

Ethernet/RS232 Accelera Series, 1–8 axes

DMC-40x0 Series

Product Description

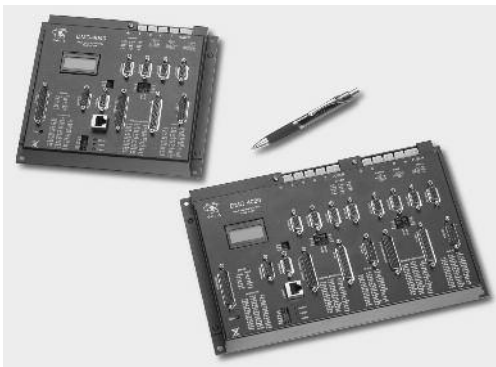
The DMC-40x0 is Galil's highest performance, stand-alone motor controller. It belongs to Galil's latest generation motion controller family: the Accelera Series, which accepts encoder inputs up to 22 MHz, provides servo update rates as high as 32 kHz, and processes commands in as fast as 40 microseconds—10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

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



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

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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 (± 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/sec²

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- (± 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 μ sec	31 μ sec
■ 3–4 axes:	125 μ sec	62 μ sec
■ 5–6 axes:	156 μ sec	94 μ sec
■ 7–8 axes:	187 μ sec	125 μ 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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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

BT	Coordinate start
PV	Position, velocity, time

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

Ethernet/RS232 Accelera Series, 1–8 axes

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ACCELERA

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[†]
- 23 Reverse limit B-isolated[†]
- 24 Reverse limit C-isolated[†]
- 25 Reverse limit D-isolated[†]
- 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[†]
- 37 Forward limit B-isolated[†]
- 38 Forward limit C-isolated[†]
- 39 Forward limit D-isolated[†]
- 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[†]
- 23 Reverse limit F-isolated[†]
- 24 Reverse limit G-isolated[†]
- 25 Reverse limit H-isolated[†]
- 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[†]
- 37 Forward limit F-isolated[†]
- 38 Forward limit G-isolated[†]
- 39 Forward limit H-isolated[†]
- 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

[†]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[†]
- 15 Aux B+
- 16 Index-
- 17 B+
- 18 Ground
- 19 Motor command
- 20 Amp Enable Power
- 21 Reserved
- 22 Reverse limit—isolated[†]
- 23 Aux B-
- 24 Aux A+
- 25 B-
- 26 A+

[†]Programmable for Active high or Active low

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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

resolution. The AFn command selects sinusoidal interpolation where n specifies 2^n interpolation counts per encoder cycle (n=5 to 12). For example, if the encoder cycle is 40 microns, AF10 results in $2^{10}=1024$ 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)
Unique Purpose	Default ICM	Sine Interpolated Encoders	More convenient for external drives
Inside 40x0 Enclosure	Yes	Yes	Yes
Breaks out I/O and Drive Signals	Yes	Yes	Yes
Encoder connector	15-pin HD F D per axis	15-pin HD F D per axis	26-pin HD F D per axis
Axis Connector	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
Analog In connector	15-pin LD M D	15-pin LD M D	15-pin LD M D
I/O Connector	44-pin HD F D	44-pin HD F D	44-pin HD F D
8 500mA high-side digital outs (max 3A)	Yes	Yes	Yes
Configurable Amp Enable hi/lo, 5 V, 12 V, and ext. V, sink, source	Yes	Yes	Yes, no need to remove cover. Axis-independent circuitry.
Accepts Quad and Pulse and Direction encoders and inputs	Yes	Yes	Yes
Sine Encoder Interpolation	No	Yes	No
SSI and BiSS options available	Yes	No	Yes

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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 ± 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-4324 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-435x0 2- and 4-axis 600 W Servo Drives with Sinusoidal Commutation (-D3520, -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. A two-axis version, the AMP-43520, is also 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-435x0 (-D35x0)	AMP-43640 (-D3640)
Motor Type	Brushed/Brushless servo	Brushed servo	Brushed/Brushless servo	Brushed/Brushless servo	Brushless servo
Axes	4 x=4, 2 x=2	4	4	4 x=4, 2 x=2	4
Current Drive	PWM	Linear	PWM	PWM	Linear
Commutation	Trap w/ 120° Halls	Brushed only	Trap w/ 120° Halls	Sinusoidal	Sinusoidal
Axis power (Watts)	500	20 (60 max for 4 axes)	750	600	20
Cont. Current (Amps)	7	1	10	8	1
Peak Current (Amps)	10	1	20	15	2
Voltage Bus (VDC)	20-80 (160 available)	+/- 12-30 bipolar	20-80	20-80	15-30
Gains	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
Switching Freq (Khz)	60 (140 available)	N/A	24	33	N/A
Typical Current Loop BW (kHz)*	2-8	4	4	-	4
Drive Modes	Inverter, Chopper	Linear	Chopper	-	Linear
Min. Inductance (mH)	0.2-0.5	0.2	0.2	0.5	0.5
Over Voltage	Yes	No	Yes	Yes	No
Under Voltage	Yes	No	Yes	Yes	No
Over Current	Yes	Fused	Yes	Yes	Fused
Short circuit	Yes	Fused	Yes	Yes	Fused
Over temp	Yes	Thermal Shutdown	Yes	Yes	Thermal Shutdown
ELO input	Yes	Yes	Yes	Yes	Yes
Other Notes	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-440x0 2- and 4-axis Stepper Drives (-D4020, -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 A, 1.0 A, 0.75 A, or 0.5 A per phase and for full-step, half-step, 1/4 step or 1/16 step. A two-axis version, the SDM-44020, is also available.

