

# Ethernet/RS232 Accelera Series, 1–8 axes

## DMC-40x0 Series

### Product Description

The DMC-40x0 is Galil's highest performance, stand-alone motor controller. It belongs to Galil's latest generation motion controller family: the Accelera Series, which accepts encoder inputs up to 22 MHz, provides servo update rates as high as 32 kHz, and processes commands in as fast as 40 microseconds—10 times faster than prior generation controllers.

The DMC-40x0 is a full-featured motion controller packaged with optional multi-axis drives in a compact, metal enclosure. The unit operates stand-alone or interfaces to a PC with Ethernet 10/100Base-T or RS232. The controller includes optically isolated I/O, high-power outputs capable of driving brakes

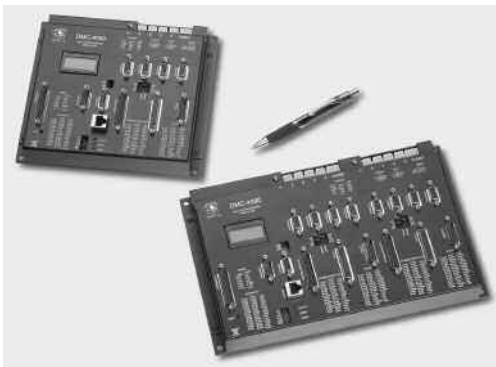
or relays, and analog inputs for interfacing to analog sensors. The DMC-40x0 controller and drive unit accepts power from a single 20–80 VDC source.

The DMC-40x0 is available in one through eight axis formats, and each axis is user-configurable for stepper or servo motor operation. Standard programming features include PID compensation with velocity and acceleration feedforward, multitasking for simultaneously running up to eight programs, and I/O processing for synchronizing motion with external events. Modes of motion include point-to-point positioning, position tracking, jogging, linear and circular interpolation, PVT, contouring, electronic gearing and electronic cam (ECAM). Like all Galil controllers, the DMC-40x0 controllers use Galil's popular, intuitive command language, making them very easy to program. GalilTools servo design software further simplifies system set-up with "one-button" servo tuning and real-time display of position and velocity information.

### Features

- Packaged controller in 1 through 8 axis versions: DMC-40x0 where  $x=1,2,3,4,5,6,7,8$  axes
- (1) 10/100BASE-T Ethernet port with Auto MDIX  
(2) RS232 ports up to 115 kbaud
- User-configurable for stepper or servo motors on any combination of axes. Optional firmware for piezo-ceramic motors. Configurable for sinusoidal commutation
- Accepts up to 22 MHz encoder frequencies for servos. Outputs pulses up to 6 MHz for steppers
- PID compensation with velocity and acceleration feedforward, integration limits, notch filter and low-pass filter
- Modes of motion include jogging, point-to-point positioning, contouring, PVT, linear and circular interpolation, electronic gearing and electronic cam. Features elliptical scaling, slow-down around corners, infinite segment feed and feedrate override
- Over 200 English-like commands including conditional statements and event triggers
- Non-volatile memory for programs, variables and arrays. Multitasking for concurrent execution of up to eight programs
- Optically isolated home input and forward and reverse end-of-travel limits for every axis.
- Uncommitted, isolated inputs and isolated outputs  
1- through 4-axis models: 8 inputs and 8 outputs  
5- through 8-axis models: 16 inputs and 16 outputs
- Isolated, high-power outputs for driving brakes or relays
- High speed position latch for each axis and output compare
- 8 uncommitted analog inputs
- 32 additional 3.3 V I/O (5 V option)
- 2 line x 8 character programmable LCD
- Dual encoder inputs for each servo axis
- Accepts single 20–80 VDC input
- Available with internal stepper and servo drives. Or, connect to external drives of any power range
- Communication drivers for Windows, Mac OSX, and Linux
- Custom hardware and firmware options available
- DMC-40x0 has CE certification. Specify DMC-40x0-ETL for ETL certification

DMC-4040 4-axis  
and DMC-4080 8-axis  
controllers



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## DMC-40x0 Series

### Specifications

#### System Processor

- RISC-based, clock multiplying processor with DSP functions

#### Communications Interface

- (1) 10/100BASE-T Ethernet port with Auto MDIX
- (2) RS232 ports up to 115 kbaud

Commands are sent in ASCII. A binary communication mode is also available as a standard feature

#### Modes of Motion:

- Point-to-point positioning
- Position Tracking
- Jogging
- 2D Linear and Circular Interpolation with feedrate override
- Linear Interpolation for up to 8 axes
- Tangential Following
- Helical
- Electronic Gearing with multiple masters and ramp-to-gearing
- Gantry Mode
- Electronic Cam
- Contouring
- PVT (Position-Velocity-Time)
- Teach and playback

#### Memory

- Program memory size — 2000 lines × 80 characters
- 510 variables
- 16,000 total array elements in up to 30 arrays

#### Filter

- PID with velocity and acceleration feedforward
- Notch filter and low-pass filter
- Dual-loop control for backlash compensation
- Velocity smoothing to minimize jerk
- Integration limit
- Torque limit
- Offset adjustment

#### Kinematic Ranges

- Position: 32 bit ( $\pm 2.15$  billion counts per move; automatic rollover; no limit in jog or vector modes)
- Velocity: Up to 22 million counts/sec for servo motors
- Acceleration: Up to 1 billion counts/sec<sup>2</sup>

#### Uncommitted I/O

	ISOLATED INPUTS	ISOLATED OUTPUTS	ANALOG INPUTS	3.3 V I/O
DMC-4010 thru -4040	8	8	8	32
DMC-4050 thru -4080	16	16	8	32

#### High Speed Position Latch

- Uncommitted inputs 1–4 latch A,B,C,D and 9–12 latch E, F, G, H axes (latches within 40 microseconds with optoisolation)

