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PROJECT NAME: KENJI TEST JAN16 / Temperature Expansion Module

Progress update 1/17/26: Soldered connection pins for UART & DEBUG, Verified STM32 works on board (flashed blinky)

Design considerations for configuring STM32 peripherals:

ADC clock is 12 MHZ (and can never be greater than 14 MHZ)

- This is a design consideration because of the multiplexers. These increase the source impedance, and thus increase the sampling time of the ADCs, and so we most likely cannot achieve the minimum cycles/per cycle. We chose **~55.5 Cycles / Sample**
- At 55.5 cycles, and with clock time = 25 microseconds, * 10 = 250uS = 0.25ms (not bad)
- Given there are 4 Mux's we must sample from, this means it takes ~1 millisecond to read in all 40 temperatures

We also cannot use continuous DMA conversions because we cannot lose control over which input we are multiplexing.

We also must wait because the multiplexer switching is not instantaneous.

- We are operating under scan conversion mode enabled. This means that the ADC (atomic) reads all 4 values on each ADC DMA call.
- This stm32 setting configures the ADC such that it scans the 4 pins once.
- To update the values we must call scan it again.
- This ensures we control and know what temp we're sensing.

I copy/pasted the main file and prompted Gemini to produce a pin configuration table summary to double check against our design needs.

Pin	Peripheral / Function	CubeIDE Mode	User Label	Notes
PD0	RCC	OSC_IN	-	8MHz Crystal
PD1	RCC	OSC_OUT	-	8MHz Crystal
PA0	GPIO	Output Push Pull	MUX_S0	Mux Select Bit 0
PA1	GPIO	Output Push Pull	MUX_S1	Mux Select Bit 1

PA2	GPIO	Output Push Pull	MUX_S2	Mux Select Bit 2
PA3	GPIO	Output Push Pull	MUX_S3	Mux Select Bit 3
PA4	ADC1	IN4	MUX1_IN	Sampling Time: 55.5 Cycles
PA5	ADC1	IN5	MUX2_IN	Sampling Time: 55.5 Cycles
PA6	ADC1	IN6	MUX3_IN	Sampling Time: 55.5 Cycles
PA7	ADC1	IN7	MUX4_IN	Sampling Time: 55.5 Cycles
PA9	USART1	Asynchronous	-	TX (Telemetry/Debug)
PA10	USART1	Asynchronous	-	RX
PA11	CAN	CAN_RX	-	<i>Shared with USB</i>
PA12	CAN	CAN_TX	-	<i>Shared with USB</i>
PA13	SYS	Serial Wire	-	SWDIO (Debug)

PA14	SYS	Serial Wire	-	SWCLK (Debug)
PB5	GPIO	Output Push Pull	LED_GREEN	Active High (Blinky)
PB10	USART3	Asynchronous	-	TX
PB11	USART3	Asynchronous	-	RX