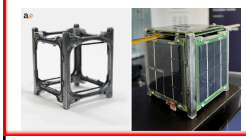
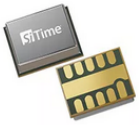
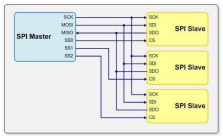
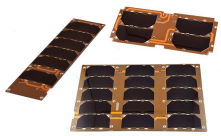
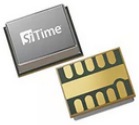
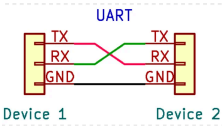
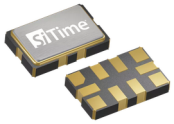
Construct a morphological chart using the concepts your team worked on during your last class/meeting. Show 2 possible concepts for your team to evaluate, along with your rationale for why you think each would be a productive choice. This is a graphical submission, with text explanation accompanying it, all in the same file. **Only pdf files will be accepted.**

OLD

Enclosure Frame	Enclosure Panels	Method of Timekeeping	Method of Communication	Communication Protocol
Metal 3D Printed 	Sheet Metal 	mRO-50 	PCIe 	I^2C 
Carbon Fiber 3D Printed 	Composite 	SiT5801 	USB 	SPI 
Metal 	Solar Panels 	SiT5802 		UART 
Composite 		SiT5356 		CAN 
High Performance Polymer 				USB 

A carbon fiber 3D printed frame is the best choice as it can be done at RIT while also being a strong material for a prototype.

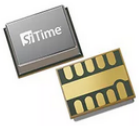
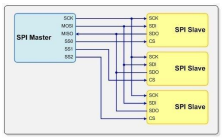
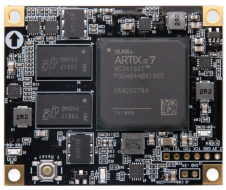
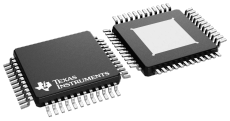
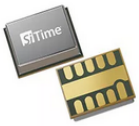
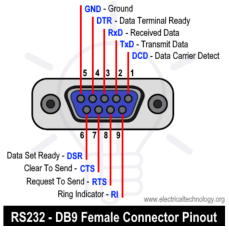
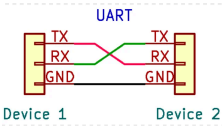
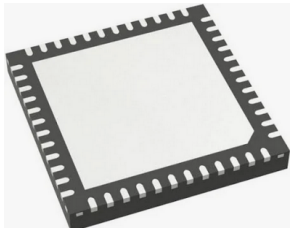
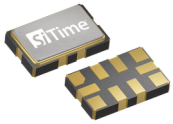
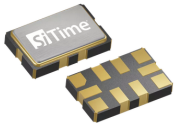
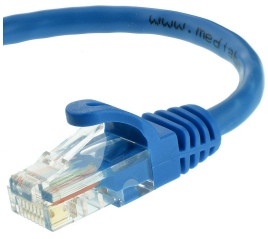
Solar Panels provide the CubeSat a means to produce a functional power source while otherwise isolated in space. Due to our timecard integration with a CubeSat, we rely on assuming a safe and stable power input where further conversions can be made on the card.

The **SiT5356** time-keeping device offers a high-performance and low-power solution to precision time-keeping. This device features 100ppb precision and several convenience features such as the freedom to place anywhere on the PCB without requiring mechanical thermal isolation devices. This device was further developed for operating through adverse airflow, temperature perturbation, vibration, shock, and electromagnetic interference (EMI).

PCIe allows for a secure connection to the server. The card can be designed to mount directly to the casing with a brack and ensure a stable connection with 3 points of contact. It allows for high speed data rate of communication as well as multiple channels if necessary.

SPI is used to communicate with the card as a slave. When the server sends it a command it will return the real time time as well as other information based on the instruction that was sent.

NEW

Method of Timekeeping	Method of Communication	Communication Protocol	Programmable Logic	Processing
mRO-50 	PCIe 	I²C 	MicroZed 7Z010 	MicroZed 7Z010 
SiT5801 	USB 	SPI 	AC7100B (Just FPGA) 	MSP430FR5969-SP 
SiT5802 	RS232 	UART 	AC7Z035B (SoC ARM-PS/PLA-FPGA) 	STM32WBA52CG 
SiT5356 		CAN 		AC7Z035B (SoC ARM-PS/PLA-FPGA) 
SiT5346 		Ethernet 		

SiT5356 - SiT5356AI-FQ-33E0-60.000000 - It is a 60Mhz oscillator that is designed to have a 0 pull range or PPM which effects drift.