#### Dedicated Inputs (per axis)

- Main encoder inputs — Channel A, A-, B, B-, I, I- ( $\pm 12$  V or TTL)
- Dual encoder (for axes configured as servo) — Channel A, A-, B, B-
- Forward and reverse limit inputs — optoisolated
- Home input — optoisolated
- Selectable high-speed position latch input — optoisolated
- Selectable abort input for each axis — optoisolated

#### Dedicated Outputs (per axis)

- Analog motor command output with 16-bit DAC resolution
- Pulse and direction output for step motors
- PWM output also available for servo amplifiers
- Amplifier enable output
- Error output (one per controller)
- High-speed position compare output (per set of 4 axes)

#### Minimum Servo Loop Update Time

	STANDARD	-FAST*
■ 1–2 axes:	62 $\mu$ sec	31 $\mu$ sec
■ 3–4 axes:	125 $\mu$ sec	62 $\mu$ sec
■ 5–6 axes:	156 $\mu$ sec	94 $\mu$ sec
■ 7–8 axes:	187 $\mu$ sec	125 $\mu$ sec

#### Maximum Encoder Feedback Rate

- 22 MHz

#### Maximum Stepper Rate

- 6 MHz (Full, half or microstep)

#### Power Requirements

- 20–80 VDC

#### Environmental

- Operating temperature: 0–70° C
- Humidity: 20–95% RH, non-condensing

#### Mechanical

- 1- thru 4-axis: 8.1" × 7.25" × 1.72"
- 5- thru 8-axis: 11.5" × 7.25" × 1.72"

#### Connectors

- Amplifier I/O: 44-pin HD Male D-sub
- General I/O: 44-pin HD Female D-sub
- Encoder: 15-pin HD Female D-sub
- Analog: 15-pin LD Male D-sub
- Extended I/O: 44-pin HD Male D-sub

\*Reduced feature set for -FAST.

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## DMC-40x0 Series

### Instruction Set

#### Ethernet

DH	DHCP Configuration
HS	Handle switch
IA	Set IP address
IH	Open IP handle
IK	Ethernet port blocking
MB	Modbus
MW	Modbus wait
SA	Send command
SM	Subnet mask

#### Servo Motor

AF	Analog feedback
AG	Set amplifier gain
AU	Set current loop gain
AW	Report AMP-43040 bandwidth
DV	Dual loop operation
FA	Acceleration feedforward
FV	Velocity feedforward
IL	Integrator limit
KD	Derivative constant
KI	Integrator constant
KP	Proportional constant
NB	Notch bandwidth
NF	Notch frequency
NZ	Notch zero
OF	Offset
PL	Pole
SH	Servo here
TK	Peak torque
TL	Torque limit
TM	Sample time

#### Stepper Motor

KS	Stepper motor smoothing
LC	Low current
QS	Error magnitude
YA	Step drive resolution
YB	Step motor resolution
YC	Encoder resolution
YR	Error correction
YS	Stepper position maintenance

#### Internal Sine Commutation

BA	Brushless axis
BB	Brushless phase
BC	Brushless calibration
BD	Brushless degrees
BI	Brushless inputs
BM	Brushless modulo
BO	Brushless offset
BS	Brushless setup
BX	Sine Amp Initialization
BZ	Brushless zero

#### I/O

AL	Arm latch
AQ	Analog configuration
CB	Clear bit
CO	Configure I/O points
II	Input interrupt
OB	Define output bit
OC	Output compare function
OP	Output port
SB	Set bit
@AN[x]	Value of analog input x
@IN[x]	State of digital input x
@OUT[x]	State of digital output x

#### System Configuration

BN	Burn parameters
BP	Burn program
BR	Brush motor enable
BV	Burn variables and arrays
BW	Brake Wait
CC	Configure communications port
CE	Configure encoder type
CF	Configure unsolicited messages handle
CI	Configure communication interrupt
CN	Configure switches
CW	Data adjustment bit
DE	Define dual encoder position
DP	Define position
DR	Data record update rate
EI	Event interrupts
EO	Echo
IT	Independent smoothing
LB	LCD Bias contrast
~L~K	Program protect (Lock)
LU	LCD Update
LZ	Leading zeros format
MO	Motor off
MT	Motor type
PF	Position format
PW	Password
QD	Download array
RS	Reset
~R~S	Master reset
UI	User interrupt
VF	Variable format

#### Math Functions

@ABS[x]	Absolute value of x
@ACOS[x]	Arc cosine of x
@ASIN[x]	Arc sine of x
@ATAN[x]	Arc tangent of x
@COM[x]	1's complement of x
@COS[x]	Cosine of x
@FRAC[x]	Fraction portion of x
@INT[x]	Integer portion of x
@RND[x]	Round of x
@SIN[x]	Sine of x
@SQR[x]	Square root of x
@TAN[x]	Tangent
%	Modulus operator

#### Interrogation

ID	AMP ID
LA	List arrays
LL	List labels
LS	List program
LV	List variables
MG	Message command
QH	Query hall state
QR	Data record
QU	Upload array
QZ	Return data record information
RL	Report latch
RP	Report command position
~R~V	Firmware revision information
SC	Stop code
TA	Tell amplifier status
TB	Tell status
TC	Tell error code

#### Interrogation (cont.)

TD	Tell dual encoder
TE	Tell error
TH	Tell handle
TI	Tell input
TP	Tell position
TR	Trace program
TS	Tell switches
TT	Tell torque
TV	Tell velocity
TZ	Tell I/O configuration
WH	Which handle

