

Broadband FOCUS - Hardened, Cybersecure Multi-service Multiplexer

TDM/Packet Multiplexer for your Mission-critical Communications

AMETEK

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Module Configuration for Ethernet Packet Transport

Developed from years of experience with our FOCUS T1/E1 systems installed in mission-critical applications around the world; the new AMETEK Broadband FOCUS (BB FOCUS) gives you a solid communications network and options you won't find anywhere else. BB FOCUS seamlessly integrates traditional TDM DS0 channels with the flexibility of Ethernet packet technology. With the BB FOCUS the choice is yours - legacy DS0 circuits over T1/E1 optically, over DS1 electrically, or over Ethernet packet networks, or all at the same time out of the BB FOCUS node. And it's fully backward compatible, not only with AMETEK FOCUS systems, but with many competitive systems and older infrastructure technologies.

Key Upgrade for Mission-critical Systems and Smart Grid Initiatives

BB FOCUS uses high-performance packet based multiplexing technology running at Gigabit speeds over dedicated fiber optic or core/edge Ethernet networks. Layer 2 packets are used for all transport, eliminating the security issues associated with layer 3 routable protocol IP-type communications. Packetized communications are faster and more easily applied than Time-Division Multiplexing (TDM).

BB FOCUS is unlike traditional SONET/SDH systems that may offer Ethernet channels encapsulated within their own transport layer. BB FOCUS does not use a typical SONET/SDH architecture involving framers, aligners, VT cross-connects or the firmware required for these types of systems. BB FOCUS operates as a packet-over-Ethernet system with a powerful packet processor controlling the flow of DS0 channels and Ethernet data through the system. Equally it is able to engage T1 systems through specialized multi T1 interfaces.

Perceived negatives for using Ethernet in critical communication applications, such as protective relaying and control functions, have been overcome by today's switch technology. Truly predictable channel latency can be now realized through prudent use of QoS tagging. Fast, redundant loop switching times ensure maximum channel availability.

Unlike traditional TDM systems, latency in a given channel is nearly independent of the number of nodes between end terminals since pass-through delays are reduced to 5-10 microseconds per node, compared to the 10-125 microseconds required in T1, E1, SONET or SDH systems. Total latency for end-to-end circuits is comparable with typical TDM circuits allowing their application wherever low latency circuits are required.

Substation-hardened Design and Secure Interface Facilitate Remote Use

The hardened BB FOCUS was designed specifically to be immune to the environmental variations seen in power substations and industrial environments. It meets applicable ANSI, IEEE, IEC and CE standards for protective relay and communications equipment.

The standard 4RU, 19" rack-mounted chassis can operate in ambient temperature ranging from -25°C to +65°C. The web based HMI offers remote temperature and DC voltage sensing with alarm reporting.

Remote diagnostics and test as well as firmware upgrades ensures minimal downtime for system updates and maintenance. Fully redundant T1/E1 Transframer (TDM transport applications) and Power Supply Modules are available as options to provide 1+1 redundancy as needed.

If the user is comfortable with different manufacturers' utility hardened Ethernet switch designs, then the optional integrated Ethernet switch would not be included and CAT 5 100Mb cables (RJ45 terminated) will connect BB FOCUS packet port and admin port to the external switch. BB FOCUS may also be deployed in simple point-to-point or linear systems without the use of internal or external Gigabit switches. For these applications, we include 100Mb SFP optical ports on the rear interface of the System Control Module. A standard web-browser interface (e.g., Mozilla Firefox, Microsoft Internet Explorer, etc.) allows parameters to be changed and data safely viewed from anywhere on the utilities' secure intranet. The interface and user information are kept safe through password protection and data encryption.

Module Configuration for Ethernet Packet Transport

The administrative system also allows for channel provisioning, without assigning pass-through connections at any in-between nodes. End-to-end connections are set up from one end with one command. If you have ever struggled with time-slot maps through TDM networks, then you can appreciate what a tremendous benefit this is.

Operator Interface Offers Status at a Glance

The BB FOCUS uses a browser-based, Windows-style, operator interface that provides an easy-to-read system status overview, including channel and common equipment status and system events. The primary interface screen (shown on front cover) also shows a summary of current major and minor alarms plus a menu of additional functions. By accessing the categories in the primary menu, operators can drill down into the system operation to check performance, review Sequence-Of-Event (SOE) logs and obtain all detailed data needed for system diagnosis, troubleshooting and maintenance. The SOE log may be synchronized to an internal clock, IRIG or Network Time Protocol (NTP) as needed.

