PCI Bus Econo Series, 1–4 axes

DMC-18x2 Series

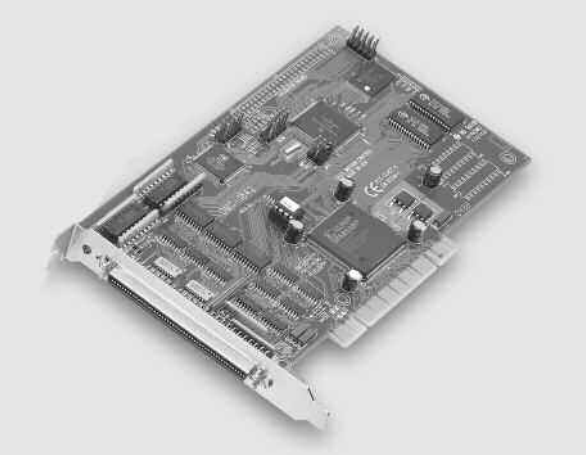
Product Description

The DMC-18x2 Series are PCI bus motion controllers for single and multi-axis applications. The Econo Series is designed for the most cost-sensitive applications.

To minimize cost, the following features are not available on the DMC-18x2: five through eight axes of control, optical isolation on inputs, uncommitted analog inputs, dual encoder inputs, and the auxiliary FIFO and DPRAM communication channel.

The DMC-18x2 incorporates a 32-bit microcomputer and provides advanced features such as PID compensation with velocity and acceleration feedforward, memory with multitasking for simultaneously running up to eight programs, and uncommitted I/O for synchronizing motion with external events. Modes of motion include point-to-point positioning, jogging, linear and circular interpolation, contouring, electronic gearing, and ECAM.

DMC-1842 4-axis PCI controller



Like all Galil controllers, the DMC-18x2 controllers use a simple, intuitive command language which makes them very easy to program. GalilTools software further simplifies system set-up with "one-button" servo tuning and real-time display of position and velocity information.

Features

- *PCI card in 1- through 4-axis versions: DMC-18x2 where x=1,2,3,4 axes*
- *User-configurable for stepper or servo motors on any combination of axes. Optional sinusoidal commutation for brushless servo motors. Optional firmware for piezo-ceramic motors.*
- *Accepts up to 12 MHz encoder frequencies for servos. Outputs up to 3 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, linear and circular interpolation, electronic gearing and ECAM. Features ellipse 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*
- *Home input and forward and reverse limits accepted for every axis*
- *8 uncommitted inputs and 8 outputs*
- *High speed position latch for each axis and output compare*
- *Expansion for 64 I/O with optional DB-14064 board*
- *100-pin SCSI connector. ICM-2900 breaks-out 100-pin cable into screw terminals*
- *AMP-19540 connects to PCI controller with 100-pin cable and provides four amplifiers for 500 W servos*
- *Communication drivers for Windows, QNX, and Linux*
- *CE certified*
- *Custom hardware and firmware options available*

DMC-18x2 Series

Specifications

System Processor
- Motorola 32-bit microcomputer

Communications Interface
- DMC-18x2: PCI with bi-directional FIFO
- 32-bit PCI interface. 64-bit compatible. 5 V/3.3 V

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 4 axes
- Tangential Following
- Helical
- Electronic Gearing with multiple masters and ramp-to-gearing
- Gantry Mode
- Electronic Cam
- Contouring
- Teach and playback

Memory
- Program memory size — 1000 lines × 80 characters
- 254 variables
- 8000 array elements in up to 30 arrays

Filter
- PID (proportional-integral-derivative) with velocity and acceleration feedforward
- Notch filter and low-pass filter
- Velocity smoothing to minimize jerk
- Integration limits
- Torque limits
- Offset adjustments
- Option for piezo-ceramic motors

Kinematic Ranges
- Position: 32 bit (±2.15 billion counts per move; automatic rollover; no limit in jog or vector modes)
- Velocity: Up to 12 million counts/sec for servo motors
- Acceleration: Up to 67 million counts/sec^2

Uncommitted Digital I/O

	DIGITAL INPUTS	DIGITAL OUTPUTS	ANALOG INPUTS
DMC-18x2	8	8	0

High Speed Position Latch
- Uncommitted inputs 1-4 latch X,Y, Z,W (latches within 0.1 microseconds)

Dedicated Inputs (per axis)
- Main encoder inputs — Channel A, A-, B,B-,I, I- (±12 V or TTL)
- Forward and reverse limit inputs
- Home input
- Selectable high-speed position latch input
- Selectable abort input for each axis

