FOCAL™

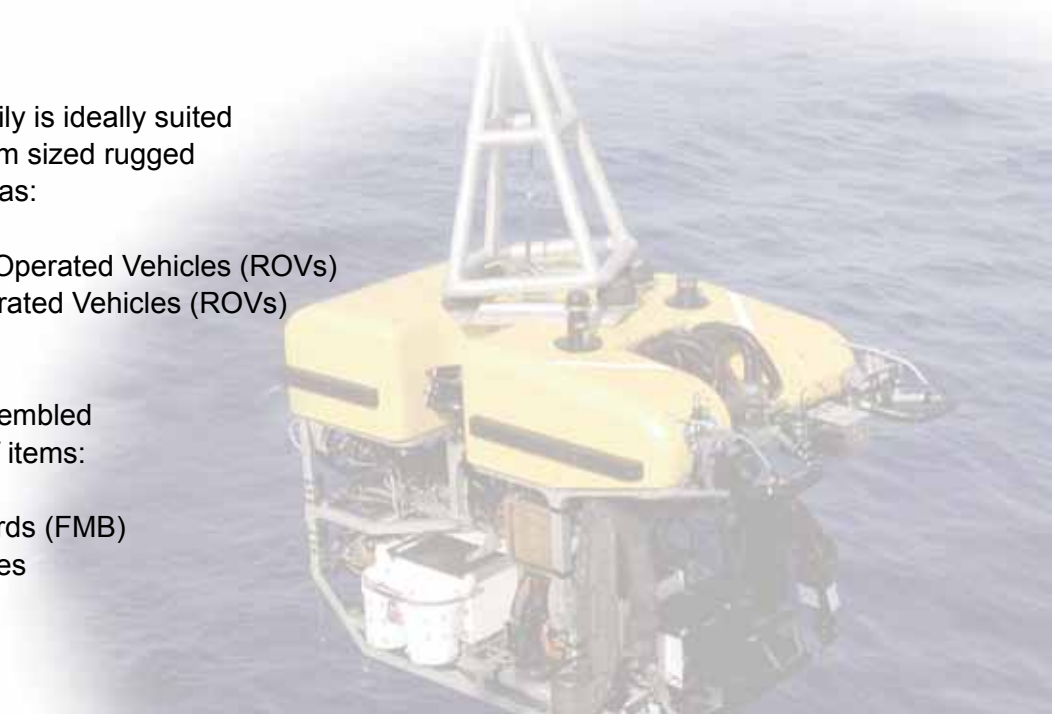
The Focal™ Model 903 product family provides a rugged video/data multiplexer and fiber optic communication system for Remotely Operated Vehicles (ROVs) and other industrial machines operating in harsh environments.

A rack based 3U height (5.25 inch) Eurocard system with a flexible architecture that supports reconfiguration and expansion of the system to meet application specific requirements. Expansion cards include analog video, serial data, Ethernet, sonar, and others. Media converter cards are available for HD video and Gigabit Ethernet.

Typical Applications

The Model 903 product family is ideally suited to meet the needs of medium sized rugged fiber optic converters, such as:

- Work class Remotely Operated Vehicles (ROVs)
- Military Remotely Operated Vehicles (ROVs)
- Subsea mining

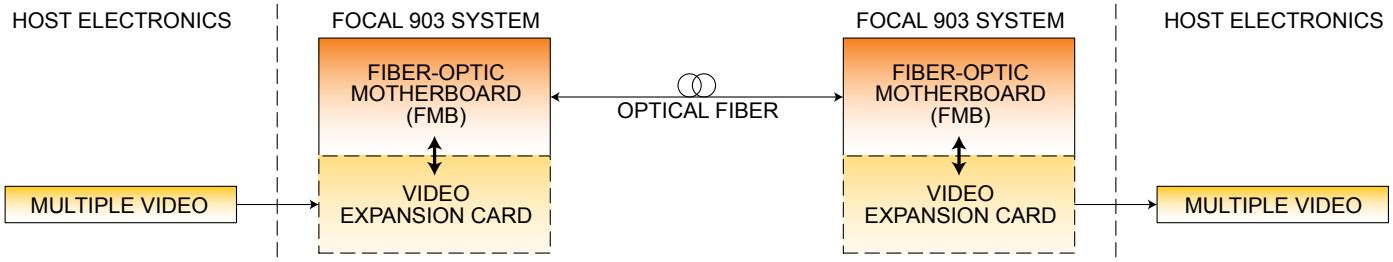


Model 903 systems are assembled from five main categories of items:

