SERVOTRENDS

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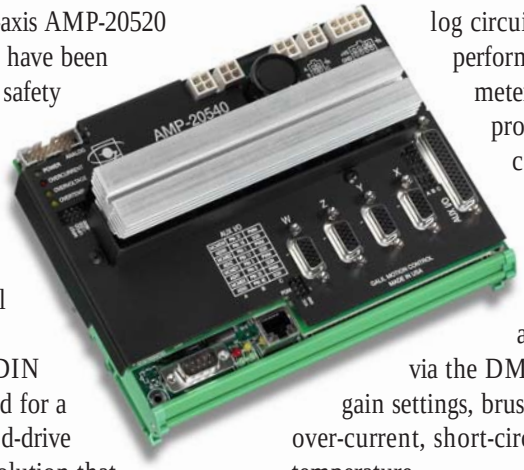
Galil's Powerful AMP-20540 Now Includes a Cover That Allows Higher Voltages

Both of Galil's 4-axis AMP-20540 and 2-axis AMP-20520 for driving 500W brush or brushless motors have been redesigned with a metal cover that increases safety when using higher voltages. The high performance AMP-205x0 series accepts 18V to 60 VDC standard and up to 160V as an option, and can produce 7 amps of continuous current, 10 amps peak per axis.



Like the other multi-axis drives that Galil offers for their DMC-21x3 controllers, the AMP-205x0 attaches directly to the 96-pin DIN connector of the controller without any need for a cable. The result is a multi-axis controller-and-drive sandwich that gives OEMs a cost-effective solution that eliminates any wiring between the controller and drives.

Essentially, Galil's AMP-205x0 is a new breed of amplifier that is commonly referred to as a "hybrid" design that combines the best features of an analog and digital amplifier. It does so by regarding the combination of the amplifier/controller as an integrated unit. With the hybrid amplifier, the current loop is closed by analog circuits that achieve fast response and excellent performance. Any diagnostics and changes in parameters are performed by the controller's microprocessor. As a result, users have an amplifier/controller combination that functions as a low cost, high performance amplifier complete with diagnostics and programmable parameter changes.

Several special features for diagnostics and set-up are provided by the AMP-205x0 via the DMC-21x3 controller, including programmable gain settings, brushless motor set-up, and protection against over-current, short-circuit, under-voltage, over-voltage and over-temperature.

Galil offers several other multi-axis amplifier options for the DMC-21x3 controller, including drives for full/half step, microstepping (available 2nd Quarter 2004), brush servos and brushless servo motors. Please refer to the table below for the most current list of available drive and I/O options. Or, go to **http://www.galilmc.com/dmc21x3.html** to get complete specifications.

DMC-21x3 AMPLIFIER and I/O OPTIONS

MODEL NUMBER	MOTOR TYPE	# OF AXES	CURRENT	VOLTAGE	OTHER	U.S. PRICE (QTY 1/100)
ICM-20100	Interconnect for external drives	4	N/A	N/A		$95/$75
ICM-20105	Interconnect for external drives	4	N/A	N/A	Provides optical isolation of I/O	$195/$145
SDM-20240	Stepper–full and half step	4	Up to 1.4A/phase	12-30 VDC		$195/$175
SDM-20640*	Stepper–microstepping	4	Up to 3.5A/phase	12-48 VDC	Includes 8 analog inputs	$695/$395
AMP-20340	Brush DC	4	1 A max	12-36 VDC	Linear drives	$195/$175
AMP-20420	Brush DC	2	3.3A max	20-60 VDC	PWM drives	$395/$245
AMP-20440	Brush DC	4	3.3A max	20-60 VDC	PWM drives	$595/$295
AMP-20520	Brush DC or brushless DC	2	7A cont 10A peak	18-60 VDC *(Up to 160 V as an option)*	Includes 8 analog inputs, programmable gains and diagnostics	$595/$395
AMP-20540	Brush DC or brushless DC	4	7A cont 10A peak	18-60 VDC *(Up to 160 V as an option)*	Includes 8 analog inputs, programmable gains and diagnostics	$795/$495
DB-28040	I/O expansion	N/A	N/A	N/A	40 digital I/O plus 8 analog inputs	$295/$195
Custom (Consult Galil)	Any	Any	Any	Any	Can specify special I/O, connector and size requirements	Nominal tooling fee, 25 unit minimum

Available second quarter 2004.