Setting System Parameters Is Easy

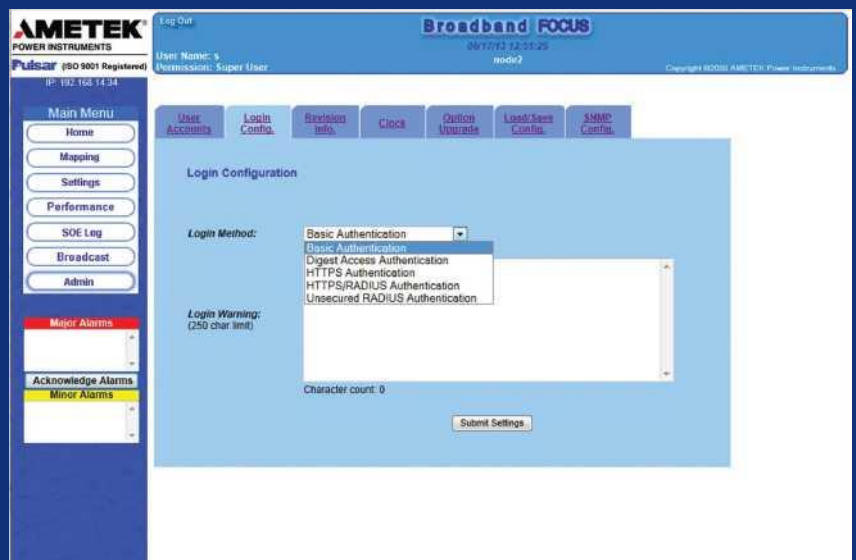
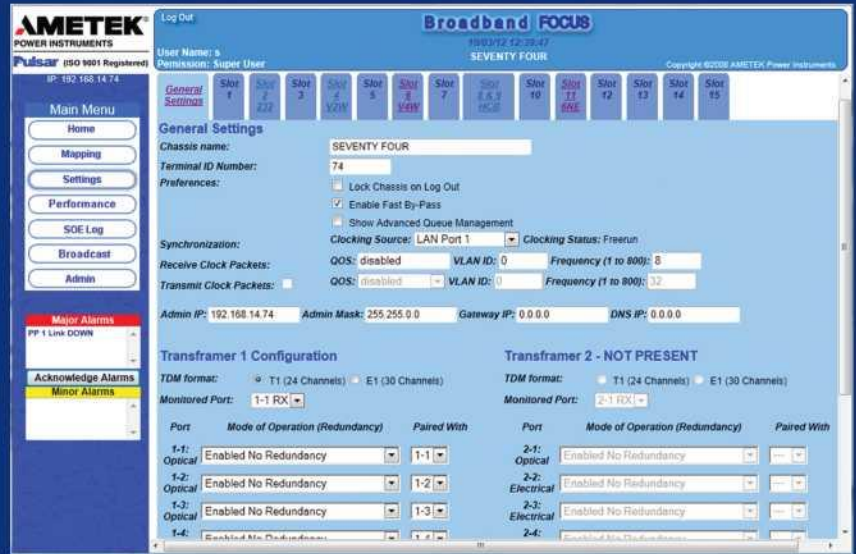
The “General Settings” window gives the user access to all primary system settings, including: Transframer configurations, network synchronizing mode, port identifications, as well as links to both local and remote individual channel modules.

Configuring Individual Channel Modules Takes Only Minutes

Each BB FOCUS Channel Module can be configured quickly via the module configuration screens. Settings are available as radio buttons, check boxes, drop down menus or simple fill-ins. Once set up, these configurations, along with all system settings, may be saved to offline configuration files for future maintenance or reporting needs. See page 6 for channel priority/bandwidth requirement options.

Several User Choices For Secure Log-In Authentication Provided

The Secure Administration access browser page provides users secure log-in choices, including HTTPS, and RADIUS access for central administration of user IDs and passwords. Additional tabs for the Administrator allow enabling a “Warning Banner” text message that will display upon log in, notifying non-authorized users to not attempt access to this network.



