**Description**

The SDR-4002 MRSS is a rugged, conduction-cooled IF-to-Ethernet modem processing subsystem for use in development of your radio gateway or system. Based on Spectrum’s highly successful SDR-4000 small form factor modem transceiver product line, the SDR-4002 is a subsystem consisting of 3U CompactPCI analog IF and modem processing cards, system controller, rear transition I/O module, and backplane that is ready to be integrated into your custom or off-the-shelf chassis or radio enclosure.

The SDR-4002 MRSS architecture is cost-optimized for systems requiring multi-band and multi-channel RF/IF operation. It is an ideal platform for radio manufacturers and system integrators to meet the primary analog and modem processing needs of a variety of applications including radio gateways, tactical radio, and terminals. The SDR-4002 MRSS features a software reconfigurable processing engine, as well as multiple PHY/MAC layer and analog IF processing cards. The subsystem is designed to run a variety of legacy narrowband waveforms, as well as current generation ad-hoc networking and IP-centric waveforms.

**Benefits**
- Rugged design to support deployment in harsh environments
- Enable interoperability between heterogeneous legacy and ad-hoc radio networks
- Replace multiple modems with a single software reconfigurable modem that can support multiple networks
- Save up to 2 person-years in developing the modem processing subsystem for a multi-band radio or gateway
- Quickly develop or port waveform applications in a Software Communications Architecture (SCA) compliant environment
- Build a robust, secure and reliable radio system.
- Lower your development effort to integrate with an existing or custom designed multi-band RF solution or subsystem
- Minimize overall hardware costs for a multi-channel, or multi-band radio

**Target Applications**
- Gateway System
- Software Reconfigurable Tactical Radio
- Ground Mobile Radio (Voice, Data and Video)
- High-Channel Density Radio
- Push-to-Talk (PTT) Radio

**Features**
- High-speed serial full-duplex connectivity between PHY and MAC layer processing blades
- Incorporates FPGA, DSP and GPP software reconfigurable technology to support PHY and MAC layer processing of waveforms such as Wideband Networking Waveform (WNW), Soldier Radio Waveform (SRW), and Single Channel Ground and Airborne Radio System (SINCGARS)
- Rugged, conduction-cooled modem hardware immediately ready to be designed and deployed into your custom chassis or enclosure
- Supports interfaces for Absolute GPS timing reference, Push-to-Talk operation, Gigabit Ethernet, RF control, and MMI (Man-Machine-Interface)
- Supports Communications Research Canada (CRC) SCA SCARI++, SCA CF v2.2.2, and Spectrum’s high-performance API library, quicComm™
- Utilizes Green Hills® INTEGRITY® Embedded RTOS
- Supports analog IF frequencies including 70 MHz, 21.4 MHz, and IF Bandwidths of up to 30 MHz bandwidth, along with digital and analog control interfaces
- Pre-integrated and tested system controller, backplane, modem processing and analog IF modules that can be scaled in a cost-effective manner
The SDR-4002 MRSS utilizes an industry standard form factor, and digital and analog I/O interfaces that allow it to be easily integrated with other major radio components such as RF tuner and amplifiers, antenna, and embedded host computer. It can be packaged into a 3U COTS or custom conduction cooled chassis or enclosure. The SDR-4002 MRSS is designed for use in harsh environments and is tested to stringent ANSI VITA47 CC3 standards for extended temperature and shock and vibration.

**SDR-4002 MRSS Architecture**

The SDR-4002 MRSS is comprised of a collection of 3U CompactPCI cards which include:

- One modem processing card to handle PHY/MAC and network layer waveform processing functions using a Texas Instruments DSP (TMS320C6416T), Xilinx® FPGA processor (XC4VLX60), and a Freescale® GPP (MPC8541E). For more information, please see the PRO-4600 datasheet.

- Two dual IF transceiver cards that provide integrated ADC/DAC interfaces to an external RF front-end assembly, as well as a Xilinx FPGA processor (XC4VSX55), and a Texas Instrument DSP (TMS320C6416T) for PHY layer waveform processing functions. For more information, please see the PRO-4610 datasheet.

- One system controller card that provides basic system control functions, external I/O interfaces, and built-in flash memory to store waveform and application components. For more information, please contact Spectrum Sales.