Important Product Notice:
DMC-21x0 Series To Be Replaced by DMC-22x0 Series

Galil's DMC-21x0 series of controllers will become obsolete in March 2004 as they are replaced by the newer DMC-22x0 series. The DMC-22x0 has the same form, fit and function as the DMC-21x0 controllers, with the only difference being that the DMC-22x0 offers both 10Base-T and 100Base-T communications while the DMC-21x0 offers only 10Base-T communications.

All DMC-21x0 cables and interface hardware, as well as its software programs, are interchangeable and will work with the DMC-22x0. Also, there is no price difference between the DMC-21x0 and DMC-22x0 controllers.

There is, however, a 10/100Base-T DIP switch setting on the DMC-22x0 instead of the OPT switch on the DMC-21x0. Also, the front panel LED labels are different.

Shipments of the DMC-21x0 controllers will cease on or about March 2004. After that, all orders for the DMC-21x0 controller should be replaced with the corresponding DMC-22x0 part number. For example, the DMC-2130 must be ordered as a DMC-2230. Customers will be immediately notified about any incorrectly placed orders.

This notice does not affect Galil's DMC-20x0, DMC-21x2 and DMC-21x3 controllers.

Please direct any questions or inquiries for additional information to Galil's technical support group at **1-800-377-6329** or ***support@galilmc.com.***

Galil's New I/O Module for IOC-7007 Controller Provides High Power, Optoisolated Outputs

IOC-7007 I/O Controller with Plug-in Modules

Galil has just introduced their IOM-70508, the newest module for their IOC-7007 I/O controller. It provides 8 high-side, high power outputs capable of producing 500mA each at up to 50V, and installs directly into the IOC-7007. Additionally, the IOM-70508 can be used with Galil's other I/O modules in order to provide complete input/output capability. This includes digital inputs, digital outputs, optically isolated inputs and outputs, analog inputs, analog outputs and dry contact relays. Refer to *Table 1* for a complete list of available IOM modules.

The IOC-7007 I/O controller provides an intelligent solution for handling inputs and outputs. For starters, it has a 10/100 Base-T Ethernet port that enables communication with multiple devices in an Ethernet network. This allows easy integration of Galil's Ethernet motion controllers with inputs and outputs, and eliminates the need for an external PLC.

Standard IOC-7007 controller features also include a 32-bit microcomputer for programming and synchronizing I/O events, and (like all Galil motion controllers) the ability to store and execute complex application programs designed by the user. Such application programs can be downloaded directly to the controller and executed without host intervention. Multitasking allows concurrent execution of up to eight different application programs. This controller also has a special PLC mode with deterministic timing so that an application program can be compiled into optimized code for faster execution.

While similar to Galil's motion controller language, the programming language of the IOC-7007 differs in that the motion specific commands have been removed and more I/O commands added. The similarity of the IOC and motion controller commands allow seamless integration of motion and I/O. Plus, it eliminates the need to learn two different languages.

The Ethernet 100 Base-T port of the IOC-7007 features an auto-negotiate function for communicating with 100 Base-T or 10-Base-T devices. It supports both TCP/IP and UDP, and MODBUS in both master and slave mode for interface to other MODBUS devices. The IOC-7007 also includes one RS232 port up to 19.2kb.

Available as a compact 10.8" x 4.5" x 2.6" packaged unit, the IOC-7007 also comes as a DIN rail mount unit or a card-level product. The box-level version accepts 90-260 VAC or 20-60 VDC, while the DIN rail and card-level unit accepts 20-60 VDC. Each IOM module uses a 20-pin Molex connector to interface to I/O.

For complete IOC-7007 and I/O Module specifications, call Galil at **800-377-6329** or go to **http://www.galilmc.com/products/eseries/ioc7007.html.**

Table 1. I/O Modules for IOC-7007

IOM-70016	I/O Module- 16 TTL inputs
IOM-70108	I/O Module- 8 optoisolated inputs
IOM-70208	I/O Module- 8 optoisolated outputs (24 V @ 25mA each)
IOM-70308	I/O Module- 8 high power outputs (24V @ 100mA each)
IOM-70508	I/O Module- 8 high-side, high power outputs (50V @ 500mA each)
IOM-70404	I/O Module- 4 dry contact relays (150V @ 250mA)
IOM-70808	I/O Module- 8 analog inputs (12-bits standard)
IOM-70904	I/O Module- 4 analog outputs (12-bits standard, 16-bit option)
IOM-70908	I/O Module- 8 analog outputs (12-bits standard, 16-bit option)

New Version of Galil's SmartTerm with Two Time-Saving Features

Galil's newest version of SmartTerm software (Version 6.1) has been enhanced with two time-saving features: 1) IP Address Helper and, 2) Macro Editor. To download the latest SmartTerm software and Help File, go to: **http://www.galilmc.com/support/download.html.** The following describes the new features in detail:

IP Address Helper

Galil has improved the method used to assign IP addresses to Galil controllers. Now, there is an "IP address Helper" dialog box that walks the user through the process of selecting and testing the IP address for their controller.

