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Version 8.0

# **VisSim/Navigator User's Guide**

**By Visual Solutions, Inc.**

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**Visual Solutions, Inc.**

**VisSim/Navigator User's Guide Version 8.0**

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# Introduction

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## What is VisSim/Navigator

The VisSim/Navigator DK2300 add-on module lets you communicate with the Navigator card from Performance Motion Devices.

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## The VisSim product family

The VisSim product family includes several base products and product suites, as well as a comprehensive set of targeted add-on modules that address specific problems in areas such as data communications, data acquisition, linearization and analysis, and digital signal processing.

### Base products and product suites

Product	Function
Professional VisSim	<p>Model-based design, simulation, testing, and validation of dynamic systems.</p> <p>A personal version, VisSim PE, is also available. VisSim PE limits diagram size to 100 blocks.</p>
VisSim/Comm Suite	<p>Simulates end-to-end communication systems at the signal level using 200+ communications, signal processing, and RF blocks.</p> <p>Includes Professional VisSim and VisSim/Comm blockset.</p> <p>A personal version, VisSim/Comm Suite PE, is also available. VisSim/Comm PE limits diagram size to 100 blocks and limits the Communication blockset. See the VisSim/Comm datasheet for details.</p> <p>VisSim/Comm Suite add-on modules are available for real-time data acquisition (Red Rapids digital tuner card); modeling PCCC turbo codes, including UMTS specification; and for support of Bluetooth, 802.11 a/b/g (Wi-Fi), and ultrawideband wireless designs.</p>

VisSim/Embedded Controls Developer Suite	<p>Rapidly prototypes and creates embedded controls for DSPs, DSCs, and MSP430 microcontrollers. You can simulate and generate scaled, fixed-point ANSI C code, as well as code for on-chip peripherals.</p> <p>Includes Professional VisSim, VisSim/C-Code, VisSim/Fixed-Point, and one user-specified target support.</p> <p>A personal version, VisSim/Embedded Controls Developer PE, is also available. VisSim/Embedded Controls Developer PE limits diagram size to 100.</p>
VisSim Viewer (free)	Lets you share VisSim models with colleagues and clients not licensed to use VisSim.

### Add-on modules

Add-On Module	Function
VisSim/Analyze	Performs frequency domain analysis of a linearized nonlinear subsystem.
VisSim/CAN	Interfaces with a USB CAN device to read and write CAN messages on the CAN bus.
VisSim/C-Code	Generates highly-optimized, ANSI C code that can be compiled and run on any platform that supports an ANSI C compiler.
VisSim/C-Code Support Library Source	Provides source code for the Support Library.
VisSim/Comm blockset	<p>Simulates end-to-end communication systems at the signal level using 200+ communications, signal processing, and RF blocks.</p> <p>A personal version, VisSim/Comm PE, is also available. VisSim/Comm PE is a subset of the Communication blockset. See the VisSim/Comm datasheet for details</p> <p>You can purchase VisSim/Comm add-on modules for real-time data acquisition (Red Rapids digital tuner cards); for modeling PCCC turbo codes, including UMTS specification; for support of Bluetooth, 802.11 a/b/g (Wi-Fi), and ultrawideband wireless designs.</p>
VisSim/Fixed-Point	Simulates the behavior of fixed-point algorithms prior to code generation and implementation of the algorithm on the fixed-point target.
VisSim/Knobs and Gauges	Provides dynamic gauges, meters, and knobs for process control, and measurement and validation systems.
VisSim/Model-Wizard	Generates transfer function model from historic or real-time data.
VisSim/Motion	Simulates motor control systems with customizable amplifiers, controllers, filters, motors, sensors, sources, tools, and transforms.
VisSim/Neural-Networks	Performs nonlinear system identification, problem diagnosis, decision-making prediction, and other problems where pattern recognition is important.
VisSim/OPC	Connects to any OPC server and log data or run a virtual

	plant in VisSim for offline tuning.
VisSim/OptimizePRO	Performs generalized reduced gradient method of parameter optimization.
VisSim/Real-TimePRO	Performs real-time data acquisition and signal generation using I/O cards, PLCs, and DCSs.
VisSim/Serial	Performs serial I/O with other computers.
VisSim/State Charts	Creates, edits, and executes event-based systems.
VisSim/UDP	Performs data exchange over the internet using UDP.
VisSim Viewer (free)	Lets you share VisSim models with colleagues and clients not licensed to use VisSim.

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## Resources for learning VisSim/Motion

For those of you that are new to VisSim, we have provided several free services to make your transition to VisSim fast, smooth, and easy:

### Interactive webinars

Interactive webinars offer you the opportunity to meet with Visual Solutions product specialists who will introduce and demonstrate our software products live on your computer and answer any questions you have. Each webinar is approximately 45 minutes long. To learn more about our interactive webinars, go to <http://www.vissim.com/webinars/webinars.html>.