- Fiber-optic motherboards (FMB)
- Chassis and backplanes
- Media converters
- Expansion cards
- System modules

Fiber-Optic Motherboards (FMB)

A Model 903 system contains one remote (subsea) FMB and one console (surface) FMB. The FMB converts electrical signals from a Eurocard backplane into a bidirectional fiber-optic telemetry link. Expansion cards (also called interface boards) can be added to the chassis for analog video, Ethernet, serial data such as RS-232 and RS-485/422, and many special signal formats for sonars, responder triggers, and other devices.



903 FMBs come standard with redundant fiber operation and have an option for Coarse Wavelength Division Multiplexing (CWDM) transceivers.

Motherboard	FMB-X-2.5
Description	Fiber-optic motherboard
Part Number	903-5082-XX (R) 903-5083-YY (C)
Features	Redundant-fiber operation with auto fiber switching; 100 Mbps Ethernet; remote diagnostics
Baud Rate	2.5 Gbaud
Wavelength	Standard: 1310/1550 nm, CWDM: 1471 – 1611 nm, 20 nm spacing
Card Width	8 HP (40.64 mm)

For CWDM wavelengths, substitute the following two digit code for XX/YY:
47 = 1471 nm, 49 = 1491 nm, 51 = 1511 nm, 53 = 1531 nm, 55 = 1551 nm, 57 = 1571 nm, 59 = 1591 nm, 61 = 1611 nm.
Other wavelengths available upon request.

FMB-X-2.5 cards provide more advanced diagnostic features and higher bandwidth than older FMB cards (i.e. FMB-VTX/FMB-VRX), and may be installed as upgrades to older multiplexer system as long as:

- Any medium speed backplanes are replaced with -X backplanes;
- Both console and remote FMBs are FMB-X-2.5 types

Chassis and Backplanes

Model 903 FMBs, media converters, expansion cards and system cards are housed in a Eurocard chassis. The backplane allows for communication between the FMB and the expansion cards. The backplane can also provide power to the installed cards. All chassis are available in a variety of widths to accommodate one FMB, up to two video and four data expansion cards. Cards come in standard widths of 4 HP, 6 HP, or 8 HP, where 1 HP is 5.08 mm (0.2 inch). Chassis are also available with additional slots for media converters.

903 Chassis	CBP-100-XR	CBP-200-XR	CBP-231	CBP-241
Description	Single High Density Remote Chassis	Dual High Density Remote Chassis	Standard Chassis	Extended Chassis
Part Number	903-0004-03	903-0005-12	903-6746-00 (R) 903-6747-00 (C)	903-6745-01 (R) 903-0007-06 (C)
Rack Width	12 HP (60.96 mm)	16 HP (81.28 mm)	40 HP (203.2 mm, R) 42 HP (213.4 mm, C)	50 HP (254 mm, R) 50 HP (254 mm, C)
No. Expansion Cards Supported	1 HD Slot	2 HD Slots	5 (2 Video, 3 Data)	6 (2 Video, 4 Data)
No. Media Converter Cards Supported	0	0	3	4

