

## SBC-COMe

A Windows /Linux Embedded Single Board Computer with XMC IO Site

### FEATURES

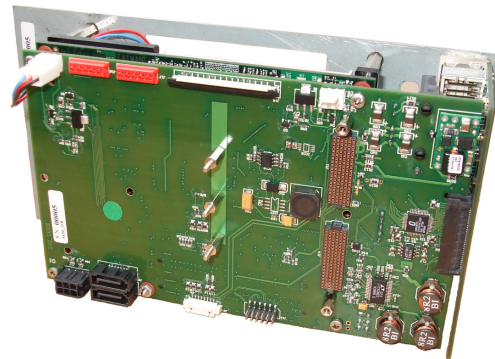
- Combines an industry standard COM Express CPU module with an XMC IO module in a compact, stand alone design
- Scalable CPU performance from Celeron to Core2 Duo using COM Express
- Small form factor: 165 x95 mm
- Rugged, stand-alone operation
- Runs Windows or Linux applications
- Configurable IO uses standard XMC IO modules. Add anything from RF receivers to industrial control modules.
- PCI Express IO sites (VITA 42.3) deliver >160MB/s to CPU memory\*\*
- Integrated timing and triggering support for IO includes optional IRIG-disciplined clock
- Supports Innovative X3 and X5 IO module features for private data channels, triggering and timing features
- USB2.0 x4, Gigabit Ethernet, SATA x2, VGA, DVI
- Boots from SATA HDD / SSD
- 12V DC operation

### APPLICATIONS

- Embedded instrumentation
- Remote, autonomous IO
- Mobile instrumentation
- Distributed data acquisition

### SOFTWARE

- Windows and Linux compatible
- Runs standard desktop applications
- MSVC++ Developers Kit supporting IO integration and customization
- Device drivers, example software and support applets supplied for all peripherals



### DESCRIPTION

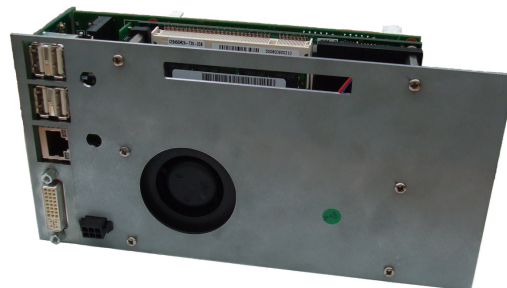
The SBC COMEX is a user-customizable, turnkey embedded instrument that includes a full Windows/Linux PC and supports a wide assortment of ultimate-performance XMC modules. With its modular IO and easy to use PC architecture, the SBC COMEX reduces time-to-market while providing the performance you need.

Distributed Data Acquisition – Put the SBC COME at the data source and reduce system errors, cable pickup and complexity. Optional IRIG-synchronized timing, triggering and sample control is available for remote IO. Limitless expansion via multiple nodes.

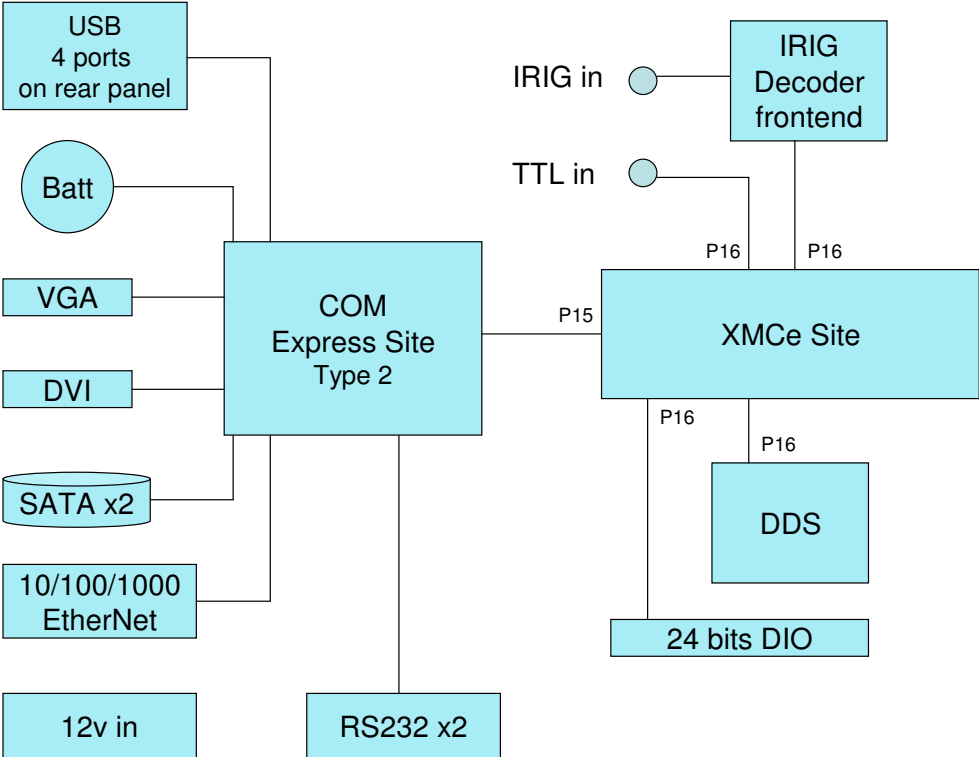
Remote or Local Operation - Continuous data streaming across 1Gb/s Ethernet.