The default configuration supports four IF inputs and four IF outputs, with each supporting industry standard analog IF frequencies such as 21.4 MHz and 70 MHz. Adding or removing PRO-4610 and PRO-4600 modules allows integrators and radio developers to easily scale the system to meet specific performance or channel capacity requirements.

In order to achieve the highest level of integration and performance, the cards utilize a specially designed backplane that combines data, control and other external I/O interfaces. A dedicated data plane features high-speed serial links that provide a direct, high-bandwidth, low-latency deterministic communication path between various FPGA, DSP and GPP processors. A separate control plane uses industry standard PCI bus communication. The backplane also routes a Gigabit (10/100/1000BT) Ethernet interface, and provides I/O lines to support essential radio functions such as IRIG-B or 1PPS distribution, Push-to-Talk (PTT) control, and custom interface to a radio controller or Man Machine Interface. The SDR-4002 MRSS is designed to be housed in a rugged, conduction-cooled chassis or enclosure.
Support Multiple Channel, Multiple Waveforms

The SDR-4002 MRSS contains the FPGA, DSP and GPP processing resources necessary to support the Physical and MAC layer processing for multiple tactical wideband and legacy narrowband waveforms such as:

- Wideband Networking Waveform (WNW) OFDM PHY
- Soldier Radio Waveform Electronic Warfare (SRW EW) PHY
- Single Channel Ground and Airborne Radio System (SINCGARS)

The use of software reconfigurable processing technology offers maximum flexibility in partitioning your waveform and software development, and provides a means to use one hardware platform to support multiple waveforms or standards. The system can also be scaled to support more (up to eight) or less (down to two) IF channels, by adding additional IF transceiver cards. Waveform software can also be loaded, unloaded and stored in the SDR-4002 MRSS on-board non-volatile memory, allowing for complete stand-alone operation in the field.

Deploy in Harsh Environments

The SDR-4002 MRSS has been designed for and tested for use under harsh environmental conditions that are typical of military radio.

- Conduction-cooled circuit assemblies, with wedge-locks
- Backplane with embedded serial and parallel I/O lines to minimize cabling requirements between cards
- Extended operating Temperature, -40 to 70°C, VITA47 CC3 standard
- Optional conformal coating for high humidity
- Designed to meet MIL-STD 810-F shock and vibration testing

Start Waveform Development Today, Deploy Tomorrow

Since every radio or gateway application has unique deployment requirements, Spectrum can supply the SDR-4002 MRSS in a standard 3U cPCI development chassis to allow you to begin your application and software development immediately. Your application and software development can then continue on to the target hardware, while design and implementation of the final deployed hardware can occur in parallel. Spectrum offers comprehensive training, technical support and application development services that will help accelerate your radio development and reduce schedule risk.

Spectrum will use its unique Modified COTS (MCOTS) capabilities and process to provide a deployment solution that meets your specific needs. Customizations and possible options include:

- Modify the hardware to meet custom waveform processing or I/O requirements
- Design or integrate analog or RF front-end
- Conduct environmental or EMI testing
- PHY and/or MAC layer waveform software
- Design and manufacture a custom chassis and enclosure
- Manufacture end radio system
- System Integration
- SCA Core Framework Development and Porting
- Support for alternative Operating Systems such as VxWorks, Linux

For more information on Spectrum’s MCOTS process and radio development capabilities or to discuss your specific deployment requirements, please contact Spectrum Sales.

Figure 3. Begin development immediately on Spectrum’s COTS 3U cPCI chassis then migrate to the hardware that best suits your deployment environment. Example: Rugged conduction-cooled ATR chassis for deployments in harsh environments (photo provided by Elma Electronics).
Specifications

Please refer to individual board datasheets for PRO-4600 and PRO-4610 for more details.

[ General ]
• CompactPCI system controller with flash memory
• Modem Processing Engine:
  One (1) PRO-4600 Modem Processing Cards. Refer to component datasheets for more details
• IF Processing Card:
  Two (2) PRO-4610 Dual IF Transceiver Cards. Refer to component datasheets for more details
• For additional configurations, please contact Spectrum Sales

[ Analog I/O ]
• RX IF Sample Rate: 96 MSPS @ 14-bit
  (36 to 105 MSPS are optional)
• TX IF Sample Rate: 192 MSPS @ 14-bit
  (up to 300 MSPS is optional)

