AMC005 – AMC Time and Frequency with on-board GPS and IRIG

AMC Time and Frequency with on-board GPS

KEY FEATURES

- GPS/PTP(1588)/IRIG/NTP Grand Master Clock
- Synchronous Ethernet
- Three arbitrary frequency disciplined clocks
- Onboard GPS receiver
- IRIG AM decoder input / IRIG DCLS input/output
- AMC.1 Dual PCIe Gen2 x4 or AMC.2 Dual 10GbE
- AMC.2 Dual 1000Base-X (one can mux to front RJ-45)
- 100ns precision UTC timestamps, system status and GPS positions via PCIe
- TSIP data Broadcast/Multicast/Unicast via Ethernet w/ bonding/failover
- GPS NMEA serial port
- Battery or SuperCap Almanac/Ephemeris/Last position backup
- 1 PPS PCIe interrupt, time events, time trigger for overall system/software synchronization
- Holds over clocks/1 PPS using OCXO

Benefits of Choosing VadaTech

- Complete GPS/PTP (1588)/IRIG/NTP solution
- Flexible allocation to backplane clock signals
- Grand-Master Clock/Clock Bridge capability
- Electrical, mechanical, software, and system-level expertise in house
- Full system supply from industry leader
- AS9100 and ISO9001 certified company

The AMC005 provides a complete, feature-rich, GPS/PTP (1588)/IRIG/NTP bus-level timing solution to a MTCA/ATCA system, with exceptional flexibility.

The onboard GPS receiver 1 PPS or IRIG input is used to discipline the local oscillator and cancel out any oscillator drift or aging. Precision UTC timestamps and GPS location/time/status are all made available via PCIe registers to the host CPU/application. Time trigger output and time event interrupts synchronized to GPS UTC are available under host control. GPS location/time/status data Broadcast/Unicast output via backplane Ethernet with selectable bonding/failover behaviour.

The board can demodulate IRIG Amplitude Modulated (AM) signals and receive/transmit IRIG DC Level Shift (DCLS) signals. The disciplined clock, 1 PPS, divided-down clocks, IRIG DCLS, and time trigger may be output in any combination to the TCLKA/TCLKB/TCLKC/TCLKD backplane channels.

The board acts as a Grand-Master Clock/Clock Bridge between GPS/PTP (1588)/IRIG/NTP to provide enhanced flexibility to your system design. The board also supports Synchronous Ethernet (SyncE) to eliminate clock drift at the Ethernet PHY level.

A back-up battery or SuperCap provides non-volatile storage of the Almanac, Ephemeris, and Last position data to enable rapid “warm start” re-acquisition, usually within 35 seconds. The module’s console is available via front serial or SSH via Ethernet. Locking/holdover status is also available via IPMI sensors. A secondary serial port enables GPS NMEA data in/out.

See Synchronised DAQ for a description of how phase coherent acquisition can be achieved using this product. Also, see Solution Brief for an overview of a 56 GSPS digitizer with IRIGB/GPS timestamping.

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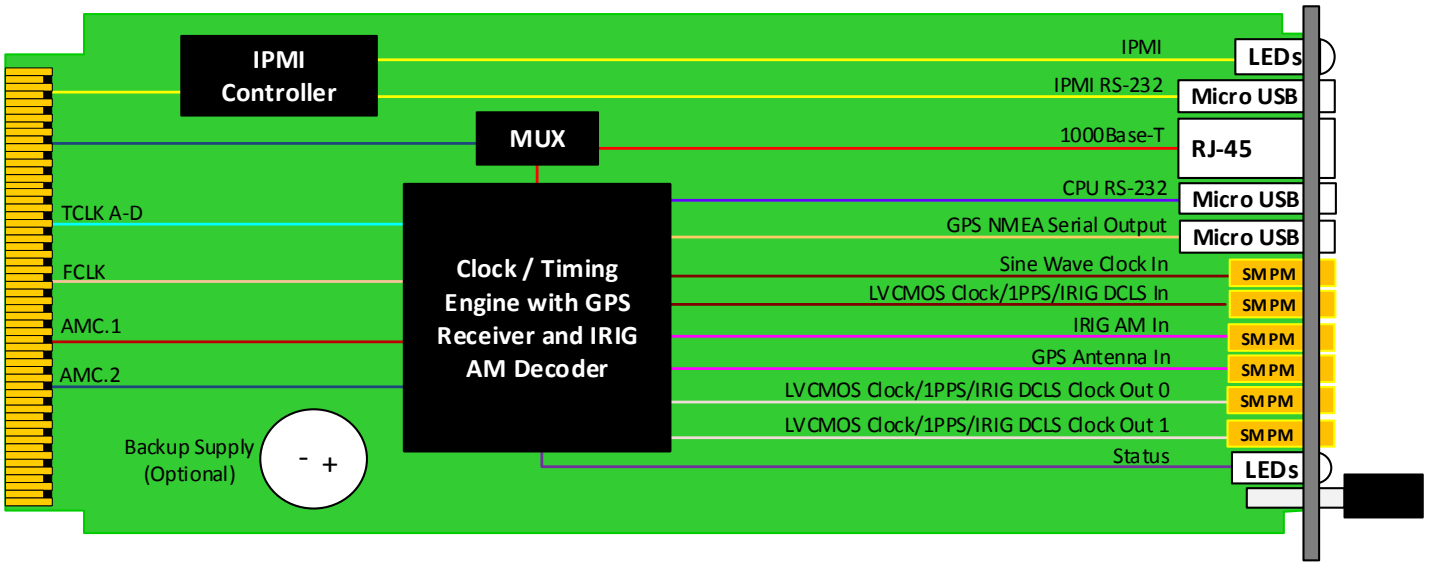
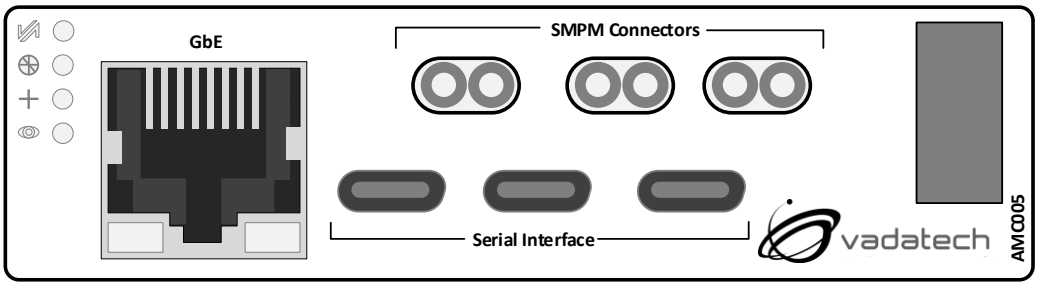
BLOCK DIAGRAM