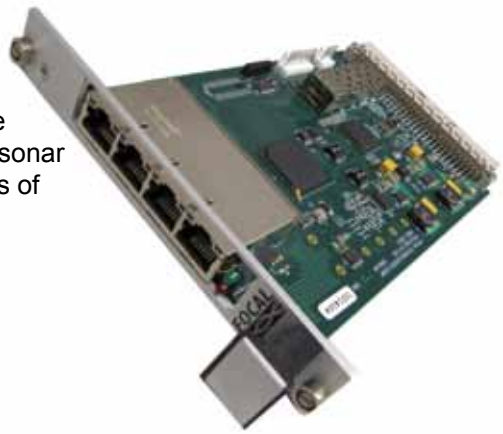
(R) = Remote, (C) = Console

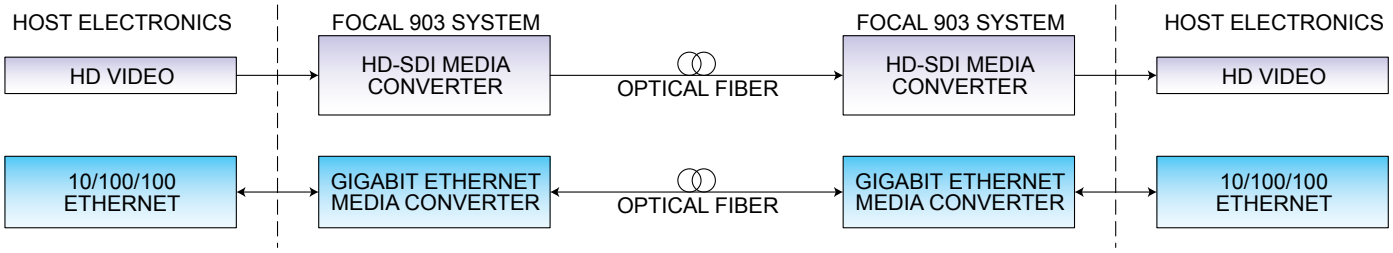
Don't see a size or configuration to suit your application? We have built hundreds of different chassis and backplane configurations. Contact Moog to see how we can meet your specific application requirements.

For users of older 903 systems, backplanes were available in either 'medium' or 'high' speed versions. All new backplanes are 'high' speed versions only.

Media Converter Cards

Media converter cards provide direct electrical to optical signal conversion and transmit over one or two dedicated optical fibers. A number of signal formats are supported, including ECL/PECL signals for Cypress HOTLink™ and multi-beam sonar links; high-definition digital video (SMPTE-292); and one, two, and four channels of Gigabit Ethernet.





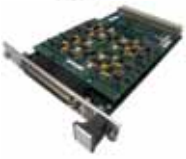
Media converters may be deployed on their own dedicated optical fiber or configured to support CWDM optical transceivers that allow for optically multiplexing of multiple cards using one of the passive 903 CWDM Optical cards.

Media Converter	HDSDI-SM	HDV-02	GBE-02	GBES-SM	ECL-02
Description	HD-SDI/SDI Media Converter	Dual HD-SDI/SDI Media Converter	Dual Gigabit Ethernet Media Converter	Quad Gigabit Ethernet Switch Media Converter	Dual ECL/PECL
Part Number[1]	903-5060-XX	903-5092-XX	903-5091-XX	903-5087-XX	903-5050-XX
Channel Direction	Unidirectional	Unidirectional	Bidirectional	Bidirectional	Unidirectional
NRZ Data Rate	143 – 1485 Mbps	143 – 1485 Mbps per Channel	10/100/1000 Mbps	10/100/1000 Mbps	30 – 150 Mbps
I/O Connectors	1 x SMB In, 1 x SMB Out	2 x SMB In, 2 x SMB Out	2 x RJ-45	4 x RJ-45	2 x SMB In, 2 x SMB Out
Card Width	4 HP (20.2 mm)	4 HP (20.2 mm)	4 HP (20.2 mm)	4 HP (20.2 mm)	4 HP (20.2 mm)

[1] XX – CWDM wavelength (47 = 1471, 49 = 1491, 51 = 1511, 53 = 1531, 55 = 1551, 57 = 1571, 59 = 1591, 61 = 1611 nm). Other wavelengths available by request.

Expansion Cards

A maximum of four data expansion cards and two analog video expansion cards can be added to a 903 chassis. An Adaptable Interface Board (AIB) expansion card allows standard AIB plug-in modules to be employed as well.



Expansion Card	Description[2]	Part Number	Supported Video Formats	Video Channels	Supported Data Formats	On-board Data Channels
VIB-TX VIB-RX	4-Channel Video Expansion Card	903-0014-00 (R) 903-0015-00 (C)	NTSC, PAL, RGB, S-Video (Y/C)	4	NA	NA
HDB-TX	High-Density Video/Data Expansion Card[1]	903-5006-00 (R)	NTSC, PAL, RGB, S-Video (Y/C)	4	4 x RS-232, 4 x AIB	8
AIB-4	Adaptable Interface 4-Channel Expansion Card	903-5003-02	NA	NA	AIB	4
CIB-10	Control Interface Expansion Card	903-5040-00	NA	NA	Bidirectional Channels (ON/OFF)	10
DIB-232-16	RS-232 16-Channel Expansion Card	903-5020-00	NA	NA	RS-232	16
907-232-E	RS-232 8-Channel Expansion Card	903-5056-00	NA	NA	RS-232	8
907-485-E	RS-485 8-Channel Expansion Card	903-5053-00	NA	NA	RS-485, RS-422	8
EIB-10/100	Ethernet Expansion Card	903-5044-00	NA	NA	10/100 Base-T(X) Ethernet	3

[1]The HDB-TX is compatible with a High Density remote chassis only.
[2]Expansion cards are 4 HP (20.2 mm) in width.

