TIME & FREQUENCY SOLUTIONS

BY BRANDYWINE COMMUNICATIONS

VPX Timing Card

Ruggedized Timing Solution for VPX Backplanes

Key Features:

- SOSA Aligned
- 3U VPX Form-Factor
- Reduced SWaP applications
- Ruggedisation Level 200
- 11 Radial Clock Outputs
- OpenVPX Backplane support for 1000BASE-KX or 10GBASE-KR
- Optional Chip Scale Atomic Clock (CSAC) Holdover
- Optional Low Phase Noise (LPN) Analog output
- Optional secure GPS (M-code)
- Optional Timecode I/O

The VPX Timing Card offers a complete solution set for all PNT needs. This ruggedised conduction-cooled unit provides versatile, multifunction, highly-stable clock references for any environment.

The VPX Timing Card provides three (3) 1000BASE-KX Ethernet ports, with optional software upgrade for faster 10GBASE-KR. The Ethernet ports support PTP (IEEE 1588-2008) and NTP functionality (RFC 5905) with both server and client capabilities.

The P1 backplane provides 11 individually programmable AUX (1PPS) and REF (10MHz-3GHz) radial clocks, with standard output at LVDS levels. Non-standard LVPECL output levels are available for lower jitter requirements. These radial clocks have a maximum group skew of ±25 picosecond between pairs, while the PPS inputs to outputs phase alignment is maintained within ±10ns. Furthermore, each clock phase can be further tuned within ±25 picoseconds to calibrate module radial clock routing.

The P2 backplane is fitted with a 14-port VITA 67.3C aperture (10-port optional), providing standard inputs for 1PPS and 10MHz synchronization sources. It optionally supports commercial GNSS, secure M-Code GPS, analog PPS and sine outputs, as well as timecode inputs and outputs.

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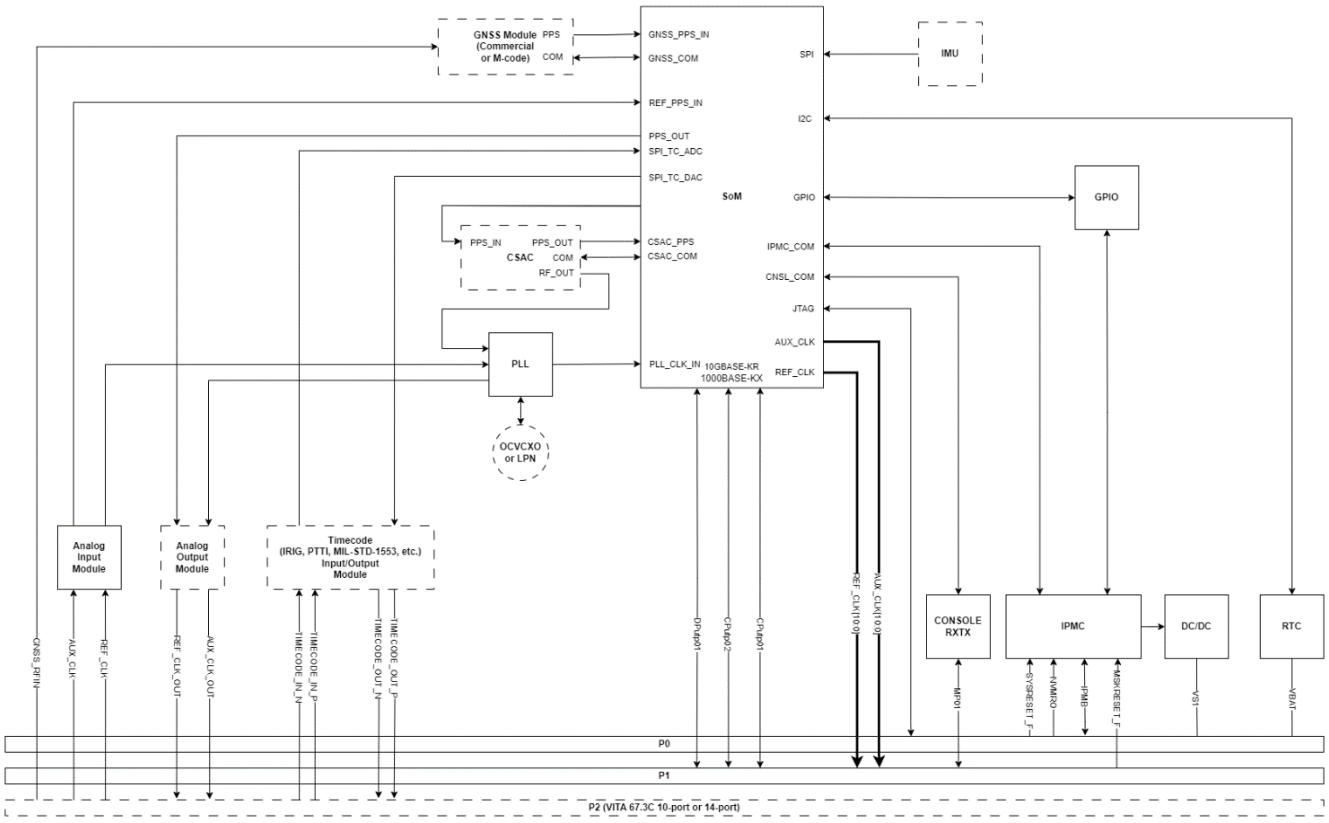
Developed timecode I/O modules include: HQ1, HQ2, ICD-GPS-060 (PTTI HQ), IRIG-AM, IRIG-DCLS, NMEA 0183, STANAG 4372 (Saturn i & ii), STANAG 4430 (XHQ) and MIL-STD-1553.