#### Programming

BK	Breakpoint
DA	Deallocate variables/arrays
DL	Download program
DM	Dimension arrays
ED	Edit program
ELSE	Conditional statement
ENDIF	End of cond. statement
EN	End program
HX	Halt execution
IF	If statement
IN	Input variable
JP	Jump
JS	Jump to subroutine
NO	No-operation—for comments
RA	Record array
RC	Record interval
RD	Record data
RE	Return from error routine
REM	Remark program
RI	Return from interrupt routine
SL	Single step
UL	Upload program
XQ	Execute program
ZA	Data record variables
ZS	Zero stack
'	Comment

#### Error Control

BL	Backward software limit
ER	Error limit
FL	Forward software limit
LD	Limit disable
OA	Encoder failure
OE	Off-on-error function
OT	Encoder failure period
OV	Encoder failure voltage
TW	Timeout for in-position

#### Trippoint

AD	After distance
AI	After input
AM	After motion profiler
AP	After absolute position
AR	After relative distance
AS	At speed
AT	After time
AV	After vector distance
MC	Motion complete
MF	After motion—forward
MR	After motion—reverse
WT	Wait for time

#### Independent Motion

AB	Abort motion
AC	Acceleration
BG	Begin motion
DC	Deceleration
FE	Find edge
FI	Find index
HM	Home
HV	Home speed
IP	Increment position
IT	Smoothing time constant
JG	Jog mode
PA	Position absolute
PR	Position relative
PT	Position tracking
SD	Switch deceleration
SP	Speed
ST	Stop

#### Contour Mode

CD	Contour data
CM	Contour mode
DT	Contour time interval

#### PVT Mode

PV	Position, velocity, time
BT	Coordinate start

#### ECAM/Gearing

EA	ECAM master
EB	Enable ECAM
EC	ECAM table index
EG	ECAM go
EM	ECAM modulus
EP	ECAM interval
EQ	Disengage ECAM
ET	ECAM table entry
EW	ECAM widen
EY	ECAM cycle counter
GA	Master axis for gearing
GD	Engagement distance for gearing
GM	Gantry mode
_GP	Correction for gearing
GR	Gear ratio for gearing

#### Vector/Linear Interpolation

CA	Define vector plane
CR	Circular interpolation move
CS	Clear motion sequence
ES	Elliptical scaling
IT	Smoothing time constant
LE	Linear interpolation end
LI	Linear interpolation segment
LM	Linear interpolation mode
ST	Stop motion
TN	Tangent
VA	Vector acceleration
VD	Vector deceleration
VE	Vector sequence end
VM	Coordinated motion mode
VP	Vector position
VR	Vector speed ratio
VS	Vector speed
VV	Vector Velocity

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### Connectors—Communications

#### RS-232 Main Port (DCE)

##### 9-pin; Low-density Male D-sub

- 1 NC
- 2 Transmit data-output (TxD)
- 3 Receive data-input (RxD)
- 4 NC
- 5 Ground
- 6 NC
- 7 Clear to send-input (CTS)
- 8 Request to send-output (RTS)
- 9 NC

#### RS232 Auxiliary Port (DTE)

##### 9-pin; Low-density Female D-sub

- 1 NC
- 2 Receive data-input (RxD)
- 3 Transmit data-output (TxD)
- 4 NC
- 5 Ground
- 6 NC
- 7 Request to send-output (RTS)
- 8 Clear to send-input (CTS)
- 9 NC/5 V (jumper select)

#### Ethernet 10/100Base-T

##### RJ-45 connector

### Connectors— Amplifier Board AMP-43040

#### J2 Power\*\*

##### 6-pin

- 1 Ground
- 2 Ground
- 3 Ground
- 4 +VM (20 V–80 V)
- 5 +VM (20 V–80 V)
- 6 +VM (20 V–80 V)

#### JA1, JB1, JC1, JD1 Motor Output

##### 4-pin

- 1 Motor Phase C
- 2 Motor Phase B
- 3 NC
- 4 Motor Phase A

#### Extended I/O

##### (ICM-42000 & -42200)

##### 44-pin Hi-density Male D-sub

- 1 I/O18
- 2 I/O21
- 3 I/O24
- 4 I/O26
- 5 I/O29
- 6 I/O32
- 7 I/O33
- 8 I/O36
- 9 I/O38
- 10 NC
- 11 I/O41
- 12 I/O44
- 13 I/O47
- 14 NC
- 15 Reserved
- 16 I/O17
- 17 I/O20
- 18 I/O23
- 19 I/O25
- 20 I/O28
- 21 I/O31
- 22 NC
- 23 I/O35
- 24 I/O37
- 25 NC
- 26 I/O40
- 27 I/O43
- 28 I/O46
- 29 I/O48
- 30 3.3 V
- 31 I/O19
- 32 I/O22
- 33 Ground
- 34 I/O27
- 35 I/O30
- 36 Ground
- 37 I/O34
- 38 NC
- 39 Ground
- 40 I/O39
- 41 I/O42
- 42 I/O45
- 43 Ground
- 44 NC

#### J2 General I/O Axes A thru D

##### (ICM-42000 & -42200)

##### 44-pin Hi-density Female D-sub

- 1 Error output\*
- 2 Input 1-isolated
- 3 Input 4-isolated
- 4 Input 7-isolated
- 5 Electronic Lockout-isolated input\*
- 6 Limit switch common
- 7 Home A-isolated
- 8 Home B-isolated
- 9 Home C-isolated
- 10 Home D-isolated
- 11 Output power+
- 12 Output 3-isolated
- 13 Output 6-isolated
- 14 Output return-
- 15 +5 V
- 16 Reset-isolated\*
- 17 Input common
- 18 Input 3-isolated
- 19 Input 6-isolated
- 20 Abort-isolated\*
- 21 NC
- 22 Reverse limit A-isolated<sup>†</sup>
- 23 Reverse limit B-isolated<sup>†</sup>
- 24 Reverse limit C-isolated<sup>†</sup>
- 25 Reverse limit D-isolated<sup>†</sup>
- 26 NC
- 27 Output 2-isolated
- 28 Output 5-isolated
- 29 Output 8-isolated
- 30 +5 V
- 31 Ground
- 32 Input 2-isolated
- 33 Input 5-isolated
- 34 Input 8-isolated
- 35 Ground
- 36 Forward limit A-isolated<sup>†</sup>
- 37 Forward limit B-isolated<sup>†</sup>
- 38 Forward limit C-isolated<sup>†</sup>
- 39 Forward limit D-isolated<sup>†</sup>
- 40 Ground
- 41 Output 1-isolated
- 42 Output 4-isolated
- 43 Output 7-isolated
- 44 Output Compare A–D