Optional, stand-alone, autonomous operation with IRIG timed sampling.

12V DC-Only Operation - Perfect for portable or automotive data loggers or waveform generators.



# SBC-COMe



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## Standard Features

COM Express Site	
Standards	PCIMG COM.0 COM Express specification 1.0 compliant
Type	2
Size	Supports 95 x 125 mm modules
Verified Modules	Radisys Procelerant CE945GM series
CPU Types	Low power: Celeron @ 1.06GHz to High Performance: Core Duo L2400 @ 2GHz
COM Express memory	Upto 4GB (2 SODIMMs)

IO Ports	
USB	USB 2.0 4 rear panel
EtherNet	10/100/1000 port on rear panel, speed depends on COM Express module
Video	VGA and DVI
RS232	2 on internal connectors
Digital	24 bits LVTTTL/12 bits LVDS on internal connector
IRIG	Optional IRIG A/B decoder for time reference and clock generation

XMC Site	
Module sites	1
Standard	VITA 42.3 XMC for PCI Express
Size	75 x 150 mm, 10 mm height
PCIe	6 lanes
J16	24 bits DIO, interface to IRIG front end and DDS

Timing and Triggering Support	
DDS Range	0 to 25MHz
DDS Output	P16, EXT REF connections for Innovative Integration X3 series boards
IRIG Decoder	Decodes IRIG A132 (10kHz sinewave, BCD time) and B122 (1kHz sinewave, BCD time). Sampling can be started at a predetermined time.
Clock Synchronisation	Using IRIG as a distributed source, sample clocks can be accurately set.
Gate Synchronisation	Either by external TTL gate or by IRIG.

Power Requirements	
Input	12V DC
Consumption	Varies according to XMC and COM Express module. See relevant XMC and COM Express module datasheet.

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## ***COM Express Advantages***

- **Intel compatible PC runs Windows and Linux software**
- **Scalable performance**
- **Latest technologies: PCIe, Gb EtherNet, USB 2.0**
- **Compact 95 x 125 mm form factor**
- **Industry standard, multi-vendor**

## ***XMC Modules for IO***

- **Flexible, modular IO**
- **Industry standard VITA 42.3**
- **PCI Express with upto 500MB/s transfers**
- **X3 modules: Analogue and Digital IO with FPGA**
- **X5 modules: IF Rx, Tx, GSPS with Virtex 5 FPGA**

## ***Architecture and Features***

The SBC COMe combines a Windows/Linux compatible embedded PC with XMC IO modules and supporting peripherals to create a customizable instrument for a variety of applications.

## ***Embedded PC***

The embedded PC architecture is Windows/Linux compatible – it runs the same applications as a desktop computer. The COM Express CPU module is a PC on a module and provides the computing engine, available with a range of Intel processors from low power Celeron to Core2 Duo for ultimate computing power. The COM Express module provides the PCI Express bus that links the XMC module to the CPU. XMC modules install just like PCI Express add-in cards on the PC and are software compatible with PC applications. The PCI Express bus tightly couples the CPU to the XMC module and outperforms previous generation systems by 2 to 4 times.

The SBC COMe provides familiar PC interfaces for expansion and connectivity: Gigabit Ethernet, USB ports, and SATA HDD/SSD. The VGA/DVI video port and USB keyboard/mouse make operating the SBC COMe to operate just like any PC. Standard PC screens supporting up to 2048x1536 are supported. "Headless" operation is also supported for truly embedded applications without keyboard/monitor/mouse attached. In the headless mode, the SBC COMe can be remotely controlled and accessed over Ethernet.

## ***XMC IO Site***

A single XMC IO module site enables the SBC COMe to be configured with a wide variety of IO modules. The XMC site is for PCI Express mezzanine cards conforming to VITA 42.3 standard, which are 75 x 150 mm modules (IEEE 1386). Innovative Integration offers two lines of XMC IO modules: the X3 and X5 families. The X3 and X5 module families offer a range of analog performance mated to high performance FPGA computing cores, with the X5 family featuring the Xilinx Virtex5 and the X3 using the Xilinx Spartan3 family. Innovative's Velocia architecture data packet system allows these modules to stream data continuously to system memory at rates up to 500 MB/s – making the SBC COMe well suited for data logging and playback functions.