The VPX Timing card can be optionally configured with a CSAC for enhanced holdover accuracy while operating in reference-denied environments. As an added feature the raw GNSS data can be distributed via multicast from the module for downstream processing.

To facilitate higher level integration, selected 3rd party source code is available to build status and control applications software on platforms running almost any operating system. e.g. Single Board Computer (SBC). Applications connect using gRPC over HTTP via Ethernet or even locally using RS-232 console access via localhost.

Additionally, the unit can be outfitted with a triaxial MEMS-based IMU with multi-layered Kalman filtering for increased position and navigation accuracy.

To Illustrate the Functionality of the VPX Timing Card, a Block Diagram is provided below for illustrative purposes:



Specifications

Input Specifications

1PPS accuracy to GNSS RF	± 30ns	
1PPS accuracy to external PPS	± 10ns	
Frequency Stability (OCXO)	$5x10^{-9}$	
Frequency Stability (CSAC)	$3x10^{-10}$	
Aging (CSAC)	Monthly:	$<9x10^{-10}$
	Yearly:	$<1x10^{-8}$
Allan Deviation (CSAC)	@1s:	$4x10^{-10}$
	@10s:	$1.3x10^{-10}$
	@100s:	$4x10^{-11}$
	@1000s:	$1.3x10^{-11}$
Secure GPS Keying Interface (optional)	RS-232	
Secure GPS-Zeroize (optional)	Software Command	
GPS Antenna	Active 3.3V Antenna, L1 and L2, Maxtenna	
GNSS Receiver – SAASM GPS (optional)	12 channels, L1 and L2, SAASM, DS101 Key and zeroize	
GNSS Lock from cold start	<5 minutes	

Output Specifications

P1 Radial Clocks	11 programmable output clock sets (REF + AUX)
P1 Radial Clock REF_CLK Frequency Range	3-3000 MHz
P1 Radial Clock REF_CLK output	CML, LVDS, LVPECL
P1 Radial Clock AUX_CLK output	LVDS, LVPECL
P2 (VITA 67.3C) Analog Sine Output	10 MHz (optional 100 MHz), 0dBm
P2 (VITA 67.3C) Analog Sine Output Phase Noise	@10 Hz: -120 dBc/Hz @100 Hz: -140 dBc/Hz @1 kHz: -145 dBc/Hz @10 kHz: -150 dBc/Hz @100 kHz: -155 dBc/Hz
P2 (VITA 67.3C) Analog PPS Output	0dBm, 1 ms pulse width

Mechanical & Environmental

Size	3U VPX
Pitch	1”
Oscillator Warm Up Time	< 4 minutes
Power Consumption, Typical	10.9 W
Power Consumption, CSAC, Maximum	0.14 W
Power Consumption, GPS M-Code, Maximum	0.8 W
Power Consumption, LPN Oscillator, Maximum	3.5 W
Operating Temperature	-40°C to +85°C
Cooling	Conduction or Air
SOSA Timing Slot Profiles	SLT3x-TIM-2S1U22S1U2U1H-14.9.2-X
SOSA Timing Module Profiles	MOD3x-TIM-2S1U22S1U2U1H-16.9.2-X