

Galil. We Move the World.

With over 500,000 controllers installed worldwide, Galil is the leading supplier of motion controllers. Galil's legacy of innovation began in 1983 with the introduction of the first microprocessor-based servo motion controller. Today, Galil continues its leadership by offering the most powerful, cost-effective and easy-to-use controllers to accommodate all your motion and I/O needs.

Galil offers a broad array of motion controllers in a variety of formats: single and multi-axis, card-level and box-level, bus-based and stand-alone. Galil's Ethernet/RS232 and PCI controllers are available in an Econo version for lowest cost and Accelera version for ultra high-speed performance. Plug-in, multi-axis drives for steppers and servos save space, cost and wiring. For intelligent I/O control, the RIO Pocket PLC is compact, low-cost and packed with analog and digital I/O.

At Galil, we share our expertise with our customers. You will find a wealth of information on our website at <http://www.galilmc.com>. Here you can view any of Galil's free web-tutorials, read an application note or white paper, post a question on our bulletin board, or download the latest software and manuals.

Exceptional application support is a top priority at Galil. Call Galil today at 800-377-6329 to discuss your project with one of our highly-trained applications engineers. ■



ACCELERA CONTROLLERS AND DRIVES

- DMC-40x0** Ethernet/RS232
- DMC-18x6** PCI

ECONO CONTROLLERS AND DRIVES

- DMC-41x3** Ethernet/USB/RS232 — **New!**
- DMC-21x3** Ethernet/RS232
- DMC-18x2** PCI

SINGLE-AXIS CONTROLLERS AND DRIVES

- DMC-300xx** Ethernet/RS232 — **New!**
- DMC-1415** Ethernet/RS232
- CDS-3310** Ethernet/RS232

POCKET PLC I/O CONTROLLER

- RIO-47xxx** Ethernet/RS232

SOFTWARE TOOLS

- GalilTools.** Servo Tuning and analysis software
- Frequency Analysis Software.** Performs Servo Tuning in the frequency domain. — **New!**
- Ladder Interface.** Converts Ladder program into DMC code for RIO Pocket PLC.
- Galil PVT.** Software tool for PVT mode of motion.



DMC-41x3 Econo Motion Controller

FREE Online Support Tools

- ✓ Application notes, white papers and industry articles <http://www.galilmc.com/support/application-notes.php>
- ✓ Free 2-minute how-to videos <http://www.galilmc.com/learning/two-minute-videos.php>
- ✓ Over 20 tutorials about servo tuning, motion programming, & motors and drives <http://www.galilmc.com/learning/tutorials.php>
- ✓ MotionCode™ Toolkit, step-by-step solutions with downloadable code <http://www.galilmc.com/learning/motioncode.php>
- ✓ MotorSizer™ Tool for quick sizing of stepper and servo motion systems <http://www.galilmc.com/learning/motorsizer.php>
- ✓ Interactive bulletin board with knowledge base for fast answers to your questions <http://www.galilmc.com/forums/ubbthreads.php>
- ✓ Customer stories and videos <http://www.galilmc.com/support/smartmoves.php>
- ✓ Product catalog with specs and pricing <http://www.galilmc.com/support/catalog.php>



QUARTERLY NEWSLETTER PUBLISHED BY GALIL MOTION CONTROL

Introducing Galil's DMC-300xx Pocket Motion Controller. Smart. Compact. Low Cost..... Pg 1

Key Benefits of Galil's High Performance Controller/Drive Products..... Pg 3

“The mission of Galil's experienced Applications Department is to provide prompt and accurate technical assistance to help OEMs successfully deliver their products to market.”

GALIL SUPPORT TEAM



SERVO TRENDS

OCT 2011, VOL. 26 NO. 4



DMC-30012-BOX Motion Controller and 800W Sine Drive

Introducing Galil's DMC-300xx Pocket Motion Controller. Smart. Compact. Low Cost.

