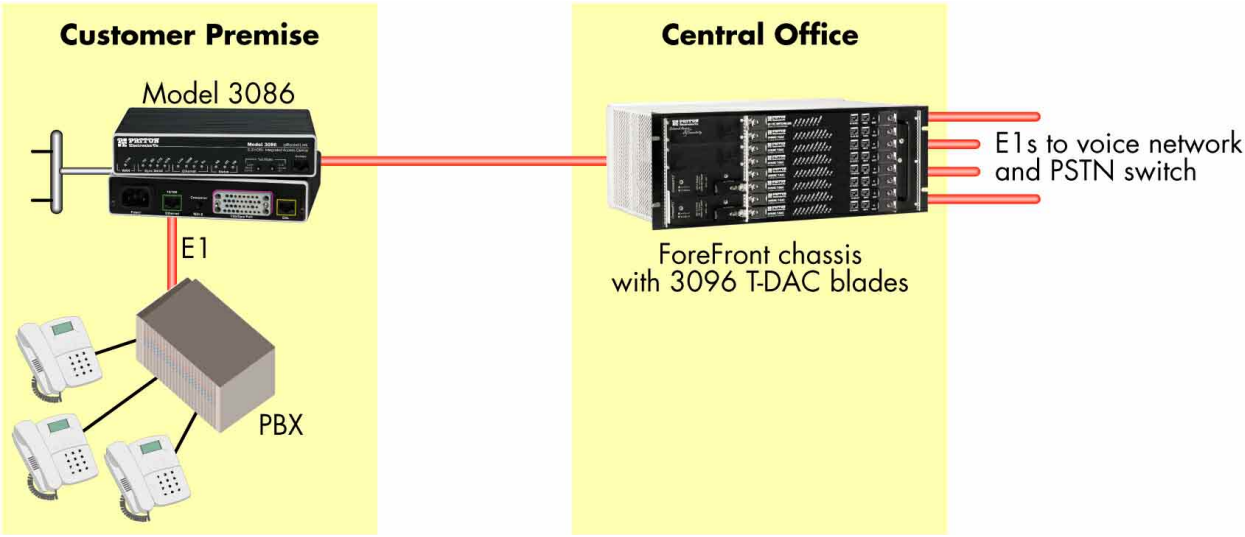


3086 Applications

Application 4

IP/FR and Voice over DSL

The 3086/RIK, dual Ethernet and E1/T1 IAD offers business customers complete one-box data and voice solution over DSL when used in conjunction with the Patton 3096 Forefront system.Using a Patton Model 3086/RIK, telephony services can be transported to a local PBX over standard T1/E1 WAN connections. As the E1/T1 is transparently interconnected to the PBX through the 3086, any signaling protocol can be used, including CAS R2, and CCS PRI. Through the TDM network, T1/E1's are cross connected from the PSTN voice network to appropriate E1/STM-1 streams and interconnected to a Patton 3096RC ForeFront Chassis. The E1 is then routed to the appropriate DSL port on the 3096. At the customer premise, the E1 is connected to the PBX. All call control, signaling, and voice traffic is between the PBX and the voice switch. Additionally, E1 ports on the 3096 can also be used to deliver PBX extension through the TDM network. As the Ethernet port is active and can allow always-on IP access at the same time the E1 is being used. This allows easy and low-cost integration into the existing voice network while offering advance IP connectivity…all over DSL.