BB FOCUS May Just be the Most Flexible Multiplexer Ever Offered

Unique Trans framers Keep Traditional TDM Equipment in Place

BB FOCUS provides complete flexibility, mapping DS0-to-T1/E1 over legacy TDM transport networks today, or mapping DS0-to-Ethernet packet for transport over EOS, Ethernet switches, or IP/MPLS Transport Networks of the future. The choice is yours right now, today, to mix and match throughout your networks as you wish.

The BB FOCUS system includes an ingenious Transframer (combined transceiver/T1-E1 framer) design that allows seamless transport of data from existing external channel banks, T1/E1 networks or ports from SONET/SDH systems. Intelligent Digital Access Cross-Connect System (DACS) offers a fully non-blocking fabric, allowing the user to select any DS0 channels from the connected T1/E1 streams to be mapped to any other T1/E1 stream. Up to two Transframer modules may be installed into each BB FOCUS node and each Transframer module can have up to four T1/E1 optical or electrical ports interfaces, for up to a total of eight T1/DS1/E1 ports. Several redundancy configurations are possible including four-fiber hot standby and high speed ring re-routing. The Transframers may be fitted with any combination of optical or electrical ports using a variety of standard connector pluggable interfaces.

For legacy DS0 channel needs, the basic BB FOCUS includes 12 physical channel card slots accepting any current FOCUS channel modules. Three additional physical card slots are provided for additional future DS0 channel modules or for higher bandwidths applications channel cards in future applications. For large sites, one BB FOCUS Expansion Shelf providing 12 additional DS0 channel module slots may be subtended off the main BB FOCUS chassis as needed.

Unique TDM-to-packet integration, coupled with the broad array of available channel modules and Transframers, lets the powerful BB FOCUS system work with SONET, PDH / SDH systems or any T1/E1 channel banks, layer 2 Ethernet switches, or layer 3 IP / MPLS equipment.

BB FOCUS will transport channel information for almost every type of equipment installed in your substation, including:

h SCADA/RTU

h Video surveillance

h Substation LANs

h Protective Relays

(directional comparison, current differential, direct transfer trip, etc.)