The new DMC-300xx Pocket Motion Controller is Galil's latest generation, single-axis Ethernet motion controller. It combines a high performance motion controller and an optional 800W sine drive in a low-cost, compact package. The DMC-300xx is also available as a controller-only card or box that can be connected to a stepper or servo motor amplifier of any power range. Using a 32-bit

RISC processor and improved power technology, the DMC-300xx provides higher speed, better power efficiency and smaller size than prior generation controllers. The DMC-300xx is ideal for single-axis motor control applications where compact size, low cost and remote location are important.

►(cont. pg 2)

DMC-30011-CARD,
DMC-30011-BOX
and DMC-30012-BOX
connected by daisy-chained
Ethernet ports.



Smart

A powerful new feature of the DMC-300xx is that it provides two 100Base-T Ethernet ports that can be daisy-chained. This allows multiple units to be connected without the use of an Ethernet hub.

The DMC-300xx is also higher speed than prior generation single-axis controllers. The 125 microsecond servo loop update time is twice as fast and the 15MHz encoder frequency and 3 MHz stepper pulse output is 25% faster than the CDS-3310 single axis controller.

The DMC-30012 is available packaged with an efficient, high-performance amplifier for driving servo motors up to 800W. The fully digital, transconductance amplifier is a sinusoidally commutated brushless motor amplifier (it can drive brush motors as well) which minimizes torque ripple compared to drives using trapezoidal commutation. This is especially important for applications using low friction linear motors. The intelligent amplifier provides commands for initialization of the brushless motor using either hall sensors or encoder feedback.

Each amplifier drives motors operating at 20-80 VDC, up to 10 amps continuous, 15 amps peak. The gain settings of the amplifier are user-programmable at 0.4, 0.8, and 1.6 amp/volt. The switching frequency is 33 KHz. The amplifier offers protection for over-voltage, under-voltage, over-current, and short-circuit. An internal shunt regulator option is available.

Other intelligent features of Galil's 5th generation single-axis controller include PID compensation with velocity and acceleration feedforward, non-volatile memory for user programs, multitasking for simultaneously running up to four programs, and I/O processing for synchronizing motion with external events. Modes of motion include point-to-point positioning, position tracking, jogging, contouring, electronic gearing, ECAM, and PVT.

Compact

Similar in size to Galil's RIO-47xxx Pocket PLC and much smaller than the CDS-3310 single axis motion controller, the DMC-30012-BOX motion controller and 800W sine drive unit measures just 3.9" x 5.0" x 1.5". The DMC-30011-BOX which is the controller-only measures 3.9" x 4.2" x 1.4", and the DMC-30011-CARD is 3.0" x 4.0". The controller-only unit can be connected to a stepper or servo amplifier of any power range.

Low Cost

The DMC-300xx series is cost-effective making it ideal for OEM projects. The DMC-30012-BOX controller and 800W drive package is \$695 U.S. in single quantity and \$445 in quantities of 100. The DMC-30011-BOX controller-only is \$365 in 100 quantities and the DMC-30011-CARD is \$330 in 100 quantities. Additional savings are available by purchasing the DMC-30010 model that does not include a DC-to-DC converter.



DMC-30010-CARD
Controller without DC-to-DC

Multiple Inputs and Outputs

The DMC-300xx provides optically isolated inputs and outputs as a standard feature. I/O includes: forward and reverse limit inputs, homing input, 8 uncommitted digital inputs, 4 uncommitted digital outputs, 2 uncommitted analog inputs and 1 uncommitted analog output. Unlimited analog and digital I/O can be added using multiple RIO Ethernet I/O controllers.

The DMC-300xx accepts both a main and auxiliary encoder. Quadrature encoders are standard with BiSS and SSI formats available as an option.

Easy to Use

The DMC-300xx operates stand-alone or interfaces to a PC with Ethernet or RS232. Like all Galil controllers, the DMC-300xx is programmed with Galil's intuitive, 2-letter command language, making them easy to program. GalilTools software simplifies system set-up with automated servo tuning and real-time display of motion information in the time domain. Galil's new Frequency Analysis Software (FAS) allows tuning in the frequency domain.