The dialog box shown in *Figure 1* allows the user to correctly assign an IP address regardless of how they are connected to the controller. For example, on a Managed Network, the network card is connected to a server that dynamically assigns IP addresses. On the other hand, on an Unmanaged Network, the network card has a fixed IP address. While the latter is the preferred setup for a Galil controller, either method can be used. The dialog box allows the user to search for, test and assign an IP address to a controller. This eliminates some of the guesswork that can lead to improperly configured networks.

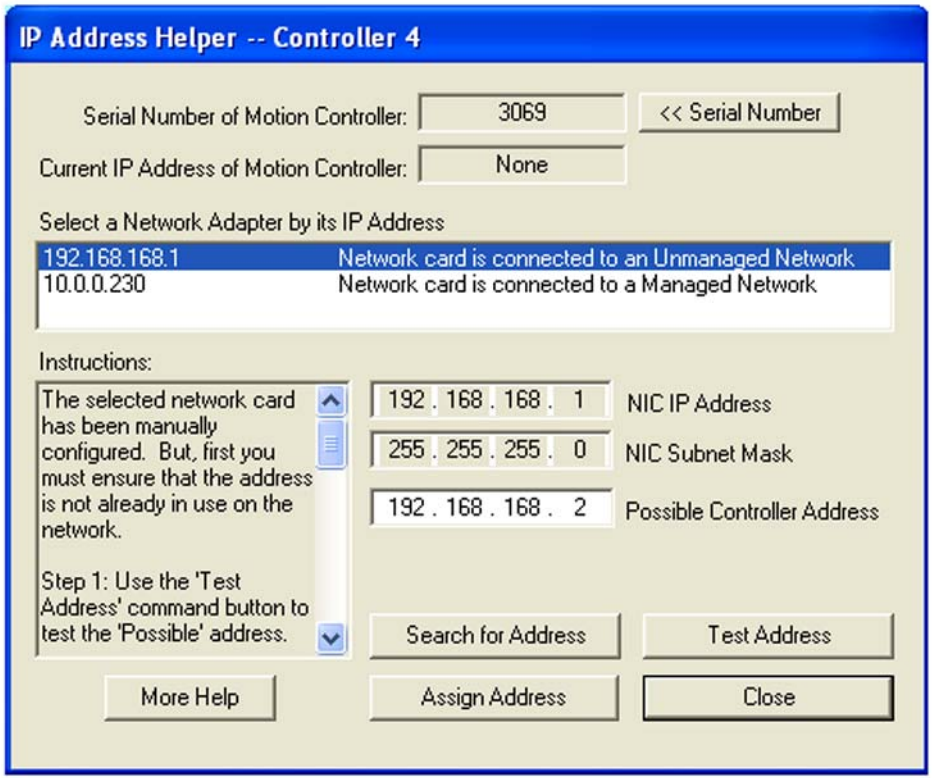


Figure 1. IP Address Helper–Dialog Box

Macro Editor

Galil's Macro Editor enables the user to write scripts that simplify frequently performed tasks on the PC. Macros can be executed from inside SmartTerm from the new Macro Toolbar. For example, commonly used Galil DMC programs that are stored on the PC can be downloaded and executed at the touch of a button. Following is a sample of the macro code that automates this task:

Connect RegNum = 1

Download C:\Program Files\Galil\DMC Smart Terminal\HomeX.dmc

Cmd XQ

MsgBox Running HomeX.dmc

Disconnect

This macro will connect to Controller #1 in the registry, then download the program *HomeX.dmc* and execute it. The macro then displays a message box that informs the user that the program is running.

Another way to use the macro features is to do so directly from the command line, allowing tasks to be performed without having to open the SmartTerm software. The command line arguments can be put into a Windows™ shortcut or a batch file so that only one button needs to be pressed to run the entire macro.