#### J2 General I/O Axes E thru H

##### (ICM-42000 & -42200)

##### 44-pin Hi-density Female D-sub

- 1 Error output\*
- 2 Input 9-isolated
- 3 Input 12-isolated
- 4 Input 15-isolated
- 5 Electronic lockout-isolated input\*
- 6 Limit switch common
- 7 Home E-isolated
- 8 Home F-isolated
- 9 Home G-isolated
- 10 Home H-isolated
- 11 Output power+
- 12 Output 11-isolated
- 13 Output 14-isolated
- 14 Output return-
- 15 +5 V
- 16 Reset-isolated\*
- 17 Input common
- 18 Input 11-isolated
- 19 Input 14-isolated
- 20 Abort-isolated\*
- 21 NC
- 22 Reverse limit E-isolated<sup>†</sup>
- 23 Reverse limit F-isolated<sup>†</sup>
- 24 Reverse limit G-isolated<sup>†</sup>
- 25 Reverse limit H-isolated<sup>†</sup>
- 26 NC
- 27 Output 10-isolated
- 28 Output 13-isolated
- 29 Output 16-isolated
- 30 +5 V
- 31 Ground
- 32 Input 10-isolated
- 33 Input 13-isolated
- 34 Input 16-isolated
- 35 Ground
- 36 Forward limit E-isolated<sup>†</sup>
- 37 Forward limit F-isolated<sup>†</sup>
- 38 Forward limit G-isolated<sup>†</sup>
- 39 Forward limit H-isolated<sup>†</sup>
- 40 Ground
- 41 Output 9-isolated
- 42 Output 12-isolated
- 43 Output 15-isolated
- 44 Output Compare E–H

\*\*Note: Power can be input through either of the amplifier connectors to power the entire unit due to power pass-thru connectors that connect input power to all modules. For 5- through 8-axis units with two different types of amplifiers, the lower of the maximum voltages is the maximum rating for the unit. However, if you need different voltages, you can specify the ISAMP and/or ISCNLT option to separate the various power inputs.

When using the AMP-43140 with a power supply lower than +/-20 Volts, a separate supply of 20–80 VDC must be input to the 2-pin connector on the side of the DMC-40X0 or specify the 12 V option for the DMC controller.

\*Active low

<sup>†</sup>Programmable for Active high or Active low

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## DMC-40x0 Series

### Connectors—I/O

#### **J1 Amplifier I/O Axes A thru D (ICM-42000)**

##### **44-pin Hi-density Male D-sub**

- 1 Reserved
- 2 PWM C/Step C
- 3 Reserved
- 4 Reserved
- 5 Sign C/Dir C
- 6 Reserved
- 7 Amp enable A
- 8 Amp enable D
- 9 NC
- 10 -12 V
- 11 Motor command B
- 12 Reserved
- 13 NC
- 14 NC
- 15 +5 V
- 16 PWM A/Step A
- 17 Reserved
- 18 PWM D/Step D
- 19 Sign A/Dir A
- 20 Reserved
- 21 Sign D/Dir D
- 22 Amp enable common-1
- 23 Amp enable C
- 24 NC
- 25 +12 V
- 26 Reserved
- 27 Motor command C
- 28 Reserved
- 29 NC
- 30 NC
- 31 PWM B/Step B
- 32 Reserved
- 33 Ground
- 34 Sign B/Dir B
- 35 Reserved
- 36 Ground
- 37 Amp enable B
- 38 Amp enable common-2
- 39 Ground
- 40 Motor command A
- 41 Reserved
- 42 Motor command D
- 43 Ground
- 44 NC

#### **J1 Amplifier I/O Axes E thru H (ICM-42000)**

##### **44-pin Hi-density Male D-sub**

- 1 Reserved
- 2 PWM G/Step G
- 3 Reserved
- 4 Reserved
- 5 Sign G/Dir G
- 6 Reserved
- 7 Amp enable E
- 8 Amp enable H
- 9 NC
- 10 -12 V out
- 11 Motor command F
- 12 Reserved
- 13 NC
- 14 NC
- 15 +5 V out
- 16 PWM E/Step E
- 17 Reserved
- 18 PWM H/Step H
- 19 Sign E/Dir E
- 20 Reserved
- 21 Sign H/Dir H
- 22 Amp enable common-1
- 23 Amp enable G
- 24 NC
- 25 +12 V out
- 26 Reserved
- 27 Motor command G
- 28 Reserved
- 29 NC
- 30 NC
- 31 PWM F/Step F
- 32 Reserved
- 33 Ground
- 34 Sign F/Dir F
- 35 Reserved
- 36 Ground
- 37 Amp enable F
- 38 Amp enable common-2
- 39 Ground
- 40 Motor command E
- 41 Reserved
- 42 Motor command H
- 43 Ground
- 44 NC