DMC-300xx specifications are shown in **Table 1**. For complete pricing and specifications for the DMC-300xx series, please see: <http://www.galilmc.com/products/dmc-300xx.php>

The DMC-300xx is currently in BETA release with full release scheduled for January 2012. Please contact a Galil applications engineer at 800-377-6329 or support@galilmc.com for more information. ■

Table 1: Specifications of DMC-300xx Series

Specification	DMC-300xx
Ethernet	(Two) 10/100 Base-T ports—allows daisy-chaining
RS232	1 main port, 115 kb
Maximum Encoder Rate	15 MHz
Maximum Stepper Rate	3 MHz
Minimum Servo Update	125 microseconds
Command Processing	50 microseconds
Program Memory	1000 lines x 40 chr
Array Size	3000 elements
# of Variables	254
# of Uncommitted Isolated I/O	8 inputs, 4 outputs
Optically Isolated I/O	optical isolation is standard; high current outputs are available as an option
Analog Inputs	standard, 2 inputs 0-5V
Analog Output	standard, 1 output +/-10V
Packaging Options	CARD or BOX-level
Voltage Inputs	
DMC-30010	+5V and +/-12V (no DC-to-DC)
DMC-30011	9-48 VDC
DMC-30012	20-80 VDC
Metal Enclosure Dimensions	
DMC-30010-Card	3.0" x 4.0"
DMC-30010/30011-Box	3.9" x 4.2" x 1.4"
DMC-30012-Box	3.9" x 5.0" x 1.5"
Drive Specifications for DMC-30012	sinusoidal commutation 10A cont, 15A peak; 20-80 VDC drives a brush or brushless servo motor

Key Benefits of Galil's High Performance Controller/Drive Products

A common shortcut with single axis controller/drive combinations is to use a single control loop (and processor) to handle both the Position Control Loop (ie: PID loop) and the Amplifier Current loop. Galil separates these two loops onto different hardware and therefore optimizes each of them for the highest system performance. For instance, on the DMC-30012 and -D3540 sinusoidal amplifiers, the current loop is closed at a 33kHz sample rate that gives a fast response and tight control of the current going to the motor. It allows a high closed loop frequency response of 3-4kHz. This frees the controller processor for closing the position loop as well as running programs and processing commands. This two-loop architecture allows Galil to be extremely responsive and highly accurate on many different types of servo systems.

Software Adjustable Settings to Interface to Many Different Servo Systems

Galil is able to achieve precise control over many different types of servo motors – (both brush and brushless) by allowing software-selectable control loop parameters (ie: PID) and amplifier current loop parameters. For instance, the gain of the amplifier is selectable using the AG command. This can be set for small, medium, or large motors and determines how much current is delivered to the motor. In addition, the controller's AU command allows the user to adjust the current loop gain high or low. A high current loop gain is good for motors with large inductance values. On rare occasions, a very specific current loop setting is needed. Galil offers the capability of further customizing the controller/amplifier settings at the factory in order to precisely match a user's servo system.

Sinusoidal Commutation for Smooth Motion

For the smoothest mechanical output of a brushless servo motor (linear and rotary), sinusoidal commutation is the best method for minimizing torque ripple. On standard trapezoidal-based commutation, a small amount of torque ripple occurs when switching from one phase to the next. On some servo motor systems, this torque ripple affects the smoothness of motion and may have an audible component such as a "ticking" sound when transitioning between phases. Sinusoidal commutation comes standard on the DMC-30012 single axis controller and drive and is available as the -D3540 amplifier on multi-axis systems.

Easy Setup and Integration

Several methods are available to commutate a brushless motor with the Galil sinusoidal drives. A short initialization procedure on power-up uses minimal motion and allows the controller to commutate a brushless motor using only the encoder feedback. This eliminates the need for Hall sensors. Removing the Hall sensors helps reduce cost and space of a motor while also making wiring and system setup easier. For systems where gravity or a constant force is present, Hall sensors may be required for proper commutation. On these systems, the controller can use them to initialize by simply moving past the first Hall transition. For further information on single or multi-axis controller and drive solutions, contact a Galil applications engineer. ■