For example, a common task is for people to set up their new controllers by downloading their #AUTO program or configuration file. To simplify this, a macro can be written like this:

Connect RegNum = 1

Download C:\Program Files\Galil\DMC Smart Terminal\Config.dmc

Cmd BP

Cmd XQ

MsgBox Running Config.dmc

Disconnect

CloseSmartTerm

This macro can be stored as Macro #1. Then, all that is required is to create a Windows shortcut with the target specified as:

"C:\Program Files\Galil\DMC Smart Terminal\DMCTERM.exe" -m 1

Thus, only one button is needed to download, burn, and execute the Galil program. Macros are ideal for users that don't need a full-fledged Visual Basic or C++ program, but need to automate the use of Galil software.

Here is a list of the currently available macros:

Macro Instructions

Connect. The Connect instruction creates a connection with a specified controller. A connection is ended with the Disconnect instruction.

Disconnect. The disconnect instruction ends a connection with the currently connected controller (if any). A connection is established with the Connect instruction.

Cmd. The Cmd (command) instruction sends a Galil Application Language command to the currently connected controller. The Cmd instruction does not retrieve the response from the controller, if any.

GetRspn(). The GetRspn function returns the result (if any) from a Galil Application Language command.

Integer. The Integer instruction declares an integer variable that is 4 bytes long.

(Continued on Page 4)

Galil's SmartTerm Released...*(Continued from Page 3)*

Float. The Float instruction declares a Float variable that is has the same precision as a C/C++ float type or a Visual Basic Single type.

String. The String instruction declares a String variable. String variables are variable length.

If *(condition)* Then. The If () Then instruction allows conditional interpretation of macro instructions.

Do .... While *(condition)*. The Do ... While () instruction allows conditional interpretation of macro instructions in a looping structure.

Wait. The Wait instruction causes the macro interpreter to wait the specified number of seconds.

WaitForMotionComplete. The WaitForMotionComplete instruction causes the macro interpreter to wait until motion on the specified axis or axes has completed.

Send. The Send instruction sends a file to the currently connected controller and executes the commands immediately. The file is not stored on the controller.

Download. The Download instruction downloads a file to the memory of the currently connected controller and stores it for later execution with the XQ command.

DownloadFirmware. The DownloadFirmware instruction downloads firmware to the currently connected controller.

RunSilent. The RunSilent instruction turns on-and-off syntax error notification. Errors can occur when an instruction has a typo, or an instruction like Cmd generates a DMC error.

CloseSmartTerm. The CloseSmartTerm instruction causes the DMCTerm.exe application to close. If a connection is open, it is automatically closed prior to closing the application. This instruction can be useful for closing the application after a macro is run from the command line.

MsgBox. The MsgBox instruction causes an "OK" Message box to be displayed.

RunMacro. The RunMacro instruction allows one macro to call another. Macros cannot be called recursively.

Backlash Compensation by Closed Loop Steppers

By Jacob Tal, President, Galil Motion Control

Introduction

Backlash compensation is one of the more difficult challenges that a designer can face. Unfortunately, as the requirements for accuracy get more demanding, the problem becomes more severe.

Backlash occurs when mechanical parts have some freedom of movement. The most common form of backlash occurs in lead screws and gears. Such backlash creates a difference in the positions of the motor and the load, and creates stability problems when the position loop is closed around the load encoder.

The simple solution of ignoring the backlash and closing the loop does not work. Especially since the backlash causes a delay that results in system oscillations.

In recent years, Galil has offered a unique solution: the advanced dual loop. Here, we close two position loops: 1) the internal loop with the motor encoder, and, 2) the external loop with the load encoder. By managing the two loops carefully and making sure that the inner loop is stable, it is possible to achieve accuracy in spite of the backlash.

Now, it appears that another solution is available. Instead of an inner loop, use a stepper motor, which results in a single loop that is based on the load encoder.

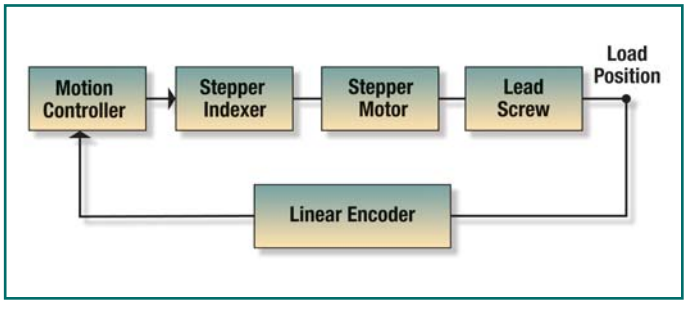


Figure 1. System elements of proposed system

The System

For a specific description, assume that the motor drives a load via a lead screw, with a backlash of 50 microns, and that the required load position accuracy is within one micron. The proposed system consists of the components seen in *Figure 1*.