System Cards

System cards provide the support required to adapt the Model 903 architecture to many different applications. These cards provide mechanical integration of the Model 907 and Model 914 into Eurocard form-factor, and operation with a wide range of AC or DC input power.

System Card	PSU-AC	PSU-24V	PSU-48V	907-EURO4	914-EURO2
Description	Selectable AC Power Supply Module	Isolated DC-DC Power Supply Card for 18-36 VDC Input	Isolated DC-DC Power Supply Card for 36-60 VDC Input	907 to Eurocard Adaptor	914 to Eurocard Adaptor
Part Number	903-0022-00	903-0022-02	903-0022-01	907-0005-00	903-7208-00 (No 914s)
Features/ Options	Supports 115/230 VAC input, provides backplane power	Supports 18-36 VDC input, provides backplane power	Supports 36-60 VDC input, provides backplane power	Allows use of one Model 907 in a Eurocard System	Allows use of two Model 914 in a Eurocard System
Card Width	8 HP (40.64 mm)	8 HP (40.64 mm)	8 HP (40.64 mm)	4 HP (20.32 mm)	4 HP (20.32 mm)

Adaptable Interface Boards (AIB)

AIB plug-in modules are compatible with the Model 903, the Model 907, and the Model 914 product lines. The AIB-4 has four sockets for separate AIB plug-in modules. AIB plug-in modules are available for a variety of data signals and analog formats.

903-AIB Supports Four AIB Plug-in Modules

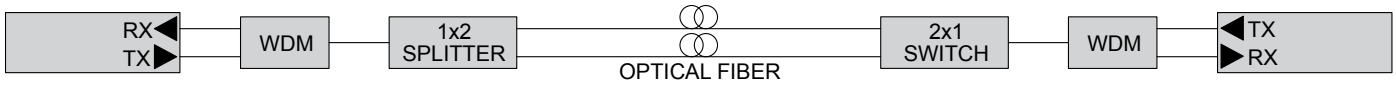
AIB plug-in modules are used to convert the signal interface format to a TTL format, which is then accessed through the Eurocard backplane. AIB plug-ins support standard serial data interfaces (RS-232/485/422), hydrophone and other audio signals, various digital and analog sonar telemetry, and control networks, such as CAN and Profibus.

AIB Card	AIB-232	AIB-485	AIB-HYDRO	AIB-ARCNET	AIB-MS900	AIB-CAN Bus
Description	1 x RS-232	1 x RS-485/422	1 x Hydrophone	1 x Tritech ARCNET	1 x MS-900 Analog Sonar	1 x CAN Bus Bridge
Part Number	903-0251-00	903-0252-00	903-0244-00	903-0261-00	903-0250-00	903-0297-00
Channel Direction	Bidirectional	Bidirectional	Unidirectional	Bidirectional	Bidirectional	Bidirectional
NRZ Data Rate	120 kbps	2.5 Mbps	30 Hz - 30 kHz BW	156 kbps/78 kbps	5 - 30 kHz, 380 - 580 kHz	62.5 kbps - 1 Mbps
I/O Connectors	4-pin WAGO headers on 903-AIB adapter card					
Options	Responder Trigger	AC-Coupled 485, TTL	IRIG-B, Audio	Terminations	Low Speed Telemetry (LF)	Repeater Mode