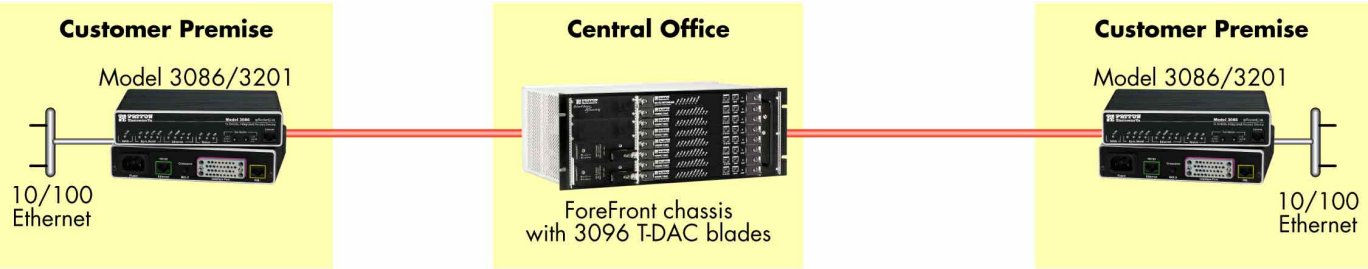


3086 Applications

Application 5

Metro Intranet Access

As a result of the symmetrical nature of the G.SHDSL modulation scheme, 3086 units can be deployed in simple back-to-back configurations. This benefit allows the easy and lowest cost creation of VPN's and intranets. Additionally, Model 3086 AID units can be connected through the network, either locally such as a metro office extension application through the same center, or via the TDM network to other centers. This allows secure networking and independent traffic engineering. Logically a PPP or Frame Relay link is established between each 3086 router. Either bridging or IP routing is activated. The use of IP routing permits NAT as well as other IP services such as firewall and DHCP. Each router will then forward traffic as appropriate to each end node of the network. IP, PPP, and Frame Relay connections are between each standalone, whether through T-DAC, TDM Network, or in back-to-back configurations.



3086 Software Overview

The Model 3086's rich software feature set enables users to configure routing, WAN, Management, and diagnostic for operation in a wide array of WAN and LAN environments. The operator can use the traditional EIA-232 craft port or the embedded graphical user interface (GUI). The RS-232 serial port with VT-100 emulation allows for connection of a terminal. Based on SNMP, the 3086 also contains built-in web and Telnet servers.

- HTTP
- SNMPv2 with MIB II
- TELNET
- RS-232 Console port
- Full system management including status queries and diagnostics

Routing Protocol Support

- Complete internetworking with IP (RFC 741), TCP (RFC 793), UDP (RFC 768), ICMP (RFC 950), ARP (RFC 826).
- IP Router with RIP (RFC 1058), RIPv2 (RFC 2453)]
- Support for OSPF (RFC 2328)*+ dynamic routing.
- Up to 64 static routes with user selectable priority over RIP/OSPF routes.
- Built-in Ping and Traceroute facilities.
- Integrated DHCP Server (RFC 2131). Selectable general IP leases and user specific MAC/IP parings. Selectable lease period.
- DHCP relay agent (RFC 2132/RFC 1542) with 8 individual address pools.
- DNS Relay with primary and secondary Name Server Selection.
- NAT (RFC 3022) with Network Address Port Translation (NAPT) for cost-effective sharing of a single DSL connection. Integrated Application Level Gateway with support for over 80 applications.
- NAT MultiNat with 1:1 mapping.
- NAT Many:1
- NAT Many:Many mapping
- NAT Port/IP redirection and mapping.
- VPN services supporting PPTP PAC+ (RFC 2637) with MS-CHAP*+ and MPPE*+ L2TP LAC+ (RFC 2661).
- uPNP controlled device for seamless networked device interconnectivity and Windows XP integration.
- IP-in-IP (RFC 2003) Encapsulation Patton VL2 Technology (Virtual-Layer-2)*+
- IP-in-IP selectable Direct-IP for NBT traffic with default routing for all others. Supports NBT broadcasts for tunneling across WAN.*
- IGMPv2 Proxy support (RFC 2236)+
- Frame Relay with Annex A/D/LMI, RFC 1490 MpoFR and FRF.12 Fragmentation

Compression Support

- STAC (LZS) Compression.*
- V.44* Compression.*
- PPP Header Compression.*
- VJ TCP Header Compression.*
- PPP Compression Control Protocol (RFC 1974).*

PPP Support

- Point-to-Point Protocol over HDLC
- PPPoA (RFC 2364) Point-to-Point Protocol over ATM.
- PPPoE (RFC 2516) Client for autonomous network connection. Eliminates the requirement of installing client software on a local PC and allows sharing of the connection across a LAN.
- User configurable PPP PAP (RFC 1661) or CHAP (RFC 1994) authentication.
- PPP BCP (RFC 1638) support for bridged networking support.