Here, the stepper motor and the indexer operate in the microstepping mode, with microstepping resolution that is finer than one micron. Such a subsystem receives pulses and then translates those into incremental motion.

A load encoder, with a resolution that is finer than one micron, provides the feedback to the motion controller, which, in turn, generates the pulses that drive the stepper.

Note that the resolutions of the linear encoder and the microstepping system do not have to be the same because the motion controller can handle the differences in resolutions.

The system operation starts with the first phase, which is "open loop control of the stepper". The controller sends the pulses that nominally drive the stepper to the required position, or slightly short of that. The second phase is the "closed loop" or the "correction" step. Here, the controller closes the loop, determines the position error, and generates correction pulses at a rate that is proportional to the error. This results in an exponential conversion of the position error to zero.

The controller operation can be easily performed by a simple application program, which periodically determines the error and generates output pulses at a proportional frequency.

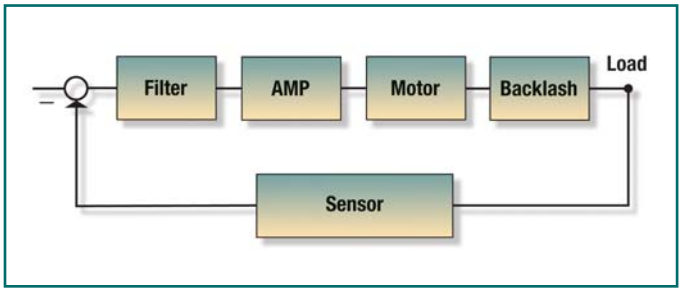


Figure 2. Single loop with backlash

(Continued on Page 5)

Backlash Compensation...

(Continued from Page 4)

The correction move will converge faster if the motion stays on one side of the backlash. To ensure this happens, it is advised to make the initial move slightly shorter than the nominal move, and to design the correction algorithm to be over damped, thereby avoiding overshoots.

Why Does It Work?

To understand the dynamics of this system, first consider the block diagram of a single loop servo system, as shown in *Figure 2*.

Such a loop includes the standard delays associated with the servo-motor, (two integrators between current and position), plus the delay due to the backlash. The total delay is so large that the system is unstable.

A working alternative is to use the dual loop method and to close a stable loop around the motor, as shown in *Figure 3*.

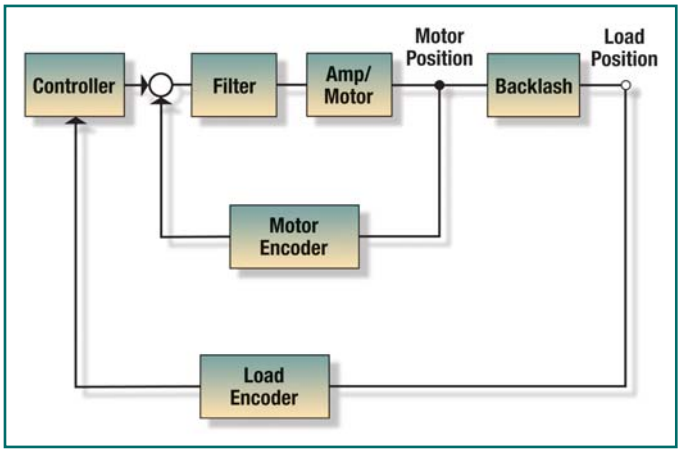


Figure 3. Dual loop with a stable inner loop

Since the inner loop is stable, it is possible for the controller to adjust the motor position so that the load position error is eliminated. This method has proven to be successful and has been reported as such over the last few years.

Now, we can replace the stable inner loop by a microstepping system. The microstepping system is also a stable system with a dynamic response that is similar to that of the servo system. The elements of this alternative method are shown in *Figure 1*.

It is important to note that the application program that generates the drive pulses can be modified to improve the system stability. For example, see the following programs:

Application Programs

First consider the case of a program that generates a pulse train at a rate that is proportional to the position error. The first step is to configure the axis to step motor mode, so that it produces pulses. The following program determines the position error _TEX and generates a pulse train at the frequency of KV*_TEX.

Program	Interpretation
#A	*Label*
KV=5	*Velocity constant*
JG0	*Set in jog mode*
BGX	*Start motion*
#L	*Label*
V=_TEX*KV	*Correction speed*
JGV	*Update speed*
JP#L,V<>0	*Loop if necessary*
EN	*End*

The constant KV can be adjusted experimentally for best results. As expected, low values of KV result in slow response, whereas larger values lead to faster response and, eventually, to overshoot and algorithm instability.