### Sample diagrams

VisSim 8.0 includes a directory of fully documented sample diagrams. These diagrams illustrate both simple and complex models spanning a broad range of engineering disciplines, including aerospace, biophysics, chemical engineering, control design, dynamic systems, electromechanical systems, environmental systems, HVAC, motion control, process control, and signal processing.

#### To access sample diagrams

Click on the **Diagrams** menu in VisSim.

Click on **Examples > Applications**.

### Training

Visual Solutions offers training sessions for learning and gaining expertise in VisSim and the VisSim family of add-on products. Training sessions are conducted at Visual Solutions training facility in Westford, MA, as well as at customer sites and as online webinars.

For information on setting up a training session, contact [sales@vissol.com](mailto:sales@vissol.com).





# Installing VisSim/Navigator DK2300

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## Installation procedure

When the installation is complete and you start VisSim, the VisSim/DK2300 block will be listed under **Blocks > Real Time**. In addition, if you click on **Edit > Preferences > Addons**, the DK2300 will be listed in the Addons window.

### To install VisSim/Navigator DK2300

1. Before installing the VisSim/Navigator DK2300 add-on, you must install the PMD Navigator card and drivers.
2. Then run **setupVisSimDK230070.exe** to install the software.
3. After you run **setupVisSimDK230070.exe**, the VisSim/Navigator DK2300 will be installed under VisSim.



# Using the DK2300 Block

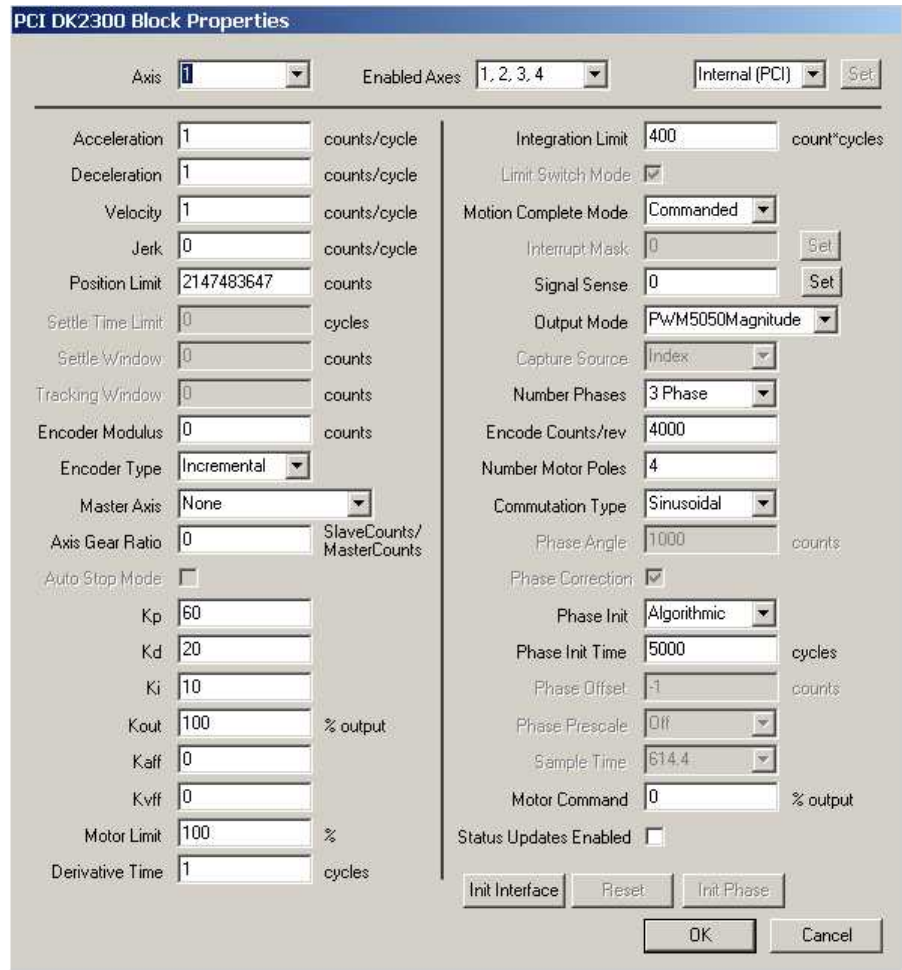
VisSim/Navigator DK2300 add-on interfaces with a PMD Navigator card.

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## DK2300 block

The DK2300 block supports up to four independent axis of control. Position, velocity and status can be read on the output pins. Axis commands, and bias are inputs to the block.

You configure the DK2300 block through its Properties dialog box. Refer to your PMD Navigator Motion Processor Programmer's Reference manual for more information.