h Private automatic branch exchange (PBX) voice network

h Synchronous/asynchronous data

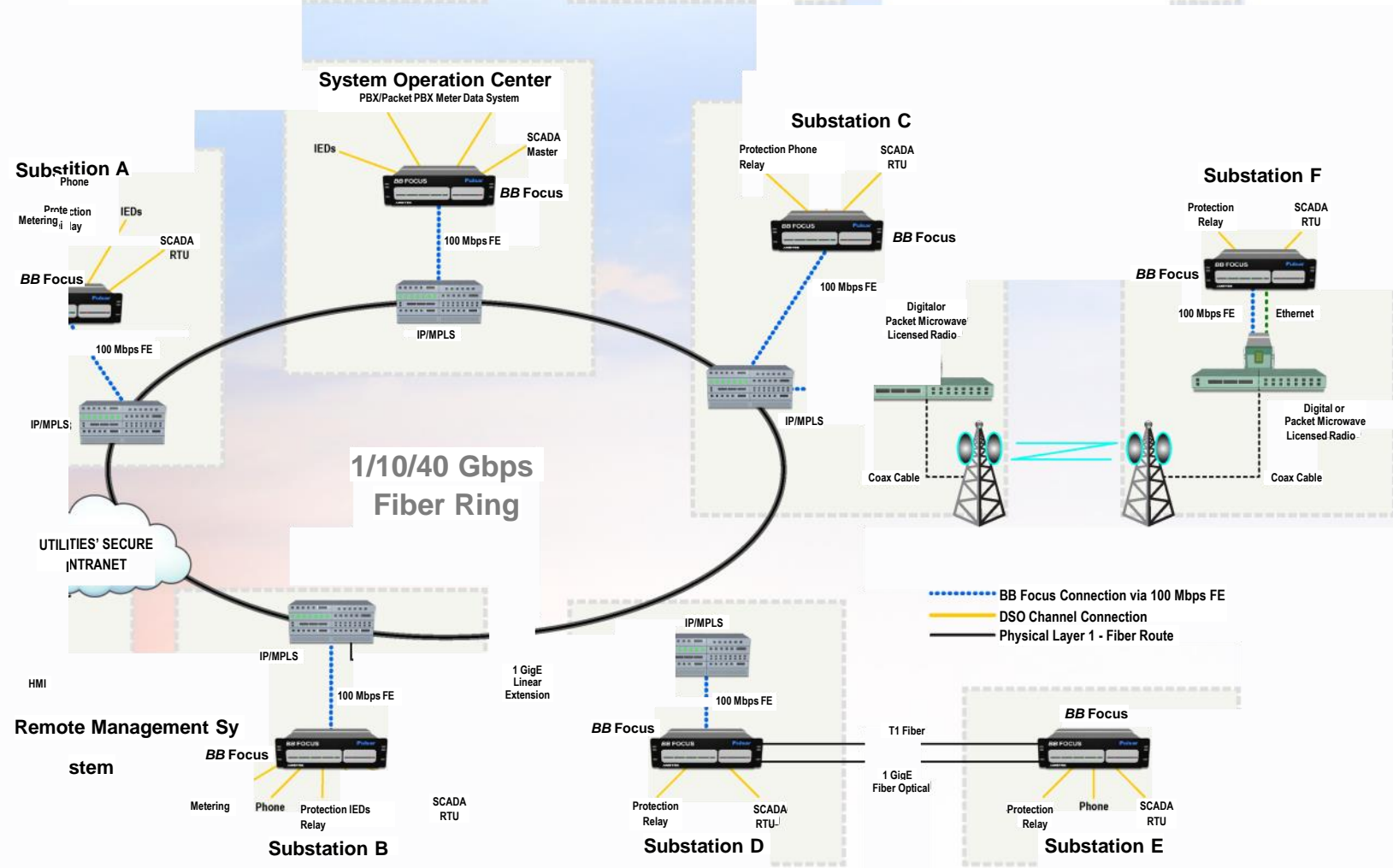
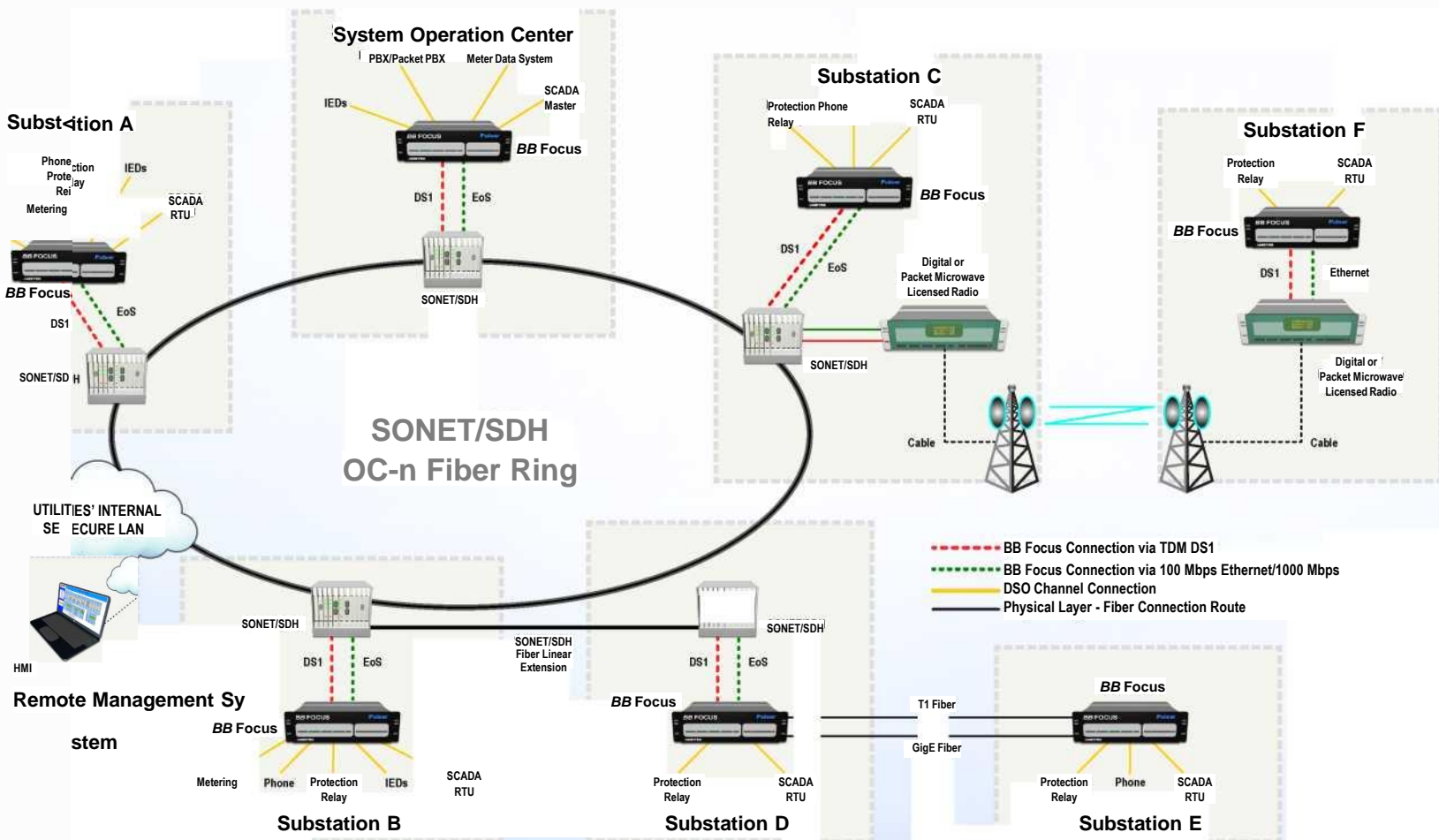
h Telephone systems