The above program can be modified to provide additional damping in order to improve the loop stability. It adds the damping term D as shown below:

Program	Interpretation
#B	*Label*
KV=5	*Velocity constant*
D=0.2	*Damping constant*
E1=0	*Previous Error*
JG0	*Set in jog mode*
BGX	*Start motion*
#L	*Label*
E=_TEX	*Current error*
DE=E-E1	*Change in error*
V=(D*DE+E)*KV	*Filtered velocity*
JGV	*Update speed*
E1=E	*Update error*
JP#L,V<>0	*Loop if necessary*
EN	*End*

Note that the damping is achieved by adding to the current error, a term that is proportional to the change in error. This creates an effect of "proportional plus derivative" filter.

Galil Receives CE Certification for New Products

Galil's newest series of motion controllers and drives have recently received CE certification. They include the following Galil products:

- DMC-14x5 Ethernet Controllers
- DMC-34x5 Ethernet Controllers
- DMC-21x3 Ethernet Controllers
- DMC-18xx PCI bus Controllers
- AMP-205x0 Multi-axis Drives for DMC-21x3 controllers
- AMP-195x0 Multi-axis Drives for DMC-18xx controllers

DMC-18x0 PCI Controllers Provide Dual-Port Ram for Access to High Speed Axis and I/O Data

By Chris Cortopassi, Galil Applications Engineer

In motion control systems, high-speed access to controller axis and I/O data is often required for:

- *A GUI running on a PC that displays many controller axis and I/O data fields to the user*
- *A host PC calculation that requires access to many controller axis data fields*

Although axis and I/O data is available from the Galil language with commands such as TP or MG @IN[1], the data rate is not optimal because 1) it is transferred as ASCII text and 2) both a write and a read are required. These commands are transferred from the PC to the controller's "write FIFO" and responses are received from the "read FIFO".

For unsolicited high-speed binary access to controller axis and I/O data (the data record), Galil's DMC-18x0 PCI motion controllers (1-4 axes Rev. G, 5-8 axes Rev. D) provide a dual-port RAM *(Figure 1)*.

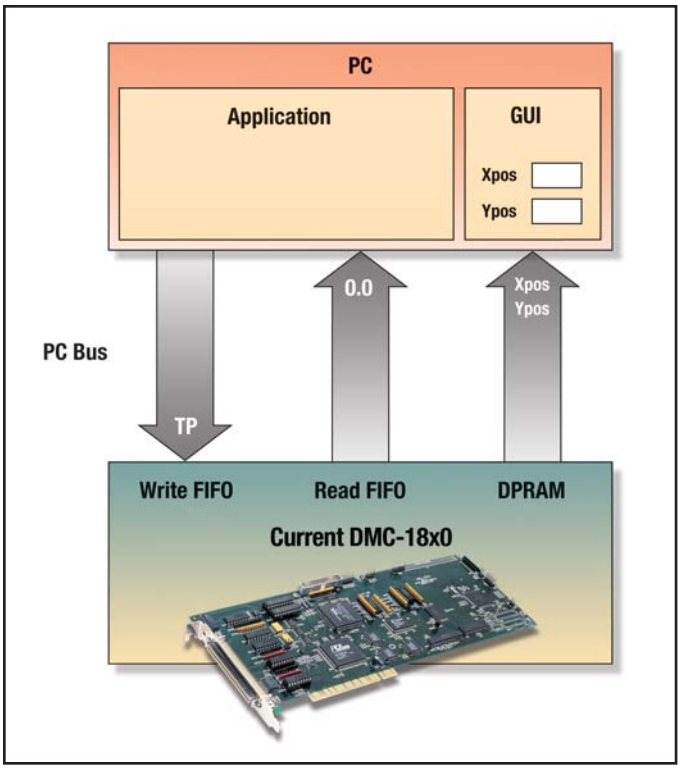


Figure 1. The three communication channels between the PC and a DMC-18x0: write FIFO, read FIFO, and dual-port RAM. Previous DMC-18x0s had a third FIFO instead of dual-port RAM.

The dual-port RAM replaces the third FIFO used on the previous revisions of the DMC-18x0 for the binary data record. Both the controller's processor and the PC's processor can access the dual-port RAM since it has two separate address and data buses. In comparison, conventional RAM has only one address and data bus so it only allows a single processor to access it *(Figure 2)*.