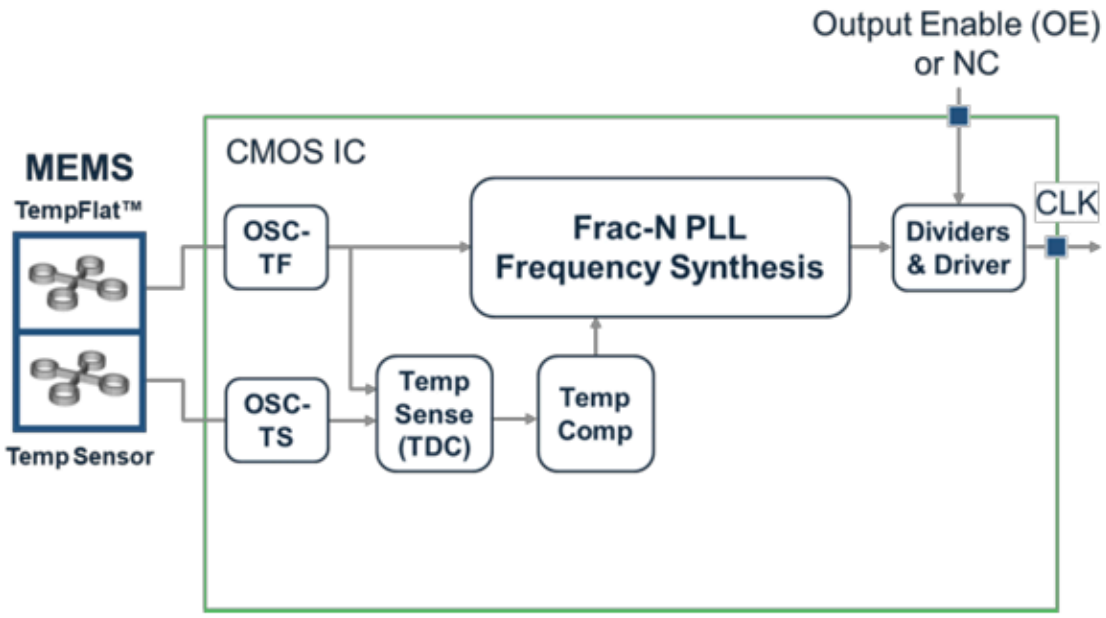


Figure 46. Block Diagram – TCXO

TCXO Configuration

The TCXO generates a fixed frequency output, as shown in Figure 46. The frequency is specified by the user in the frequency field of the device ordering code and then factory programmed. Other factory programmable options include supply voltage, output types (LVCMOS or clipped sinewave), and pin 1 functionality (OE or NC).

The SiT5346 is a much better chip that cost around 400 dollars if we wanted one instead of the 60 dollars of the SiT5356.
PCIe isn't available on most motherboards while RS232 is widely used
You can use ethernet to RS232 to communicate with the motherboard
MicroZed was chosen due to the low cost SoC Zynq family including a Dual-Core ARM PS and PLA-FPGA fabric, familiarity, and US suppliers.

Automotive Ethernet vs. CAN, SPI, I²C, and UART

Feature	Ethernet	CAN	UART	I²C	SPI
Wiring	2+ wires (twisted pair, or more)	2 wires (CAN_H, CAN_L)	2 wires (TX, RX)	2 wires (SDA, SCL)	4 wires (MOSI, MISO, SCK, SS)
Speed	Up to 10 Gbps (depends on Ethernet type)	Up to 1 Mbps (CAN FD: 8 Mbps)	Slow (9600 bps to 1 Mbps)	Moderate (up to 3.4 Mbps)	Fast (up to tens of Mbps)
Multi-Device Capability	Excellent, supports many devices with switches	Supports multiple devices (with arbitration)	Point-to-point (1:1)	Supports multiple devices	Supports multiple devices but needs separate SS lines
Error Detection	CRC, extensive error detection	Extensive error detection (CRC, ACK)	Limited error checking	Built-in acknowledgment	None
Distance	Long (up to 100 meters or more)	Moderate (up to 40 meters)	Short	Short	Short
Duplexing	Full-Duplex	Half-Duplex	Full-Duplex	Half-Duplex	Full-Duplex
Real-Time Support	Possible with TSN	Excellent for real-time (prioritized messages)	Limited	Moderate (due to half-duplex nature)	Excellent
Noise Immunity	High	High	Low	Moderate	Low
Cost	Higher	Moderate	Low	Low	Moderate
Power Consumption	Higher	Low	Low	Moderate	Moderate