#### **JA1, JB1, JC1, JD1 Encoder Axes A thru D (ICM-42000)**

#### **JE1, JF1, JG1, JH1 Encoder Axes E thru H (ICM-42000)**

##### **15-pin Hi-density Female D-sub**

- 1 Index+
- 2 B+
- 3 A+
- 4 Aux B+
- 5 Ground
- 6 Index-
- 7 B-
- 8 A-
- 9 Aux A-
- 10 Hall A
- 11 Aux A+
- 12 Aux B-
- 13 Hall B
- 14 Hall C
- 15 +5 V

#### **J3 Analog Inputs (ICM-42000 & -42200)**

##### **15-pin Low-density Male D-sub**

- 1 Analog Ground
- 2 Analog input 1
- 3 Analog input 3
- 4 Analog input 5
- 5 Analog input 7
- 6 Analog Ground
- 7 -12 V
- 8 +5 V
- 9 Analog Ground
- 10 Analog input 2
- 11 Analog input 4
- 12 Analog input 6
- 13 Analog input 8
- 14 NC
- 15 +12 V

#### **Axis Connectors Axes A thru H (ICM-42200)**

##### **26-pin Hi-density Female D-sub**

- 1 Reserved
- 2 Amp Enable
- 3 Direction
- 4 Home—isolated
- 5 Limit switch common
- 6 Aux A-
- 7 Index+
- 8 A-
- 9 +5 V
- 10 Ground
- 11 Amp Enable Return
- 12 Reserved
- 13 Step
- 14 Forward limit—isolated<sup>†</sup>
- 15 Aux B+
- 16 Index-
- 17 B+
- 18 Ground
- 19 Motor command
- 20 Amp Enable Power
- 21 Reserved
- 22 Reverse limit—isolated<sup>†</sup>
- 23 Aux B-
- 24 Aux A+
- 25 B-
- 26 A+

<sup>†</sup>Programmable for Active high  
or Active low

# Ethernet/RS232 Accelera Series, 1–8 axes

## DMC-40x0 Series

### DMC-40x0 Interconnect Options

#### ICM-42000 Interconnect Module (-I000)

The ICM-42000 resides inside the DMC-40x0 enclosure and breaks out the internal CPU board connector into convenient D-sub connectors for interface to external amplifiers and I/O devices. Eight 500 mA highside drive outputs are available (total current not to exceed 3 A). The ICM-42000 is user-configurable for a broad range of amplifier enable options including: High amp enable, Low amp enable, 5 V logic, 12 V logic, external voltage supplies up to 24 V and sinking or sourcing. Two ICMs are required for 5- thru 8-axis controllers.

#### ICM-42100 Sinusoidal Encoder Interpolation Module (-I100)

The ICM-42100 option resides inside the DMC-40x0 enclosure and accepts sinusoidal encoder signals instead of digital encoder signals as accepted by the ICM-42000. The ICM-42100 provides interpolation of up to four 1-volt differential sinusoidal encoders resulting in a higher position reso-

lution. The AF<sub>n</sub> command selects sinusoidal interpolation where n specifies 2<sup>n</sup> interpolation counts per encoder cycle (n=5 to 12). For example, if the encoder cycle is 40 microns, AF10 results in 2<sup>10</sup>=1024 counts per cycle, or a resolution of 39 nanometers per count. With the ICM-42100, the sinusoidal encoder inputs replace the main digital encoder inputs.

#### ICM-42200 Interconnect Module (-I200)

The ICM-42200 interconnect option resides inside the DMC-40x0 enclosure and provides a pin-out that is optimized for easy connection to external drives. The ICM-42200 uses 26-pin HD D-sub connectors for each axis that includes encoder, limit, home, and motor command signals.

All DMC-40x0 are ordered with an internal interconnect module (ICM) which breaks out and buffers the controller I/O and drive signals. 1-4 axis controllers require one ICM, 5-8 axis controllers require two, and can be mixed and matched from the following options. (Key: HD=Hi-density, LD=Low-density, F=Female, M=Male, D=D-subminiature connector)

ICM (Part Number)	ICM-42000 (-I000)	ICM-42100 (-I100)	ICM-42200 (-I200)
<b>Unique Purpose</b>	Default ICM	Sine Interpolated Encoders	More convenient for external drives
<b>Inside 40x0 Enclosure</b>	Yes	Yes	Yes
<b>Breaks out I/O and Drive Signals</b>	Yes	Yes	Yes
<b>Encoder connector</b>	15-pin HD F D per axis	15-pin HD F D per axis	26-pin HD F D per axis
<b>Axis Connector</b>	44-pin HD M D per 4 axes	44-pin HD M D per 4 axes	On Encoder connector, and 44-pin HD M D per 4 axes
<b>Analog In connector</b>	15-pin LD M D	15-pin LD M D	15-pin LD M D
<b>I/O Connector</b>	44-pin HD F D	44-pin HD F D	44-pin HD F D
<b>8 500mA high-side digital outs (max 3A)</b>	Yes	Yes	Yes
<b>Configurable Amp Enable hi/lo, 5 V, 12 V, and ext. V, sink, source</b>	Yes	Yes	Yes, no need to remove cover. Axis-independent circuitry.
<b>Accepts Quad and Pulse and Direction encoders and inputs</b>	Yes	Yes	Yes
<b>Sine Encoder Interpolation</b>	No	Yes	No
<b>SSI and BiSS options available</b>	Yes	No	Yes

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## DMC-40x0 Series

### DMC-40x0 Servo Drive Options

#### AMP-430x0 2- and 4-axis 500 W Servo Drives (-D3020, -D3040)

The AMP-43040 contains four transconductance, PWM amplifiers for driving brushless/brush servo motors. Operating at up to 7 Amps cont., 10 Amps peak, 20–80 VDC. The gain settings of the amplifier are user-programmable at 0.4, 0.7 and 1 Amp/Volt. The switching frequency is 60 kHz. The drive for each axis is software configurable to operate in either a chopper or inverter mode. The chopper mode is intended for operating low inductance motors. The amplifier offers protection for over-voltage, under-voltage, over-current, short-circuit and over-temperature. Hall sensors are required for brushless motors. A shunt regulator option is available. A two-axis version, the AMP-43020 is also available.