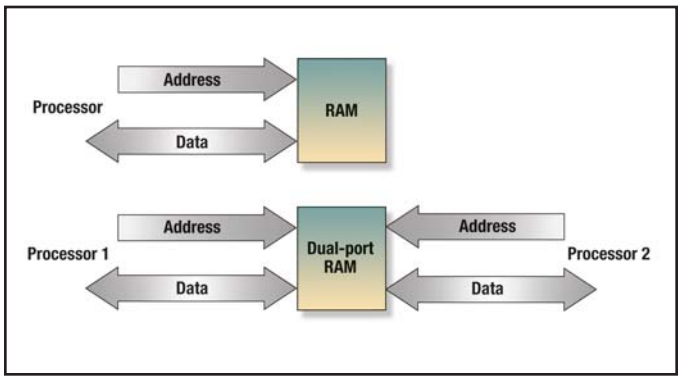


Figure 2. Conventional RAM with a single address and data bus (top) and dual-port RAM with two separate address and data buses (bottom)

Also, the DMC-18x0's dual port RAM is more efficient than the FIFO used on previous revisions *(Figure 3)*. After the controller's processor places the data record into the FIFO, the PC driver must perform two operations to retrieve an item from the data record:

- *Retrieve the entire data record from the FIFO (since data can only be accessed serially one byte at a time) and place it into memory*
- *Dereference to the particular location in memory (i.e., the x-axis position)*

With the new DMC-18x0 featuring dual-port RAM, retrieving the data record becomes a simple process for the PC. Since the dual-port RAM is a fully addressable memory that is mapped into the PC's address space, individual data record items can be dereferenced without first having to copy the entire data record into PC memory reducing access time and CPU utilization.

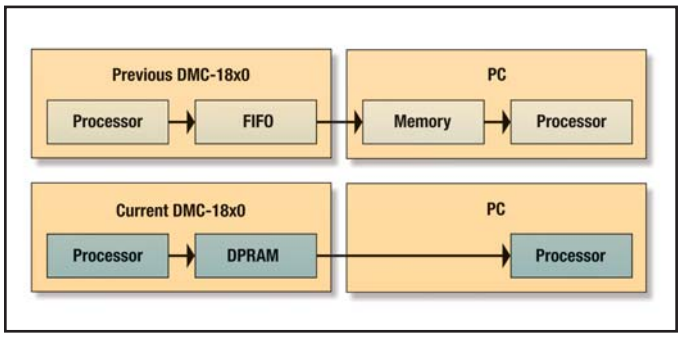
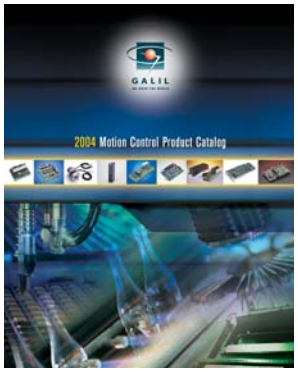


Figure 3. Retrieving a data record item on a previous revision DMC-18x0 with a FIFO (top) compared with a DMC-18x0 with dual-port RAM (bottom). The need to copy the entire data record into PC memory is eliminated with dual-port RAM.

Windows™ developers can easily access the axis and I/O data at a rate specified by the DR command from any Windows programming language, such as C or VB, by using the DMCWIN32 function DMCGetDataRecordByItemID.

Stay Current On Motion Control With Galil's 2004 Catalog

Order your free 2004 Motion Control catalog from Galil, which has been updated and is ready to ship to you today. Simply call Galil at **800-377-6329**, or go to **http://www. galilmc.com/products/catalog.html** with your request and it will be sent at no charge.



The 96-page catalog provides an easy, in-depth reference tool to the latest technical specifications and pricing on all of Galil's motion controllers, including single and multi-axis, bus-based and stand-alone, and box-level and card-level controllers. Available interface options include PCI, ISA, PC/104, VME, cPCI, USB, RS232 and Ethernet. Controllers are available in 1-, 2-, 3-, 4-, 5-, 6-, 7- and 8-axis versions and can be configured to run stepper or servo-motors in any combination of axes.

Also featured are Galil's new and award-winning DMC-21x3 Controller n' Drive Sandwiches. Each sandwich combines a high-performance Ethernet motion controller with a multi-axis drive for stepper or servo motors. A big, cost-effective advantage is that the drive attaches directly to the controller without the headaches and hassles of additional wiring or cables.

You'll also find a technical tutorial that describes motion controllers and provides programming examples for various modes of motion such as point-to-point positioning, jogging, linear and circular interpolation, contouring and electronic gearing. Information is also provided on Galil's WSDK servo tuning software for "one-button" PID tuning, and the ActiveX Tool kit for developing operator interfaces for Galil controllers.