The SBC COMe includes an IRIG Decoder, implemented in some discrete components and also using some of the X3 user logic. This can be used to extract time for synchronizing start of sampling across multiple units. The IRIG timecode can also be used to extract a 1 pulse per second, and then check that

the sample clock generation system is generating the exact number of samples per second. By using a DDS on the SBC COMe as a reference to the clock generation on the X3 module, the DDS can be adjusted to give the exact number of samples required. In a situation where multiple SBC's are used to acquire large numbers of channels simultaneously, this saves the need of distributing fast clocks around the units, instead IRIG is distributed which is a low frequency signal that can easily be distributed on long cables. The application connector, J16 has 24 bits of LVTTTL digital IO / 12 bits LVDS digital IO connected to a ZIF connector. There is also a single TTL input from the rear panel to the FPGA. This is intended for user customization in logic, and could be used as an external gate signal to start/stop sampling.

## Remote Operation

SBC COMEX can be operated using Ethernet as a remote computer or embedded instrument. For pure embedded operation, the SBC COMEX can operate "headless" without monitor, keyboard or mouse. The system boots from either FLASH hard drive or SATA HDD.

## Software Tools

Software development tools for the SBC COMe provide comprehensive support application development including device drivers, peripheral configuration and control, and utilities that allow developers to be productive from the start. Software classes provide C++ developers a powerful, high-level interface to the system devices that makes system integration and achieving real-time, high speed data acquisition easier. Software for data logging and analysis are provided with every Innovative X3 and X5 module. Data can be logged to system memory at full rate or to disk drives at rates supported by the drive and controller. Triggering and sample rate controls are provided to support data acquisition applications without writing code. Innovative software applets include *Binview* which provides data viewing, analysis and import to MATLAB for large data files. Support for MS Visual C++ is provided. Supported OS include Windows and Linux. For more information, the software tools User Guide and on-line help may be downloaded.

## List of X3 and X5 Boards

X5 XMCe	
X5-400M	Two 400 MSPS, 14-bit A/Ds and two 500 MSPS, 16-bit DACs, Virtex5 SX95 DSP FPGA and 1GB Memory ; 1GB/s PCIe interface, RIO 8x on J16
X5-210M	Four 210 MSPS 14-bit A/Ds, Virtex5 SX95 DSP FPGA, and DDR2/QDR-II Memory; 1 GB/s PCIe interface, RIO 8x on J16
X3 XMCe	
X3-10M	PCI Express XMC Module with 8 simultaneous channels of 25 MSPS 16-bit A/D, and Xilinx Spartan3A DSP1.8M or 3.4 Mgate FPGA - Digital IO: 44-bits (J16); 180 MB/s PCIe interface
X3-25M	2 A/D, 16-bit, 80MHz, >80 dB SFDR - 2 D/A, 16-bit, 50MHz, >85 dB S/N - Digital IO: 44-bits (J16), 16-bits Front Panel - Xilinx Spartan3A DSP FPGA, 1.8 or 3.4 Mgate - 4MB SRAM; 180 MB/s PCIe interface
X3-A4D4	4 A/D, 16-bit, 4MHz, >85 dB S/N - 4 D/A, 16-bit, 10MHz, >85 dB S/N - Digital IO: 44-bits (J16), 8-bit Front Panel - Xilinx Spartan3A DSP FPGA, 1.8 or 3.4 Mgate - 4MB SRAM; 180 MB/s PCIe interface
X3-DIO	Digital IO: SRAM @ 150MB/s, 44-bits (J16), 64-bits Front Panel, LVDS, LVTTTL, CMOS33, CMOS25 -Xilinx Spartan3A DSP FPGA, 1.8 or 3.4 Mgate - 4MB SRAM; 180 MB/s PCIe interface
X3-SD	16 A/D, 24-bit, 216kHz, >100 dB S/N - 44-bits (J16) Digital IO - Xilinx Spartan3 FPGA, 1 or 2 Mgate -4MB SRAM; 180 MB/s PCIe interface
X3-SDF	4 A/D, 24-bit, 20MHz, >100 dB S/N - 44-bits (J16) Digital IO - Xilinx Spartan3 FPGA, 1 or 2 Mgate - 4MB SRAM; 180 MB/s PCIe interface
X3-Servo	12 A/D, 16-bit, 250kHz, >80 dB S/N - 12 D/A, 16-bit, 1MHz, >80 dB S/N - Digital IO: 44-bits (J16), 8-bits Front Panel - Xilinx Spartan3A DSP FPGA, 1.8 or 3.4 Mgate - 4MB SRAM; 180 MB/s PCIe interface