**Axis:** Specifies the axis to configure.

**Enabled Axis:** Specifies which axis to enable.

**Acceleration:** Specifies maximum limit on acceleration.

**Deceleration:** Specifies minimum limit on acceleration.

**Velocity:** Specifies maximum limit on velocity.

**Jerk:** Specifies maximum limit on rate of acceleration change (jerk).

**Position Limit:** Specifies maximum limit on position.

**Settle Time Limit:** Sets the time, in the number of cycle, that the specified axis must remain within the settle window before the axis-settled indicator in the activity status register is set.

**Settle Window:** Sets the position range within which the specified axis must remain for the duration specified by the Settle Time Limit before the axis-settled indicator in the activity status register is set.

**Tracking Window:** Sets the boundaries for the position error of the specified axis. If the absolute value of the position error exceeds the tracking window, the tracking indicator is set to 0. When the position error returns to within the window, the tracking indicator is set to 1..

**Encoder Modulus:** Sets the parallel word range for the specified axis when parallel-word feedback is used.

**Encoder Type:** Indicates either absolute or incremental.

**Master Axis:** Used for synchronizing multiple axis.

**Axis Gear Ratio:** Indicates the slave axis speed relative to master axis.

**Auto Stop Mode:** Determines the action to be taken when the motion error bit in the event status register becomes set. If the motion error bit is set, and Auto Stop Mode is enabled, then the axis goes into an open-loop model. When the Auto Stop Mode is disabled, the axis is not affected by a motion error. Auto Stop Mode has no effect on the motion error bit of the event status register.

**Kp:** Indicates the proportional gain.

**Kd:** Indicates the derivative gain.

**Ki:** Indicates the integral gain.

**Kout:** Indicates the PID output gain.

**Kaff:** Indicates the acceleration feed forward gain.

**Kvff:** Indicates the velocity feed forward gain.

**Motor Limit:** Sets the maximum value for the motor output allowed by the digital servo filter of the specified axis. Motor values beyond this value will be clipped to the specified motor limit.

**Derivative Time:** Sets the sampling time, in number of servo cycles, for the servo filter to use in calculating the derivative term for the specified axis.

**Integration Limit:** Loads the integration-limit register on the servo filter for the specified axis.

**Limit Switch Mode:** Enables or disables limit-switch sensing for the specified axis.

**Motion Complete Mode:** Establishes the source for the comparison which determines the motion-complete status for the specified axis.

**Interrupt Mask:** Determines which bits in the event status register of the specified axis will cause a host interrupt.

**Sense Signal:** Establishes the sense of the corresponding bit of the signal status register for the specified axis.

**Output Mode:** Sets the form of the motor output signal of the specified axis.

**Capture Source:** Determines which of the two encoder signals (index or home) is used to trigger the high-speed capture of the axis position for the specified axis.

**Number Phases:** Establishes the number of phases (1, 2, or 3) for the commutation of the specified axis.

**Encode Counts/Rev:** For axes configured for brushless DC motor types, sets the number of encoder counts per electrical cycle. The phase count is:

$2 * \text{encoder-counts-per-revolution} / \text{number-motor-poles}$

**Number Motor Poles:** See **Encode Counts/Rev** for how Number Motor Poles is used.

**Commutation Type:** Sets the phase commutation mode for the specified axis. When set to Sinusoidal, as the motor turns, the encoder input signals are used to calculate the phase angle. This angle is used to generate sinusoidally varying outputs to each motor winding. When set to Hall, the hall effect sensor inputs are used to commute the motor winding using a “six-step” or “trapezoidal” waveform method.

**Phase Angle:** Sets the instantaneous commutation angle for the specified axis. For brushless CD motors, the phase angle is specified in units of encoder counts.

**Phase Correction:** Enables (1) or disables (0) the correction mode for the specified axis. When phase correction is enabled, the encoder index signal is used to update the commutation phase angle once per motor revolution. This ensures that the commutation angle will remain correct, even if some encoder counts are lost due to electrical noise, or due to the number of encoder counts per electrical phase not being an integer.

**Phase Init:** Establishes the mode in which the specified axis is to be initialized for commutation. In Algorithmic mode, the motor windings are briefly stimulated, and the initial phasing based on the observed motor response is set. In Hall mode, the three Hall sensor signals are used to determine motor phasing.

**Phase Init Time:** Sets the time value, in cycles, to be used during the algorithmic phase initialization procedure.

**Phase Offset:** Sets the offset from the index mark of the specified axis to the maximum output value of phase A.

**Phase Prescale:** Controls scaling of the encoder counts before they are used to calculate a commutation angle for the specified axis. When operated in prescale mode, the motion processor can commutate motors with a high number of counts per electrical cycle, such as motors with very high accuracy encoders.

**Sample Time:** Sets the cycle time (in microseconds) for the chip. This is the time between servo loop updates and trajectory calculations.

**Motor Command:** Loads the motor-command buffer register of the specified axis. For DC brushless motors, this command directly sets the servo output register when the motor mode has been set to OFF.

**Status Updates Enabled:** Enables or disables event and signal status.

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