Supplies are limited, so request your free 2004 catalog from Galil today at **800-377-6329** or at **http://www.galilmc.com/products/catalog.html.**

View Free Web Tutorials on Motion Control

Available 24/7 and free to registered viewers, Galil has an extensive, growing library of web-tutorials covering a variety of motion control subjects including servo tuning, dual loop control, and motor types. Go to **http://www.galilmc.com/training/webconf.html** to view any of the twenty Galil tutorials listed below.

Video Demonstration by Jacob Tal

"Motion Controller Demonstration"

Tuning

"Tuning Servos for Best Performance"
"Advanced Tuning Methods"
"Dual Loop Compensation Methods"

System Design

"Modes of Motion"
"Control of Load Sharing Systems"
"Tension Control of Web Processing Systems"
"Optimal Design of Motion Systems"

Ethernet

"Flexible-Distributed Control Systems"
"DMC-21x3 Ethernet Controllers & Drive Options"
"Ethernet & Motion Control"

Software Tools

"ActiveX Tool Kit"

Motors & Drives

"Servo Amplifier Basics"
"Using Shunt Regulators"
"Piezo Ceramic & Ultrasonic Actuators"
"Step Motor Control"
"Brushless Motor Control"

Miscellaneous

"Connecting to Galil I/O"
"Controller Upgrade Options"
"Overview of Galil Motion Control"

"Live" Tech Support *for Fast Answers to Your Questions*

Galil has a full team of dedicated application engineers in residence and ready to support your project. They are motion control specialists, each personally trained by Jacob Tal, President of Galil and renowned expert in motion control. To receive prompt service from a "live" Galil engineer, just call Galil at 800-377-6329 Mon-Fri 8am-5pm Pacific Standard Time. Or, email *support@galilmc.com*. They're at your service.

"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 Technical Support Team

Top Row-left to right- Chris Richtsmeier, Chris Cortopassi
3rd Row- left to right- Kaushal Shah (Group Mgr.), Glen Garettsson, Robin Riley
2nd Row-left to right- Eric Kelley, Todd Shearer (northeast region)
Front- John Hayes

Galil. We Move the World.

With over 350,000 controllers installed worldwide, Galil is the #1 leading supplier of motion controllers. Galil's legacy of innovation began in 1983 when they introduced the first microprocessor-based servo motion controller. Today, Galil continues its leadership by offering the most powerful, cost-effective and easy-to-use motion controllers to accommodate all your motion needs.

Galil provides you with the widest choice of single or multi-axis, bus-based or stand-alone, and box-level or card-level controllers. Interface options include PCI, ISA, PC/104, VME, cPCI, USB, RS232 and Ethernet. Select from 1-, 2-, 3-, 4-, 5-, 6-, 7- and 8-axis controllers, and configure them to run stepper or servo motors on any combination of axes.

Additionally, Galil provides various accessories that enable you to complete your project quickly. These include servo motors, amplifiers and software tools for quick set-up and "one-button" servo tuning.

Motion Controllers – PCI

DMC-18x0. PCI, 1-8 axes
DMC-18x2. PCI, 1-4 axes
DMC-1417. PCI, 1 axis

Motion Controllers – Ethernet/RS232

DMC-20x0. USB/RS232, 1-8 axes
DMC-22x0. Ethernet/RS232, 1-8 axes
DMC-21x2/x3. Ethernet/RS232, 1-8 axes
DMC-14x5. Ethernet/RS232, 1-2 axes
DMC-34x5. Ethernet/RS232, 1-2 axes
IOC-7007. Ethernet I/O controller

Motion Controllers – Other

DMC-12x0. PC-104, 1-8 axes
DMC-13x8. VME, 1-4 axes
DMC-16x0. cPCI, 1-4 axes
DMC-17x0. ISA, 1-8 axes
DMC-1410. ISA, 1 axis
DMC-1411. PC/104, 1 axis
DMC-1412. RS232, 1 axis

Software Tools

Communication Drivers. For DOS, QNX, Linux and all current versions of Windows

SmartTerm. Provides a friendly interface to all Galil controllers

WSDK. Servo Tuning and analysis software

ActiveX Toolkit. Custom controls for Visual Basic or other ActiveX software

CAD-to-DMC. Translates AutoCAD DXF files into DMC controller files

For complete specifications and pricing on all Galil products, please go to www.galilmc.com. Request a free catalog at http://www.galilmc.com/products/catalog.html.

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