#### AMP-43140 4-axis 20 W Servo Drives (-D3140)

The AMP-43140 contains four linear drives for operating small, brush-type servo motors. The AMP-43140 requires a  $\pm 12$ -30 VDC input. Output power is 20 W per amplifier or 60 W total. The gain of each transconductance linear amplifier is 0.1 A/V at 1 A maximum current. The typical current loop bandwidth is 4 kHz. An SSR option is available which guarantees absolutely no current during motor off.

#### AMP-43240 4-axis 750 W Servo Drives (-D3240)

The AMP-43240 resides inside the DMC-40x0 enclosure and contains four transconductance, PWM amplifiers for driving brushless/brush servo motors. Operating at up to 10 Amps cont., 20 Amps peak,

20–80 VDC. The gain settings of the amplifier are user-programmable at 0.5, 1 and 2 Amp/Volt. The switching frequency is 24 KHz. The drive operates in chopper mode. The amplifier offers protection for over-voltage, under-voltage, over-current, short-circuit and over-temperature. Hall sensors are required for brushless motors. A shunt regulator option is available.

#### AMP-43540 4-axis 600 W Servo Drives with Sinusoidal Commutation (-D3540)

The AMP-43540 contains four transconductance, PWM amplifiers for driving brushless servo motors with sinusoidal commutation. Each amplifier drives motors operating at up to 8 Amps cont., 15 Amps peak, 20–80 VDC. 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, short-circuit and over-temperature. Hall sensors are not required for brushless motor commutation. A shunt regulator option is available.

#### AMP-43640 4-axis 20 W Servo Drives with Sinusoidal Commutation (-D3640)

The AMP-43640 contains four linear, transconductance amplifiers for driving brushless servo motors with sinusoidal commutation. The AMP-43640 requires 15–30 VDC, and the gain setting of each amplifier is 0.1 A/V at 1 A maximum current. Hall sensors are not required for brushless motor commutation.

The DMC-40x0 can be optionally equipped with a multi-axis internal servo or stepper motor drive that resides inside the DMC-40x0 enclosure. 5–8 axis versions can mix and match two of the following drives.

Drive Name (Part Number)	AMP-430x0 (-D30x0)	AMP-43140 (-D3140)	AMP-43240 (-D3240)	AMP-43540 (-D3540)	AMP-43640 (-D3640)
<b>Motor Type</b>	Brushed/Brushless servo	Brushed servo	Brushed/Brushless servo	Brushless servo-sinusoidal	Brushless servo-sinusoidal
<b>Axes</b>	4 x=4, 2 x=2	4	4	4	4
<b>Current Drive</b>	PWM	Linear	PWM	PWM	Linear
<b>Axis power (Watts)</b>	500	20 (60 max for 4 axes)	750	600	20
<b>Cont. Current (Amps)</b>	7	1	10	8	1
<b>Peak Current (Amps)</b>	10	1	20	15	2
<b>Voltage Bus (VDC)</b>	20-80 (160 available)	+/- 12-30 bipolar	20-80	20-80	15-30
<b>Gains</b>	0.4, 0.7, 1.0 A/V	0.1 (0.01 available) A/V	0.5, 1, 2 A/V	0.4, 0.8, 1.6 A	0.2 A/V
<b>Switching Freq (Khz)</b>	60 (140 available)	N/A	24	33	N/A
<b>Typical Current Loop BW (kHz)*</b>	2-8	4	4	-	4
<b>Drive Modes</b>	Inverter, Chopper	Linear	Chopper	-	Linear
<b>Commutation</b>	Trap w/ 120° Halls	Brushed only	Trap w/ 120° Halls	Sinusoidal	Sinusoidal
<b>Min. Inductance (mH)</b>	0.2-0.5	0.2	0.2	0.5	0.5
<b>Over Voltage</b>	Yes	No	Yes	Yes	No
<b>Under Voltage</b>	Yes	No	Yes	Yes	No
<b>Over Current</b>	Yes	Fused	Yes	Yes	Fused
<b>Short circuit</b>	Yes	Fused	Yes	Yes	Fused
<b>Over temp</b>	Yes	Thermal Shutdown	Yes	Yes	Thermal Shutdown
<b>ELO input</b>	Yes	Yes	Yes	Yes	Yes
<b>Other Notes</b>	Shunt option Adjustable current loop	SSR option, disconnects power at startup	Shunt option Adjustable current loop	Shunt option	SSR option

\*Current Loop bandwidth is system dependent. **Contact Galil for unlisted upgrade options for all above ICMs and drives.**

# Ethernet/RS232 Accelera Series, 1–8 axes

## DMC-40x0 Series

### DMC-40x0 Stepper Drive Options

#### SDM-44040 4-axis Stepper Drives (-D4040)

The SDM-44040 contains four drives for operating two-phase bipolar step motors. The SDM-44040 requires a single 12-30 VDC input. The unit is user-configurable for 1.4, 1.0, 0.75, or 0.5 A per phase and for full-step, half-step, 1/4 step or 1/16 step.

#### SDM-44140 4-axis Microstep Drives (-D4140)

The SDM-44140 contains four microstepping drives for operating two-phase bipolar stepper motors. The drives produce 64 microsteps per full step or 256 steps per full cycle which results in 12,800 steps/rev for a standard 200-step motor. The maximum step rate generated by the controller is 6,000,000 microsteps/second. The SDM-44140 drives motors operating at up to 3 Amps at 12 to 60 VDC (available voltage at motor is 10% less). There are four software-selectable current settings: 0.5, 1, 2 and 3 A. Plus, a selectable low-current mode reduces the current by 75% when the motor is not in motion. No external heatsink is required.