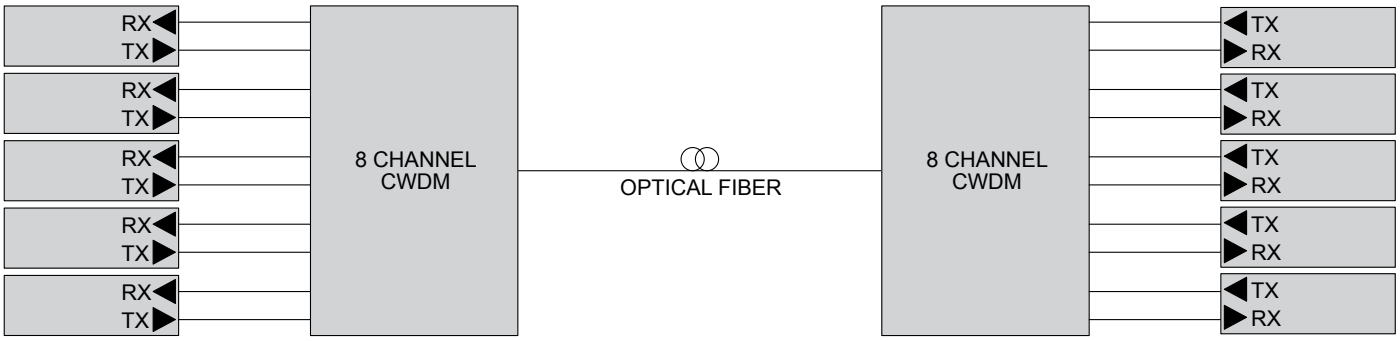
Optical Cards

Systems with only one motherboard or media converter typically transmit at an optical wavelength of 1310 nm for uplink and 1550 nm for downlink. In larger systems with multiple FMBs, media converters and expansion cards, fiber-optic signals may be combined on a single fiber using a Coarse Wavelength Division Multiplexer (CWDM) to take advantage of the high bandwidth of optical fiber. Standard CWDM optical wavelengths are separated by 20 nm and have center wavelengths of 1471 nm to 1611 nm. Bidirectional optical signals occupy two distinct wavelengths. For example, a 903 GBE-02 media converter using CWDM wavelengths may use 1471 nm for uplink traffic, and 1491 nm for downlink traffic.

To provide redundant communications between host electronics in the case of a fiber-optic cable failure, the FMB is fitted with a fiber-optic splitter, while the mating system is fitted with a fiber-optic switch. All optical traffic from the splitter system is transmitted along both fiber-optic cables. The switch system can automatically select the best fiber to use for communications.



Redundant Fiber



8-Wavelength CWDM

Optical Card	CWDM-8
Description	8-Channel CWDM Optics Card, 1471 - 1611 nm, singlemode, 20 nm spacing
Part Number	903-5251-00
Features/Options	4 HP (20.2 mm)

Key Specifications

Form Factor and Chassis

- Model 903 cards use the standard 3U Eurocard form factor of 3.937 x 6.29 inches (100 x 160 mm)
- Expansion cards communicate over the Eurocard backplane to the FMB fiber optic motherboard
- Cards plug into the Eurocard chassis, and are electrically connected via the backplane connector
- Various width chassis are available for remote and console

Analog Video

- Formats supported: NTSC or PAL, RGB or S-Video (Y/C)
- Sampled at 15 MHz, providing minimum 6 MHz bandwidth
- Voltage: 1.2 Vp-p max
- Impedance: 75 Ω

Digital HD-SDI Video

- Format supported: HD-SDI (SMPTE-292)
- Data rate: 1.485 Gbps (3 Gbps option)
- Voltage: 800 mV_{P-P} nominal
- Impedance: 75 Ω

Ethernet Options

- Support for full duplex 10/100/1000 Base-T(X) Ethernet
- Physical-layer (PHY) media converters for low latency
- Switched Ethernet for additional port count
- Multiplexed options for multiple isolated channels

Data Options

- RS-232: bidirectional channels, 120 kbaud max
- RS-422/485: 5 Mbps NRZ
- AIB expansion card daughter-cards support additional channels of RS-232, RS-422/485, CAN Bus, Tritech Arcnet, and MS900 Sonar
- Other signals such as TTL, TOR, and support for Profibus

Power

- Built in or cassette-style power supply with options for 120 VAC 50/60 Hz, 230 VAC 50/60 Hz, 24 VDC (18-36 VDC) and 48 VDC (36-60V DC)
- Input Protection: over-voltage, reverse polarity, over-current

Optical Options

- Optical Fiber: 1 or 2 singlemode (9/125 µm)
- Wavelengths: 1310/1550 nm standard, CWDM options available
- Flux Budget: 20 dB minimum standard (others available)
- Connectors: ST, others available

Diagnostics Support

- Diagnostics extracted from the FMB cards in both remote and console stacks using a 10 Base-T Ethernet or RS-232 link
- Optical transceiver data including Tx-power, Rx-power, bias current, temperature, voltage and more
- Card identity, serial number
- Built-in web server
- Terminal diagnostics through RS-232 port on FMB
- Compatible with VDM software

Call or email our knowledgeable Application Engineers for more information: 902-468-2263 or focal@moog.com