3086 Software Overview

ATM Protocols

- Multiprotocol over ATM AAL5 and Multiprotocol Bridged encapsulation RFC 2684 (Formerly RFC 1483) and RFC 1577 Classical IP over ATM. Default RFC 1483 route mode. Logical Link Control (LLC)/ Subnetwork Access Protocol (SNAP) encapsulation. Default VC mux mode.
- ATM UNI 3.0, 3.1, and 4.0 signaling ATM QoS with UBR, CBR, nrt-VBR, and rt-VBR and per-VC queuing and shaping. IISP V.1.0 Q.2931 UNI L3 and Q.2971 UNI L3 support.
- LAN Emulation Client (LEC) V.1 with LEC via PVC or ILMI connection
- Peak cell rate shaping on a per-VCC basis up to 32 active VCCs across VPI 0-255, VCI 0-65525. Single default PVC: 8/35 with PCR=5,500 cells.
- I.610 OAM network management including AIS/RDI, loop-back and performance monitoring.
- Enhanced ILMI 4.0 for auto-configuration of ATM PVCs.
- FRF.12 Frame Relay Fragmentation support, LMI For Frame Relay PVC Link Management, FRF.5 Frame Relay to ATM Network internetworking, and FRF.8 Frame Relay to ATM Service Internetworking.
- IP QoS with class of service definition and traffic shaping+
- Early Packet Discard/Partial Packet Discard DiffServ (RFC 2475)+

Management

- User selectable ATM, PPP, or Frame Relay WAN datalink connection.
- Web-Based configuration via embedded web server
- CLI menu for configuration, management, and diagnostics.
- Local/Remote CLI (VT-100 or Telnet).
- SNMPv1 (RFC 1157) MIB II (RFC 1213)
- PC Windows based configuration program to aid in setup.*
- Quick Start Setup runs through common options to simplify circuit turn-up.
- Real-time SNTP with primary and secondary NTP hosts.*
- Logging via SYSLOG, and VT-100 console. Console portset at 9600 bps 8/N/1 settings no flow control.
- EOC access for End-To-End management, configuration, and control.

Security

- Packet filtering firewall for controlled access to and from LAN/WAN. Support for 255 rules in 32 filter sets. 16 individual connection profiles.
- Statefull inspection firewall.*++
- IPSEC*++with DES and 3DES, Transport or Tunnel mode, ESP or AH Authentication, MD5 or SHA-1 data integrity & IKE key exchange.
- DoS Detection/protection. Intrusion detection, Logging of session, blocking and intrusion events and Real-Time alerts. Logging or SMTP on event.
- Password protected system management with a user-name/password for console and virtual terminal. Separate user selectable passwords for SNMP RO/RW strings.
- Access list determining up to 5 hosts/networks which are allowed to access management system SNMP/HTTP/TELNET.
- Logging or SMTP on events: POST, POST errors, line/DSL, PPP/DHCP, IP.

3086 Hardware Overview

The Model 3086 hardware is optimized for quick connection, resilience, and reliability to deliver your IP and/or serial data at high speeds in any environment. The model 3086 is equipped with a universal input power supply (100-240VAC), either user selectable DTE/DCE interface programmable for X.21/V.35, or T1/E1 port. In addition a 10/100 Base-T port includes a built-in crossover switch, a console port allows quick turn-up to get your customer's connections up and running immediately. Front panel LEDs display alarms and data status signals at-a-glance.

WAN Interface

The 3086 comes with a standard G.HSDSL interface presented in a female RJ-45 connector – The model 3086 connects directly to the local loop via 2-wire twisted pair media.
The WAN interface supports the following features:

- Sturdy RJ-45 connector for connection to the DSL link.
- 2-wire twisted pair, full duplex operation.
- Nx64kbps speeds up to 2.3Mbps
- Reach of up to 32,000 feet.
- Connects to IP/FR/ATM/PPP WAN protocols.
- Connects to another Patton 3086, 3096RC ForeFront System, or third party compliant devices.

LAN

The 10/100-Mbps Ethernet LAN port is presented on an RJ-45 connector with an auto sensing/full duplex 10Base-T or 100Base-T interface. Also included are:

- 100 Base-T half/full duplex operation
- 10 Base-T half/full duplex operation
- Auto detection and fallback
- 10/100Mbps link and status indicator

Sync Serial Interface

The 3086 comes with a Synchronous Serial Interface for connection to a router or multiplexer. Options for this port include:

- ITU-T X.21(DB-15) or V.35 (M34) fixed interfaces, or X.21/V.35 (DB-25) user selectable
- User selectable DTE/DCE configuration
- NX64kbps speeds up to 2.3Mbps (split with the LAN interface)

T1/E1

- Line Rate 1.544Mbps (T1), and 2.048Mbps (E1)
- RJ-48C connector
- Reach and range 1 mile (1.6 km), 24AWG wire
- Nx56/64kbps with full DS0 mapping
- AMI/B8ZS (T1), AMI/HDB3 (E1)
- D4/ESF coding and framing (T1)

RS-232 Console Port

The RS-232 console port (located on the front panel) provides for initial configuration of the model 3086.
The RS-232 port supports.