FRONT PANEL



GPS RECEIVER

The AMC005 includes an onboard GPS receiver which is capable of obtaining precise timing information from the GPS satellite constellation via a +3.3V active GPS antenna (the module provides the power to antenna). The antenna connection includes short/open detection circuitry and this status is provided via sensors. The GPS receiver provides NMEA serial data out the front panel for interfacing to other equipment. The receiver provides the clock/timing engine with location, velocity, time, and status information as well as a 1PPS pulse. The clock/timing engine integrates this information together to create accurate time/clock references to the rest of the system.

IRIG AM DEMODULATOR

The AMC005 includes an onboard IRIG Amplitude Modulated (AM) signal demodulator. The output of this demodulator includes time code data as well as 1PPS and reference frequency signals. The clock/timing engine integrates this information together to create accurate time/clock references to the rest of the system.

ETHERNET PORTS WITH PTP (IEEE1588), NTP, AND SYNCHRONOUS ETHERNET

The AMC005 includes two 1000Base-X ports to the backplane base fabric (one of which can be re-directed to a 1000Base-T port on the front panel). It also includes two optional XAUI (10GbE) ports to the backplane fat pipes fabric. Any of these ports can be declared a Synchronous Ethernet (SyncE) master (or some other clock reference can be the master internally) and the other ports can be slaved to match the clock of the master Port; this eliminates drift within the Ethernet PHY layer of the system when used in conjunction with other equipment that supports SyncE. All of these ports can also participate in PTP (IEEE1588) or NTP time synchronization protocols. The AMC005 can be a PTP/NTP master or a PTP/NTP slave and can bridge PTP/NTP to/from other timing protocols. The board can also broadcast/multicast/unicast the GPS Receiver's TSIP data (location/velocity/approximate time/status) to these ports.

FRONT PANEL CLOCK I/O

The AMC005 can accept a sine wave clock in the range of 10 MHz to 3 GHz for use in disciplining the on-board clock synthesizer. This sine wave clock can also be routed to other clock outputs if the frequency is kept within a more limited range of 10 MHz to 350 MHz.

An LVCMOS clock input is also provided which can be used to input a clock or a 1 PPS signal in the range of DC to 315 MHz. This port can also be used to input IRIG DCLS time code as an alternative to the IRIG AM Demodulator input.

Two LVCMOS clock outputs are provided which can output many different clocks, 1 PPS signals, and/or IRIG DCLS signals from within the unit via an on-board cross-point switch matrix used for routing. These outputs can be used for signals ranging from DC to 200 MHz.

BACKPLANE CLOCK I/O

The AMC005 connects to all four AMC TCLK channels: TCLKA(CLK1)/TCLKB(CLK2)/TCLKC / TCLKD) and can input/output clocks, 1 PPS signals, and/or IRIG DCLS signals using the onboard cross-point switch matrix used for routing. These inputs/outputs can be used for signals ranging from DC to 350 MHz.

When used with a PCIe fat pipes fabric the AMC005 can accept a 100 MHz PCIe reference clock on FCLKA(CLK3) for synchronous PCIe clocking supporting Spread Spectrum Clocking (SSC), or the board can make use of its own on-board 100 MHz PCIe reference clock for asynchronous PCIe clocking. The board does not output any clock to FCLKA (CLK3).