h OCUDP

Top Diagram: Broadband FOCUS TDM Access/Edge

Multiplexer Flexibility to Match Your Legacy TDM Transport Network

Bottom Diagram: Broadband FOCUS Ethernet Transport of Legacy DS0 Channel Requirements Mapped Over Your Ethernet/IP-MPLS Transport Network



TDM Mapping Screen

The Intuitive Mapping Browser Screen facilitates easy, fast, point-and-click selection for mapping any DS0 channel to any time slot on any TDM T1 port. The non-blocking DACS fabric enables mapping access to any of the up to 8 T1 ports and any of the 24 DS0 time slots in each T1. By clicking on the Ethernet bar, equally easy mapping of any DS0 over Ethernet packet is facilitated end-to-end, with settings that are selected by point-and-click ease, including settings such as QoS, packet jitter buffer, bandwidth utilization/latency optimization, and VLAN ID. All nodes and channel cards in the network are Auto-Discovered and shown on the Ethernet Mapping view for site/channel card selection.

The screenshot displays the AMETEK Broadband FOCUS TDM Channel Mapping interface. The main window shows a grid for mapping DS0 channels to T1 time slots. The grid has 15 columns for T1 slots and 30 rows for DS0 channels. A 'Main Menu' is on the left with options like Home, Mapping, Settings, Performance, SOE Log, Broadcast, and Admin. A 'Major Alarms' section shows 'PP 1 Link DOWN'. A 'Connection Legend' at the bottom right defines 'Local' and 'Remote' connections for different channel modules.

Slot	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Module		23Z		V2W		V4W		HCB		9NE					
Channel Map	1-1	1-2	1-3	1-4	1-5	1-6	1-7	1-8	1-9	1-10	1-11	1-12	1-13	1-14	1-15
DS0 #	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
TF1-1	2	A		A											
TF1-2	2														
TF1-3															11
TF1-4															
TF2-1															
TF2-2															
TF2-3															
TF2-4															
Ethernet															Approx. 5.376 Mbps

BB Focus Maximizes Efficiency with Channel Priority and Bandwidth Requirements

Another first for BB FOCUS is the ability to select several network parameters to ensure channel priority and bandwidth requirements are met. Quality of Service (QoS) is used to prioritize critical channels, allowing them to bypass less critical data in the unlikely event that traffic congestion or over subscription on the Ethernet network does not allow all data to be transported at the same time. Use of Gigabit Ethernet in today's switch networks means this level of congestion will be rare. When the switch network requires separating channel traffic into different Virtual LANs, (VLANs) these may also be specified on the channel mapping page to provide traffic segregation.

At times, in an access based system, bandwidth is at a premium. It is recognized that if Multi-Protocol Label Switching (MPLS) systems are deployed within existing networks, such restrictions can become more prevalent. For these and other applications, we offer bandwidth economy setting choices for each individual channel card. Higher bandwidth utilization settings permit lower back-to-back latency channels while lower bandwidth utilization settings will add from 1 to 16 ms latency delay to the back-to-back channel latency. For most voice or data circuits this delay is not noticeable, but the bandwidth savings can be significant. The bandwidth savings are accomplished by collecting a number of samples from the DS0 channel card for inclusion into a single packet, which is then transmitted to the remote destination. The remote node will distribute the data to the channel card one DS0 sample at a time allowing the connected devices to operate normally via the jitter buffers.

