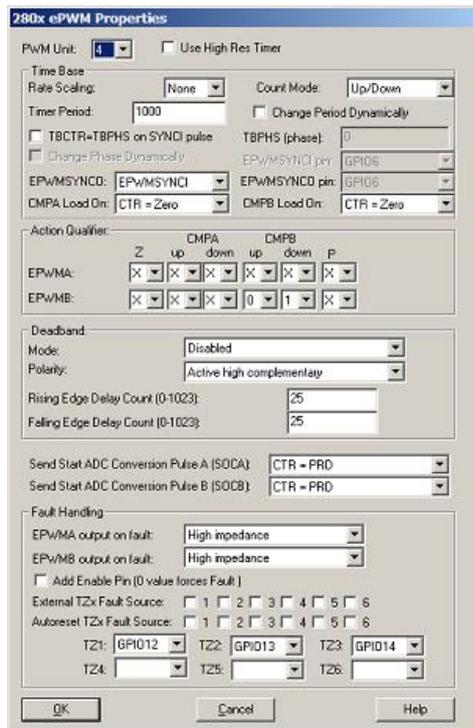


## Embedded Development and Motor Control



Embed ePWM block properties

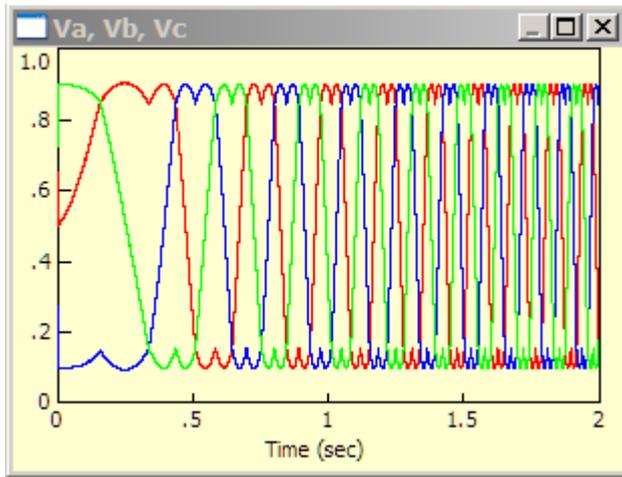
## Dramatically Shorten Design Cycles with Model-Based Development

Embed lets you perform Model-Based Firmware Development to rapidly develop control systems. This means that you can simulate your system off-line using bit true fixed-point blocks controlling a floating-point plant model. Once verified against a virtual plant, the control subsystem can be selected for automatic code generation and run on the embedded target against the real plant, while communicating in real time to the PC for interactive gain changes and digital scope plotting. Embed supports the latest C2000 and MSP430 digital microcontroller chips from Texas Instruments, as well as a wide variety as chips from STMicroelectronics, Arduino, and Raspberry Pi.

## Texas Instruments Digital Motor Control Library

The TI DMC block set is a Embed block version of Texas Instruments Digital Motor Control function library. The TI DMC block set includes:

- PID Regulator with saturation
- Space vector waveform generator
- Park and Clarke transforms
- Encoder speed estimator
- Flux estimation and sensorless PMSM sliding mode position estimator
- Volts to Hertz Profile These blocks can be used in both simulation and code generation to create efficient embedded controllers.



Embed-controlled PMSM phase voltages

## Fixed Point Block Set

The Fixed-Point block set includes the following blocks:

sum	constant	1/z	sqrt	atan2
multiply	sign	sampleHold	sin	negate
divide	absolute value	merge	cos	table lookup
convert	case	IIR and FIR Filters	PID	Boolean

An Auto-Scaling option determines the optimal radix points for each block to avoid overflow and maximize precision. The display of a minimum and maximum value for each block for determining "headroom" for radix point settings. Configurable word length.

## Efficient Code Generation

Embed's unmatched code generation efficiency allows faster sampling and use of lower cost parts. For instance, a Embed diagram for full sensorless field-oriented control of a PMSM motor with signal buffering vectors for debugging uses only 3k flash and 1k RAM. At 20kHz control sample rate on the TI 60MHz low-cost Piccolo microcontroller, only 34% of CPU is utilized. This efficiency allows multiple axis control or additional supervisory control.

## RTOS Support

Embed includes its own highly efficient native RTOS environment with primary control rates up to 1MHz. Embed supplies simple graphical interrupt handler creation, as well as custom rate, pre-emptible background tasking. Embed target support includes automatic on-chip peripheral coding, simple dialog-based configuration, interactive data exchange for nonintrusive debugging, and real-time CPU utilization calculation.

## Foreign RTOS Support

Embed also has an option to integrate with a foreign RTOS. In this mode, Embed will generate two functions: an init function to be called at boot time, and a periodic control function to be called by the RTOS at the designed rate. This allows integration with DSP/BIOS or any other RTOS.

## Code Composer Integration

Embed comes with a Code Composer Studio plug-in that automatically creates a CCS project from Embed-generated code. The project includes the generated .C file, as well as the necessary Embed support libraries, include files, and compile options.

## Full On-chip Peripheral Support

Embed supports over 1,000 microcontrollers from Texas Instruments, STMicroelectronics, Arduino, and Raspberry Pi.

Embed target support blocks let you configure and generate code for ADC, PWM, GPIO, CAN, SPI, SCI(RS232,UART), I2C, capture, watchdog and quadrature encoder on-chip peripherals.

## JTAG HotLink

The Embed JTAG HotLink automatically downloads and communicates in real time with your compiled diagram as it runs on the target. It lets you use the Embed GUI on the PC to change parameters and plot embedded target responses while it runs.

## Benefits

- Faster debug with buffered waveform monitoring and interactive on-target gain change
- Use of higher-level debugged modules for quicker prototyping
- Faster time to market
- Lower overall design and prototyping costs
- Easier transfer of knowledge from one engineer to the next

## Customer Statement

*I am using Embed almost every day. As a developer of high and very-high power digitally-controlled power supplies, I don't have the time to get too much into the nitty gritty of the DSC; therefore, I find the Embed environment ideal for me. I am very pleased with the functionality and new blocks that have been added for the F280x controller from TI. Embed Embedded is capable of creating a complete control algorithm for the F280x directly from the Embed environment. I would like to thank you for your support of Embed and the continuing development of your software.*

**Tony Boon**  
Digital Power Engineer  
CEG Elettronica

### Authorized Distributors



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