- An RJ-45 connector with EIA-561 pinout
- Asynchronous data rates up to 115 kbps
- A management interface that supports VT-100 terminals
- Hardware flow control
- Hardware CD and DTR for external modem support

Power System

The Model 3086 offers flexible power supply options.

- Internal AC power supply.
- Sturdy connection via rugged IEC-320, filtered power connector.
- Accepts universal-input voltage range, 100 –240VAC, 50–60Hz.

3086 Hardware Overview

Central Processing Core

The 3086 employs a Dual ARM RISC Virata processor. The general purpose RISC processor runs higher level protocols, while a higher performance microcoded RISC Protocol Processor is used for cell and frame handling, switching traffic at up to 120MHz. The Processor controls the direct connection to Etherenet and in conjunction with the Conexant DSL control the WAN interface. In addition the Viarta dual processor core supports the following features:

Protocol Processor

- Ethernet PHY Management
- Initialization code
- Soft-start real tasks

Network Processor

- Data transfer Framing, interleaving,CRC generation, Switching.
- Hard real-time tasks

Memory

- 8Mbyte DRAM
- 1Mbyte Flash, expandable to 2Mbytes

Configuration/Diagnostic Switches.

The model 3086 provides limited configuration capabilities via DIP-switches (located on the underside of the unit), and complete diagnostic capabilities via front panel switches.

- DIP switches: Allow configuration for speed, and clock mode for DSL and Sync Serial ports.
- Two front panel toggle switches: Allow user to initiate V.54 local or remote loops, and 511/511 BER test patterns.

System Timing

The Model 3086 may be derived from an internal source, Network (DSL), or External source from a V, 35 port. The system timing can be configured trough DIPswitches, VT-100 or NMS control.

- Internal clock, derived from an internal (oscillator source)
- Network clock, derived from the DSL link.
- External clock, derived from the V.35 serial port. Not available for units with X.21 serial port.

LED display

12 front panels LEDs display status of the WAN port, Ethernet, Sync serial, and diagnostic signals as follows:

WAN

- Link. Display connection status of the DSL link – solid yellow when connected, OFF when no connection is detected.

Ethernet

- Link. Solid yellow indicates connection to Ethernet LAN.OFF, no connection.
- 100M. Solid yellow, indicates connection to a 100Mbps LAN. OFF, connection to a 10Mbps LAN.
- TX. Glows yellow to indicate data transmission to the LAN.
- RX. Glows yellow to indicate Data received from the LAN.

Sync Serial

- TD. Indicates data received from the terminal.
- RD. Indicates data received from the DSL link.
- CTS. Indicates that the 3086 has activated the Clear –to Send signal to the terminal.
- DTR. Indicates that the terminal device has activated the Data Terminal Ready signal.

T1/E1 Signals

- Link. Indicates connection to T1/E1 line
- Loss. Indicates no valid connection detected

What are the features, functions, and key benefits of the new ForeFront Access System?

3086 Hardware Overview

Status/Diagnostic signals

- NS. Indicates that the 3086 has not detected a connection with the DSL Link.
- ER. Blinks to indicates received error when BERT patterns are activated
- TM. Indicates that the 3086 has entered diagnostic mode.

Physical & Environmental

The Model 3086 is enclosed in a strong, fire retardant case. It's small footprint is a plus when installing the units in tight spaces. The model 3086 physical and environmental includes the following.

- Dimensions: 7.3 x 6.6 x 1.62 in. (185 x 168 x 41mm)
- Operating Temperature: 0–50°C (32–122°F)
- Humidity: 5 to 95% RH, non-condensing.
- Power consumption: less that 5 watts.