Primary Reasons to Select BB Focus are the Protection and Control Specific Applications

In addition to providing the standard and most common used voice and data channel modules, specific mission critical protection and control channel modules are available. In the case of protection relaying channels, the Protective Relay Interface (PRI) Module provides standalone direct or permissive trip functions without the use of external tone or other tele-protection equipment. Security setting choices with addressing give the PRI unmatched trip security. Up to four independent bi-directional circuits are included, which may be used in point-to-point or multi-drop applications.

The 2- and 3-terminal HCB (electro-mechanical current differential relay) interfaces eliminate the use of copper pilot wire pairs by digitally mapping them through a multiplexer while maintaining critical latencies under 1.3 ms. Such low latencies are mandatory for the correct operation of HCB relays. These circuits are now mapped either via Ethernet packets or TDM T1 circuits and further over a fiber transport network for transmission at a distance through difficult electromagnetic environments.

For applications where the user desires to connect protection relays by fiber, in order to eliminate electromagnetic interference and equally to maximize the use of inter-site fiber connections, the application specific C37.94 Interface Channel Module, used in combination with the BB FOCUS multiplexer provides the perfect method for a reliable and dependable connection.

Applications that require electrical connectivity of the Protection Relay to the BB FOCUS multiplexer can be addressed by the 64G Synchronous G.703 Interface, the Data Port Channel Module DCU (OCUDP) and/or the hardened RS232 19.2 kbps Asynchronous Channel Module.

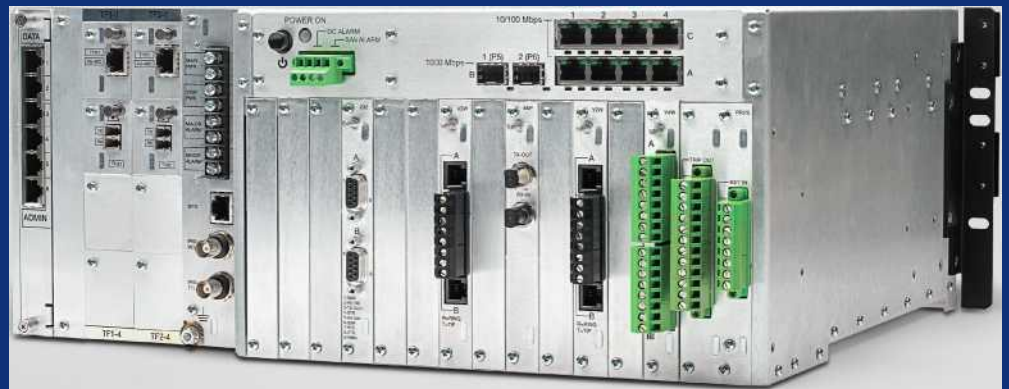
BB FOCUS - Flexible to Fit Your Applications and Configurations

All DS0 channel module connections are made on the chassis rear DS0 channel interfaces, which offer EMI shielding for personnel safety. The optional Ethernet integrated switch ports are also rear accessible, located directly above the DS0 Channel Interface Modules for easy connection. Switches may be supplied with SFP Gigabit ports as well as a number of 10/100MB RJ45 ports. The optical GigE ports are SFPs (Small Form Pluggable) with type LC connectors selected based on the power/distance requirements of the application. Although use of our integrated Ethernet switch is an optional approach for sites where an Ethernet switch is not installed, the BB FOCUS packet processor traffic and administration ports can be connected to any standards-based Ethernet network device.



Front view of the BB FOCUS (left) with cover removed, revealing the location of DS0 Channel Cards (lower right), and Common Modules (lower left), with the optional integrated Ethernet switch location above the DS0 Channel Cards section.

Rear view of the BB FOCUS (right) showing DS0 Channel Module Interfaces, System Control Module Ethernet ports, and Power, Alarm, IRIG-B and BITS Clock interfaces. The optional integrated Ethernet managed switch is shown above the Channel Module Interfaces.



Learn More - Contact Us TODAY!

With BB Focus, you can move your communications network into the broadband world without leaving expensive installed equipment behind.