CLOCK DISCIPLINING AND ARBITRARY FREQUENCY SYNTHESIS

The AMC005 uses an OCXO (Oven Controlled Crystal Oscillator) and a high-quality network synchronizer PLL to create a disciplined clock and 1 PPS pulse from the GPS/IRIG/1 PPS input. The disciplined clock can be any arbitrary frequency up to the limits of the outputs as described above. The clock and 1PPS pulse hold over if the input reference is lost to avoid disruption of the downstream clients depending on them. The board also supports two additional disciplined clocks which can be used to clean up arbitrary references and output arbitrary frequencies. These additional two can be slaved to the GPS/IRIG/1PPS input as well in case all three output clocks are desired to be derived from a common reference. The OCXO provides exceptional stability during holdover due to the way the oven maintains the crystal within its optimal temperature zone of operation.

PCI-E PRECISION TIMESTAMPING ENGINE

The AMC005 is a complete bus-level timing solution in that it maintains precision timestamps using the GPS disciplined oscillator and can provide these timestamps on demand via PCIe registers to an external host CPU (Processor AMC). Additional data is also available such as the GPS location/velocity/status information. Enhanced features such as 1PPS interrupts, time event interrupts, and time trigger output signal are also enabled under software control from the customer's application running on the host CPU.

DUAL-CORE CPU/CONSOLE

The AMC005 uses a high-performance dual-core CPU running embedded Linux to host the VadaTech clock/timing software. The CPU console can be accessed via the front panel serial port or via SSH using any of the Ethernet ports. The software / firmware are upgradable in the field using SCP protocol to transfer the field upgrade package to the board for execution.

SPECIFICATIONS

Architecture		
Physical	Dimensions	Single module, mid-size (full-size options available)
		Width: 2.89" (73.5 mm)
		Depth: 7.11" (180.6 mm)
Type	AMC Clock	GPS/PTP(1588)/IRIG/NTP Clock w/OCXO
Standards		
AMC	Type	AMC.1, AMC.2
Module Management	IPMI	IPMI Version 2.0
Configuration		
Power	AMC005	6W
Environmental	Temperature	Operating temperature: –5° to 55° C industrial and extended versions also available (See environmental spec sheet)
		Storage Temperature: -40° to +95° C
	Vibration	Operating 9.8 m/s^2 (1G), 5 to 500 Hz
	Shock	30Gs on each axis
	Relative Humidity	5 to 95 % non-condensing
Front Panel	LEDs	IPMI management control
		Payload power, power good, reset, etc.
	Connectors	SMPM connector for GPS Antenna, SMPM connector for IRIG AM in, Four SMPM connectors for clocks in/out
		Three RS-232 Ports
		RJ-45 for GbE
	Mechanical	Hot-swap ejector
Other		
MTBF	MIL Handbook 217-F@TBD Hrs	
Certifications	Designed to meet FCC, CE and UL certifications where applicable	
Compliance	RoHS and NEBS	
Standards	VadaTech is certified to both the ISO9001:2015 and AS9100D standards	
Warranty	Two (2) years, see VadaTech Terms and Conditions	

INTEGRATION SERVICES AND APPLICATION-READY PLATFORMS

VadaTech has a full ecosystem of ATCA and MTCA products including chassis platforms, shelf managers, AMC modules, Switch and Payload Boards, Rear Transition Modules (RTM), Power Modules, and more. The company also offers integration services as well as pre-configured Application-Ready Platforms. Please contact VadaTech Sales for more information

ORDERING OPTIONS

AMC005 – A0C – 0E0 –GHJ

A = GPS/RTC Backup Supplies
0 = None
1 = Lithium Battery
2 = SuperCap
3 = Lithium Battery and SuperCap

C = Front Panel Size
1 = Reserved
2 = Mid-size
3 = Full-size
4 = Mid-size, SLF, single screw***

E = Fabric on Ports 4-7 and 8-11
0 = Dual 10GbE
1 = PCIe on 4-7, 10GbE on 8-11
2 = Dual PCIe

G = Ruggedization Level*
0 = None
1 = Contact VadaTech
2 = Contact VadaTech
3 = Contact VadaTech

H = Temperature Range**
0 = Commercial (–5° to +55°C)
1 = Industrial (–20° to +70°C)
2 = Extended (–40° to +85°C)

J = Conformal Coating
0 = None
1 = Humiseal 1A33 Polyurethane
2 = Humiseal 1B31 Acrylic

Notes:
*Ruggedization level is per the MTCA.2 and MTCA.3 specification
**Edge of module for conduction-cooled boards
***The VadaTech Single Latching Flange (SLF) design provides one latching flange and screw on the left side of the AMC front panel – the opposite side of the standard AMC latching handle.

RELATED PRODUCTS

UTC004
3rd Generation MCH for µTCA Chassis

VT814
2U µTCA.4 Chassis, 6 AMC Slots

AMC723
Xeon E3-1125 Processor AMC

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