The DMC-40x0 can be optionally equipped with a multi-axis internal servo or stepper motor drive that resides inside the DMC-40x0 enclosure. 5–8 axis versions can mix and match two of the following drives.

Drive Name (Part Number)	SDM-44040 (-D4040)	SDM-44140 (-D4140)
<b>Motor Type</b>	Stepper	Stepper
<b>Axes</b>	4	4
<b>Current Drive</b>	PWM	PWM
<b>Axis power (Watts)</b>	42	180
<b>Cont. Current (Amps)</b>	-	-
<b>Peak Current (Amps)</b>	1.4	3.0
<b>Voltage Bus (VDC)</b>	12-30	12-60
<b>Gains</b>	0.5,0.75,1.0,1.4 A	0.5,1.0,2.0,3.0 A
<b>Switching Freq (Khz)</b>	27 (nominal)	60
<b>Typical Current Loop BW (kHz)*</b>	-	-
<b>Drive Modes</b>	1,2,4,16 microstep	64 microstep
<b>Commutation</b>	-	-
<b>Min. Inductance (mH)</b>	0.5	0.5
<b>Over Voltage</b>	No	No
<b>Under Voltage</b>	No	Yes
<b>Over Current</b>	Yes	Yes
<b>Short circuit</b>	Yes	Yes
<b>Over temp</b>	No	Yes
<b>ELO input</b>	Yes	Yes
<b>Other Notes</b>	Low current feature	Low current feature

\*Current Loop bandwidth is system dependent. **Contact Galil for unlisted upgrade options for all above ICMs and drives.**

#### Power Supplies — PSR Series

The PSR Series are regulated DC power supplies capable of operating from a 100/240 VAC input, at 50/60 Hz. The power supply includes a shunt regulator and blocking diode.

Model	Power Rating	Dimensions
PSR-12-24	24 VDC @ 12 A cont.	9" × 6.5" × 2" 3.5 lbs.
PSR-6-48	48 VDC @ 6 A cont.	9" × 6.5" × 2" 3.5 lbs.

#### ICS D-type to Screw-Terminal Boards

Galil offers various ICS boards which break-out the DMC-40x0 D-type connectors into screw terminals for quick prototyping:

**ICS-48015-M** 15-pin HD male to terminals — encoder.

**ICS-48115-F** 15-pin LD female to terminals — analog.

**ICS-48044-M** 44-pin HD male to terminals — I/O.

**ICS-48044-F** 44-pin HD female to terminals — drive.

**ICS-48032-F** 44-pin HD female to terminals — breaks out and optically isolates the 32 extended I/O points. Configurable for inputs and outputs in banks of 8 bits. The ICS-48032-F must only be used with the extended I/O on the DMC-40x0.

**ICS-48026-M** 26-pin HD male to terminals — for ICM-42200.

# Ethernet/RS232 Accelera Series, 1–8 axes

## DMC-40x0 Series

### Ordering Information

1- through 8-axis Models:

**DMC - 40 x 0 - C xxx - I xxx - I xxx - D xxxxx - D xxxxx - SR90**

**Number of Axes**

- 1: 1-axis
- 2: 2-axes
- 3: 3-axes
- 4: 4-axes
- 5: 5-axes
- 6: 6-axes
- 7: 7-axes
- 8: 8-axes

**Interconnect (1st four axes)**

- 000: Digital encoder
- 100: Sinusoidal encoder
- 200: Separate Axis Connectors

**Interconnect (2nd four axes)**

- 000: Digital encoder
- 100: Sinusoidal encoder
- 200: Separate Axis Connectors

**Shunt Regulator (optional)**

**Drive— Axes 5–8 (optional)**

- 3020: two 500 Watt servo motor drives
- 3040: four 500 Watt servo motor drives
- 3140: four 20 Watt servo motor drives
- 3240: four 750 Watt servo motor drives
- 3540: four 600 Watt servo drives — sinusoidal commutation
- 3640: four 20 Watt servo drives — sinusoidal commutation
- 4040: four 1.4 A stepper motor drives— Full, Half, 1/4, 1/16
- 4140: four microstep drives

**Communication**

- 012: one Ethernet port and two RS232 ports

**Drive— Axes 1–4 (optional)**

- 3020: two 500 Watt servo motor drives
- 3040: four 500 Watt servo motor drives
- 3140: four 20 Watt servo motor drives
- 3240: four 750 Watt servo motor drives
- 3540: four 600 Watt servo drives — sinusoidal commutation
- 3640: four 20 Watt servo drives — sinusoidal commutation
- 4040: four 1.4 A stepper motor drives— Full, Half, 1/4, 1/16
- 4140: four microstep drives

**Example: DMC-4080-C012-I000-I000-D3040-D3040**

**Part Number Generator: <http://www.galilmc.com/products/dmc-40x0-part-number.php>**

### Options

#### DMC Controller

OPT CODE	DESCRIPTION
DIN	DIN Rail mounting option
12V	12 VDC controller power
16BIT	16-Bit ADC for analog inputs. 12-bits is standard
NRExxxx	Customized upgrades
-ETL	Option for ETL certification and documentation

#### SDM and AMP Drives

OPT CODE	DESCRIPTION
100mA	100 mA output capacity for AMP-43140. Default is 1 Amp
ISAMP	Isolation of power between each AMP amplifier
ISCNTL	Isolation of controller power from amplifier power
SSR	No current during motor off

#### CMB Communication board

OPT CODE	DESCRIPTION
5V	5 V for the extended I/O. 3.3 V is standard
422	RS422 on main, auxiliary or both

#### ICM Interconnect board

OPT CODE	DESCRIPTION
SSI	SSI Encoders. Quadrature encoders are standard
DIFF	Differential analog motor command outputs. Single-ended is standard
LAEN	Low Amp Enable. High Amp Enable is standard
24V	24 V Amp enable-sourcing. 5 V sinking is standard
STEP	Differential Step/Direction outputs. Single-ended is standard
I100	Specify sinusoidal encoder. Digital is standard
I200	Specify 26-pin axis connectors (recommended if using external drives)
HAEN	High amplifier enable
SINK	Sinking amplifier enable
SOURCE	Sourcing amplifier enable

*Note:* If a special option is required, place the appropriate OPT CODE inside a parenthesis directly following the respective DMC, CMB, ICM, SDM or AMP part numbers. Use commas for multiple options within a parenthesis.