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-440x0 (-D40x0)	SDM-44140 (-D4140)
Motor Type	Stepper	Stepper
Axes	4 x=4, 2 x=2	4
Current Drive	PWM	PWM
Axis power (Watts)	42	180
Cont. Current (Amps)	-	-
Peak Current (Amps)	1.4	3.0
Voltage Bus (VDC)	12-30	12-60
Gains	0.5,0.75,1.0,1.4 A	0.5,1.0,2.0,3.0 A
Switching Freq (Khz)	27 (nominal)	60
Typical Current Loop BW (kHz)*	-	-
Drive Modes	1,2,4,16 microstep	64 microstep
Commutation	-	-
Min. Inductance (mH)	0.5	0.5
Over Voltage	No	No
Under Voltage	No	Yes
Over Current	Yes	Yes
Short circuit	Yes	Yes
Over temp	No	Yes
ELO input	Yes	Yes
Other Notes	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 xxx - D xxx - 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

Communication

- 012: one Ethernet port and two RS232 ports

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
- 3520: two 600 Watt servo drives — sinusoidal commutation
- 3540: four 600 Watt servo drives — sinusoidal commutation
- 3640: four 20 Watt servo drives — sinusoidal commutation
- 4020: two 1.4 A stepper motor drives— Full, Half, 1/4, 1/16
- 4040: four 1.4 A stepper motor drives— Full, Half, 1/4, 1/16
- 4140: four microstep drives

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
- 3520: two 600 Watt servo motor drives — sinusoidal commutation
- 3540: four 600 Watt servo motor drives — sinusoidal commutation
- 3640: four 20 Watt servo motor drives — sinusoidal commutation
- 4020: two 1.4 A stepper motor drives— Full, Half, 1/4, 1/16
- 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

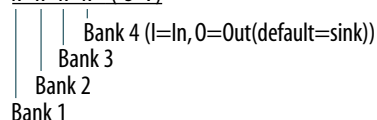
DMC-40x0 Series

Ordering Information — continued

ACCELERA

PART NUMBER	DESCRIPTION	QUANTITY 1	QUANTITY 100
DMC-4010-C012-I000	1-axis Ethernet/RS232 controller with ICM-42000	\$1595	\$ 945
DMC-4020-C012-I000	2-axis Ethernet/RS232 controller with ICM-42000	\$1695	\$ 995
DMC-4030-C012-I000	3-axis Ethernet/RS232 controller with ICM-42000	\$1995	\$1095
DMC-4040-C012-I000	4-axis Ethernet/RS232 controller with ICM-42000	\$2295	\$1195
DMC-4050-C012-I000-I000	5-axis Ethernet/RS232 controller with ICM-42000	\$2695	\$1495
DMC-4060-C012-I000-I000	6-axis Ethernet/RS232 controller with ICM-42000	\$2895	\$1595
DMC-4070-C012-I000-I000	7-axis Ethernet/RS232 controller with ICM-42000	\$3045	\$1695
DMC-4080-C012-I000-I000	8-axis Ethernet/RS232 controller with ICM-42000	\$3195	\$1795
ICM-42100 (-I100)	Sinusoidal encoder inputs instead of quad inputs. Replace -I000 with -I100	add \$ 100	add \$ 60
ICM-42200 (-I200)	Individual 26-pin HD connectors for each axis. Replace -I000 with -I200	add \$ no	add \$ no
AMP-43040 (-D3040)	Four 500 W servo motor drives	\$ 700	\$ 400
AMP-43020 (-D3020)	Two 500 W servo motor drives	\$ 450	\$ 275
AMP-43140 (-D3140)	Four 20 W servo motor drives	\$ 175	\$ 155
AMP-43240 (-D3240)	Four 750 W servo motor drives	\$ 900	\$ 500
AMP-43520 (-D3520)	Two 600 W servo motor drives with sinusoidal commutation	\$ 650	\$ 375
AMP-43540 (-D3540)	Four 600 W servo motor drives with sinusoidal commutation	\$1000	\$ 600
AMP-43640 (-D3640)	Four 20 W servo motor drives with sinusoidal commutation	\$ 600	\$ 350
SR-49000 (-SR90)	Shunt regulator (90 V)	\$ 50	\$ 35
SDM-44020 (-D4020)	Two 1.4 A stepper motor drives- Full, Half, 1/4, 1/16	\$ 125	\$ 105
SDM-44040 (-D4040)	Four 1.4 A stepper motor drives- Full, Half, 1/4, 1/16	\$ 175	\$ 155
SDM-44140 (-D4140)	Four microstep drives (1/64)	\$ 600	\$ 400
-SSR	No current for motor off (for AMP- 43140 only)	\$ 75	\$ 50
PSR-12-24	Power supply, 12 A, 24 VDC. Includes shunt regulator	\$ 250	\$ 175
PSR-6-48	Power supply, 6 A, 48 VDC. Includes shunt regulator	\$ 250	\$ 175
ICS-48015-M	15-pin D HD male to screw terminals — for encoder signals	\$ 50	\$ 35
ICS-48115-F	15-pin D LD female to screw terminals — for analog inputs	\$ 50	\$ 35
ICS-48044-M	44-pin D HD male to screw terminals — for general I/O	\$ 75	\$ 50
ICS-48044-F	44-pin D HD female to screw terminals — for external drive signals	\$ 75	\$ 50
ICS-48032-F*	44-pin D HD female to screw terminals — for extended I/O. Provides optical isolation of 32 extended I/O points	\$ 125	\$ 80
ICS-48026-M	26-pin D HD male to screw terminals — for axis connectors on ICM-42200	\$ 75	\$ 50
-ETL	Option for ETL certification and documentation	add \$ 50	
GalilTools-Lite	Editor, Terminal, Watch Tools. Includes communication library	Free download	
GalilTools	Above with Scope and Tuner	\$ 195	

* **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.