[ Processing Technology ]
• User FPGA: One Xilinx XC4VSX55 on each PRO-4610
  One Xilinx XCVLX60 on each PRO-4600
• Digital Signal Processor: One Texas Instruments TMS32OC6416T
  600MHz on each PRO-4600 and PRO-4610
• General Purpose Processor: Freescale MPC8541E on PRO-4600

[ Data and Control Planes ]
• High-Speed Data: High-Speed Serial I/O Mesh Embedded in Backplane
• Control Bus: 32-bit/33MHz CompactPCI bus

[ External Interfaces ]
• Modem Processing Engine General I/O:
  • Ethernet, RS-232 Serial, JTAG, GPIO
  • Four (4) pins for PTT (Push-to-talk), bussed to all peripheral slots
  • One (1) pin for 1PPS distribution from PRO-4600 User FPGA to the PRO-4610 modules
• IF Processing Card General I/O:
  • 4 LVDS and 25 LVCMOS lines
  • Four (4) pins for PTT (Push-to-talk) or synchronization bussed to all peripheral slots
  • One (1) pin for 1PPS distribution from PRO-4600 User FPGA to the PRO-4610 modules
• IF Input: Four SMA Sockets, 50 Ohms, AC coupled
• IF Output: Four SMA Sockets, 50 Ohms, AC coupled
• Network interfaces: RJ45 socket copper interface: 10/100/1000 BT
• Reference Clock: Single 10 MHz Reference Clock Input, SMA on each PRO-4610

[ Platform Requirements ]
• Operating System: Green Hills INTEGRITY RTOS 5.0.8
• Tools: quicComm Software Development Kit (SDK), System examples

[ Development Software ]
• Operating System: Windows XP with Green Hills MULTI IDE
• FPGA Tool Chain: Xilinx ISE Foundation, Synplicity Synplify Pro
• DSP Tool Chain: TI Code Composer Studio, DSP/BIOS

[ SCA Support ]
• Core Framework Support: Communications Research Centre Canada SCARI++ SCA v2.2.2 Core Framework
• CORBA: Objective Interface Systems OrbExpress RT

[ Electrical ]
• Supply Voltage (AC): 110 VAC 60 Hz or 220 VAC 50 Hz (air-cooled)
• Supply Voltage (DC): +5, +3.3, +12, -12 PICMG 2.0 (CompactPCI)
• Power Consumption: Min 300 W (8 IF transceiver channels)

[ Mechanical ]
• Volume: 200 mm (length) x 85 mm (width) x 100 mm (height)
  (approximate)

[ Environmental ]
• Meets ANSI/VITA 47 class ECC3 specifications
• Temperature: -40C to 70C at the Card Edge (Operating)
• Humidity: Operating: 10 to 95% (non-condensing)
  • Non operating: 10 to 95% (non-condensing)
• Shock: 40g peak, half sine pulse, duration .011 seconds, 3 shocks in each direction in each axis
  • Tested in accordance to MIL-STD-810F.
• For testing at other levels contact Spectrum.
• Vibration: Sinusoidal vibration, Operating: 10 to 100 Hz at 2G RMS, Non-operating: 10 to 500 Hz at 2G RMS
  • Tested in accordance to MIL-STD-810F.
• For testing at other levels contact Spectrum.
• Conformal Coating, Optional. Contact Spectrum Sales for details.
• RoHS: Please see component level datasheets for RoHS compliance or contact Spectrum Sales.

[ Export ]
The SDR-4002 MRSS is subject to the export control laws of Canada and the United States.

[ Ordering Information ]
• Contact your Spectrum Sales Representative for specific ordering information and MCOTS customizations including chassis and RF integration. The following items are required for a default air-cooled four channel configuration:
  • 1 x PRO-4600 Modem Processing Engine
  • 2 x PRO-4610 Dual IF Transceiver Processing Module
  • 1 x SSP-4910 System Controller
  • 1 x BP1-3911 4-slot backplane
  • 1 x TM1-4900 Rear Transition Module
• Supporting Products
  • 800-00260 Development laptop computer
  • 800-00263 3U cPCI Air-Cooled Chassis for Development
• Contact Spectrum Sales for operating system, SCA support and tools
  • 100-00572 SDR-4002 MRSS Base Software & Docs Package
  • 100-00489 ISE Foundation Development Tools
  • 700-00100 DSP development kit including Code Composer Studio

Specifications

Individual specifications on this datasheet are subject to change without notice. Please contact your Spectrum Signal Processing sales representative to determine the configuration and performance that best meets your application.

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