Ordering Information continued on the next page.

# Ethernet/RS232 Accelera Series, 1–8 axes

## DMC-40x0 Series

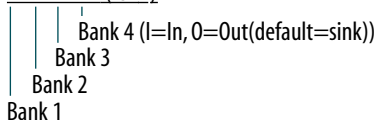
### Ordering Information — continued

ACCELERA

PART NUMBER	DESCRIPTION	QUANTITY 1	QUANTITY 100
<b>DMC-4010-C012-I000</b>	1-axis Ethernet/RS232 controller with ICM-42000	\$1595	\$ 945
<b>DMC-4020-C012-I000</b>	2-axis Ethernet/RS232 controller with ICM-42000	\$1695	\$ 995
<b>DMC-4030-C012-I000</b>	3-axis Ethernet/RS232 controller with ICM-42000	\$1995	\$1095
<b>DMC-4040-C012-I000</b>	4-axis Ethernet/RS232 controller with ICM-42000	\$2295	\$1195
<b>DMC-4050-C012-I000-I000</b>	5-axis Ethernet/RS232 controller with ICM-42000	\$2695	\$1495
<b>DMC-4060-C012-I000-I000</b>	6-axis Ethernet/RS232 controller with ICM-42000	\$2895	\$1595
<b>DMC-4070-C012-I000-I000</b>	7-axis Ethernet/RS232 controller with ICM-42000	\$3045	\$1695
<b>DMC-4080-C012-I000-I000</b>	8-axis Ethernet/RS232 controller with ICM-42000	\$3195	\$1795
<b>ICM-42100 (-I100)</b>	Sinusoidal encoder inputs instead of quad inputs. Replace -I000 with -I100	add \$ 100	add \$ 60
<b>ICM-42200 (-I200)</b>	Individual 26-pin HD connectors for each axis. Replace -I000 with -I200	add \$ no	add \$ no
<b>AMP-43040 (-D3040)</b>	Four 500 W servo motor drives	\$ 700	\$ 400
<b>AMP-43020 (-D3020)</b>	Two 500 W servo motor drives	\$ 450	\$ 275
<b>AMP-43140 (-D3140)</b>	Four 20 W servo motor drives	\$ 175	\$ 155
<b>AMP-43240 (-D3240)</b>	Four 750 W servo motor drives	\$ 900	\$ 500
<b>AMP-43540 (-D3540)</b>	Four 600 W servo motor drives with sinusoidal commutation	\$1000	\$ 600
<b>AMP-43640 (-D3640)</b>	Four 20 W servo motor drives with sinusoidal commutation	\$ 600	\$ 350
<b>SR-49000 (-SR90)</b>	Shunt regulator (90 V)	\$ 50	\$ 35
<b>SDM-44040 (-D4040)</b>	Four 1.4 A stepper motor drives- Full, Half, 1/4, 1/16	\$ 175	\$ 155
<b>SDM-44140 (-D4140)</b>	Four microstep drives (1/64)	\$ 600	\$ 400
<b>-SSR</b>	No current for motor off (for AMP- 43140 only)	\$ 75	\$ 50
<b>PSR-12-24</b>	Power supply, 12 A, 24 VDC. Includes shunt regulator	\$ 250	\$ 175
<b>PSR-6-48</b>	Power supply, 6 A, 48 VDC. Includes shunt regulator	\$ 250	\$ 175
<b>ICS-48015-M</b>	15-pin D HD male to screw terminals — for encoder signals	\$ 50	\$ 35
<b>ICS-48115-F</b>	15-pin D LD female to screw terminals — for analog inputs	\$ 50	\$ 35
<b>ICS-48044-M</b>	44-pin D HD male to screw terminals — for general I/O	\$ 75	\$ 50
<b>ICS-48044-F</b>	44-pin D HD female to screw terminals — for external drive signals	\$ 75	\$ 50
<b>ICS-48032-F*</b>	44-pin D HD female to screw terminals — for extended I/O. Provides optical isolation of 32 extended I/O points	\$ 125	\$ 80
<b>ICS-48026-M</b>	26-pin D HD male to screw terminals — for axis connectors on ICM-42200	\$ 75	\$ 50
<b>-ETL</b>	Option for ETL certification and documentation	add \$ 50	
<b>GalilTools-Lite</b>	Editor, Terminal, Watch Tools. Includes communication library for developers-supports C++, VB, C#, LabVIEW and more	Free download	
<b>GalilTools</b>	Above with Scope and Tuner	\$ 195	
<b>ActiveX Tool Kit</b>	Custom ActiveX controls for Microsoft platforms	\$ 595	

**\* ICS-48032-F Options:**

ICS-48032-F-x x x x (-5 V)



ICS-48032-F-0000-Source All 4 banks configured as outputs, outputs sourcing

ICS-48032-F-0011 First 2 banks outputs, second 2 banks inputs, outputs sinking

ICS-48032-F-0011-Source First 2 banks outputs, second 2 banks inputs, outputs sourcing  
 -5 V configured for -5 V extended I/O. 3.3 V is default

**Galil offers additional quantity discounts for purchases between 1 and 100. Consult Galil for a quotation.**