Approvals/Compliance

The model 3086 has the following approvals:

- FCC part 15, class A
- Complies with UL1950 (MET)
- Complies with Canadian cMET
- EMC directive 89/336/EEC
- Low voltage directive 73/23/EEC (EN60950)
- ETSI/ITU-T G.SHDSL G.991.2
- CTR 12, CTR 13, and FCC part 68 (T1/E1 interface models)

3086 Specifications

DSL	G.991.2 ITU G.SHDSL Annex A and Annex B, G.994.1 G.hs. nx64 data rates over 2-wire full-duplex to 2.3 Mbps, symmetrical, TC-PAM encoding. Distance of 32,000 ft (9.8 km) at 192 kbps to 18,000 ft (5.6 km) at 2.312 Mbps.
DSL Connection	Shielded RJ-11F isolation per IEC 950
Ethernet Connection	10/100Base-T, Auto-Sensing, Full/Half-Duplex operation
Serial Interface	User configurable ITU-T X.21/V.35 interface (DCE/DTE) presented on M34F or DB-25F connectors
Management	EIA-561 RJ-45 RS-232, VT-100 CLI, TELNET, Embedded WEB/HTTP, SNMP, Logging or SMTP on events: POST, POST errors, line/DSL, PPP/DHCP, IP MPOA AAL5 and Bridged encapsulation RFC 2684 and RFC 1577 IPoATM. LLC/VC Mux support.
ATM Support	UNI 3.0, 3.1, and 4.0 ATM QoS with UBR/CBR/nrt-VBR/rt-VBR and per-VC queuing and shaping. Peak cell rate shaping on a per-VCC basis up to 32 active VCCs I.610 OAM network management including AIS/RDI, loop-back and performance monitoring.
Protocol	Enhanced ILMI 4.0 for auto-configuration of ATM PVCs, IP (RFC 741), TCP (RFC 793), UDP (RFC 768), ICMP (RFC 950), ARP (RFC 826). IP Router with RIP (RFC 1058), RIPv2 (RFC 2453), OSPF (RFC 2328) Integrated DHCP Server (RFC 2131). Selectable IP
Protocol (continued)	leases and MAC/IP pairings. DHCP relay agent (RFC 2132/RFC 1542) with 8 address pools. DNS Relay. IGMP v1 and v2. IP-in-IP (RFC-2003) encapsulation, Ethernet Bridging. NAT/NAPT with integrated application support, MultiNat with 1:1 mapping, Many:1, Many:Many mapping, NAT Port/IP redirection and mapping.
Security	DoS Detection/protection. Intrusion detection, Logging of session, blocking and intrusion events and Real-Time alerts, Password protected system management with a username/password for console and virtual terminal, Packet filtering firewall for controlled access to and from LAN/WAN. Support for 255 rules in 32 filter sets. 16 individual connection profiles. Access list determining up to 5 hosts/networks which are allowed to access management system SNMP/HTTP/TELNET
Indicators	12 LEDs: DSL Link; Sync Serial: TD, RD, CTS, DTR; LAN: TX, RX, 100M Link; Status: NS, ER, TM.
Power Supply	Internal universal 90-260 VAC input
Compliance	FCC Part 15A, CE Mark, EMC Directive 89/336/EEC, Low-Voltage Directive 73/23/EEC, EN60950, EN55022 (CISPR 22)
Environment	Temperature: 32–122°F (0–50°C); Humidity: 5–90%, non-condensing
Dimensions	7.3" x 6.6" x 1.62" (185mm x 168mm x 41mm).

ForeFront Product Overview

IDSL Ports	24 iDSL access ports on RJ-21X 50 pin Telco connector
WAN Ports	Four WAN ports with integrated CSU/DSU on an RJ48C
Ethernet Ports	One 10/100 Mbps on an RJ45F
Serial Port	One RS-232 on an RJ45F
Alarm Port	Terminal block for transmitting unit alarm to external source
Clock Port	Terminal block for receipt of an external stratum clock
Port Mapping	IDSL to iDSL : connects any two end users IDSL to WAN: Any two DSOs can be mapped together providing drop-and-insert function WAN to WAN:
Line coding	64/128 kbps using 2B1Q T1 ports configurable for AMI or B8ZS E1 ports configurable for AMI or HDB3
Management	SNMP management through on-board SNMP agent
Services	Web-based management through on-board HTTP
Profile	High-density, low-profile 1U-high platform
Software Upgrades	Free Software Upgrades via FTP download

Ordering Information

309224x/RUI	Redundant Universal 90 to 120 VAC Power Supplies
309224x/R48	Redundant -32 to -72 VDC Power Supplies

x = Color of unit (W = Cool White, R = Ultra Red, B = Black Ice, U = Cobalt Blue)

Online Resources

access.patton.com