Get the communications network solution that can grow with you well into the future, without completely replacing your current system. For a complete discussion of how the new Broadband FOCUS might improve your communications network while keeping your current equipment in the loop, call 800-785-7274 toll-free in the U.S.A. and Canada, +1 954-344-9822 outside the U.S.A. and Canada.

Ordering Information for Broadband FOCUS Multiplexers

1 - Base unit

B = Chassis, System Control Module (SCM) - RJ45, FE (100mb) ports
S = Chassis, same as option B, but with SNMP trapping

2 - SCM SFP based fiber port

0 = No SFP based fiber ports
1 = Two 1310nm short range SFP based FE 100mb ports*
3 = Two 1550nm long range SFP based FE 100mb ports*

3 - Power supply one - voltage range selection****

4 = 48/60 Vdc range
1 = 125/250 Vdc, 120/240 Vac range

4 - Power supply two (optional) - voltage range selection****

4 = 48/60 Vdc range
1 = 125/250 Vdc, 120/240 Vac range
N = None supplied

5 - Optional integrated Ethernet managed switch w/2 SFP GigE ports and 8 FE 10/100Mb ports**

E = 2 - SFP electrical GigE, 8 FE 10/100mb RJ45
S = 2 - SFP 1310nm short range GigE, 8 FE 10/100mb RJ45
L = 2 - SFP 1550nm long range GigE, 8 FE 10/100mb RJ45
N = None supplied

6 - T1/E1 Transframer module for TDM

Quantity (choose one)
1 = One supplied
2 = Two supplied
N = None supplied

7 through 9 - T1/E1 port interface type***

7 = **0-8** Number of electrical ports (specify physical interface type below)

8 = **0-8** Number of 1310nm long range optical ports (type LC)

9 = **0-8** Number of 1550nm long range optical ports (type LC)

10 - DS1 electrical port interface type

D = DB-9, 110Y balanced
B = BNC, 75Q unbalanced
R = RJ48C, 110Y balanced
N = None, (no electrical ports)

11 - Power termination connections

C = Compression type terminal block
B = Barrier type terminal block

12 - Future

*3 - Future

- Example Catalog Number

B044N2400RBFF

b

1 2 3 4 5 6 7 8 9 10 11 12 13 - Catalog Number Position

- * NOTE: Each optical port replaces one RJ45 electrical FE (100mb) port on the SCM Interface Module.
- * The optional integrated Ethernet switch comes standard with two GigE SFP (Small Form Pluggable) sockets. The SFP units themselves are not specified in the BB FOCUS Catalog number. These should be ordered separately as auxiliary components.
- ** Minimum one T1/E1/DS1 port per each Transframer is required, maximum four per each Transframer. Includes any standby or redundant ports.

The Power Supply Module and Interface is a wide range voltage supply. Voltages range from 48 Vdc to 250 Vdc and 120 Vac to 240 Vac, and is selected by jumper position and appropriate fuse selection installed on Power Supply Module (see Broadband FOCUS manual).

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Available FOCUS Channel Modules	
TYPE	DESCRIPTION
V2W	Voice 2-wire originating, 2 DS0 channels per module (ring-down compatible)
V2T	Voice 2-wire terminating, 2 DS0 channels per module
FXS	Voice 2-wire originating, 2 DS0 channels (FXS signaling) per module
FXO	Voice 2-wire terminating, 2 DS0 channels (FXO signaling) per module
V4W	Voice 4-wire, E&M signaling, 2 DS0 channels per module
TR1	Addressable 2-wire voice (terminating: FOCUS-TRX)
TRW	Addressable 2-wire voice (originating)
CTR	Contact transfer (8 functions per module)
HCB-2T/3T	Pilot wire relay interface for 2- or 3-terminal HCB, HCB-1
PRI	Protective relay interface relay output (PRI-A, PRI-M)
PRS	Protective relay interface solid-state output (PRS-A, PRS-M)
232	Hardened RS-232, 19.2 Kbps asynchronous 2 DS0 channels per module
G4	64 Kbps, synchronous, G.703 interface
OCU	Optoport channel module (OCU/DP) 66kb/64kb
6NF	IEEE C37.94 compliant module (850nm) n x 64Kbps
6NE	Ethernet switch module (802.3, 10/100 Ethernet compliant) n x 64Kbps
6NV/6NR	For synchronous bandwidth equal to or greater than 64kb (V.35 or RS-422) n x 64Kbps
64K	64 Kb synchronous with 850nm fiber connectors for ABB REL530

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