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 (per card)
- High-speed position compare output (per card)

Minimum Servo Loop Update Time

	-FAST†
1–2 axes: 250 µsec	125 µsec
3–4 axes: 375 µsec	250 µsec

Maximum Encoder Feedback Rate
- 12 MHz

Maximum Stepper Rate
- 3 MHz (Full, half or microstep)

Power Requirements
- *DMC-18x2:*
  +5V 750 mA
  -12V 20 mA
  +12V 20 mA
  +3.3V 100 mA*

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

Mechanical
- DMC-18x2: 7.275" × 4.2"

Connectors
- 100-pin HD SCSI

** DMC-18x2 revision E and higher require 3.3V from PCI bus. Order DMC-18x2-3VREG to have a regulator installed to allow 5V only supply.*

†*Reduced feature set for -FAST.*

Instruction Set

Servo Motor

FA	Acceleration feedforward
FV	Velocity feedforward
IL	Integrator limit
IT	Independent time constant
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
TL	Torque limit
TM	Sample time

Stepper Motor

DE	Define encoder position
DP	Define reference position
KS	Stepper motor smoothing
MT	Motor type
QS	Error magnitude
RP	Report commanded position
TD	Step counts output
TP	Tell position of encoder
YA	Step drive resolution
YB	Step motor resolution
YC	Encoder resolution
YR	Error correction
YS	Stepper position maintenance

Brushless Motor

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

I/O

AL	Arm latch
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
@IN[x]	State of digital input x
@OUT[x]	State of digital output x

System Configuration

BN	Burn parameters
BP	Burn program
BV	Burn variables and arrays
CE	Configure encoder type
CN	Configure switches
CO	Configure I/O points
CW	Data adjustment bit
DE	Define dual encoder position
DP	Define position
EI	Enable interrupts
EO	Echo off
IT	Independent smoothing
LZ	Leading zeros format
MO	Motor off
MT	Motor type
PF	Position format
QD	Download array
QU	Upload array
RS	Reset
^R^S	Master reset
VF	Variable format

Math Functions

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

Interrogation

LA	List arrays
LL	List labels
LS	List program
LV	List variables
MG	Message command
QR	Data record
QZ	Return data record
RP	Report command position
RL	Report latch
^R^V	Firmware revision information
SC	Stop code
TB	Tell status
TC	Tell error code
TD	Tell dual encoder
TE	Tell error
TI	Tell input

Interrogation (cont.)

TP	Tell position
TR	Trace program
TS	Tell switches
TT	Tell torque
TV	Tell velocity

Programming

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
REM	Remark program
UI	User interrupt
UL	Upload program
ZS	Zero stack
'	Comment

Error Control

BL	Backward software limit
ER	Error limit
FL	Forward software limit
OE	Off-on-error function
TL	Torque limit
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
WC	Wait for contour data
WT	Wait for time

Independent Motion

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

Contour Mode

CD	Contour data
CM	Contour mode
DT	Contour time interval
WC	Wait for contour data

ECAM/Gearing

EA	ECAM master
EB	Enable ECAM
EC	ECAM table index
EG	ECAM go
EM	ECAM cycle
EP	ECAM interval
EQ	Disengage ECAM
ET	ECAM table entry
EW	ECAM widen
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	Ellipse scaling
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
VT	Smoothing time constant—vector

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Connectors

100-pin, high density; Connector: Amp# 2-178238-9, Cable: Amp# 2-175677-9; Enclosure: Amp# 176793-9

Axis 1–4 DMC-18x2

1	Ground	51	NC
2	Ground	52	Ground
3	5 V	53	5 V
4	Error output*	54	Limit common
5	Reset*	55	Home W
6	Encoder–compare output	56	Reverse limit W
7	Ground	57	Forward limit W
8	Ground	58	Home Z
9	Motor command W	59	Reverse limit Z
10	Sign W / dir W	60	Forward limit Z
11	PWM W / step W	61	Home Y
12	Motor command Z	62	Reverse limit Y
13	Sign Z / dir Z	63	Forward limit Y
14	PWM Z / step Z	64	Home X
15	Motor command Y	65	Reverse limit X
16	Sign Y / dir Y	66	Forward limit X
17	PWM Y / step Y	67	Ground
18	Motor command X	68	5 V
19	Sign X / dir X	69	Input common
20	PWM X / step X	70	Latch X/Input 1
21	Amp enable W	71	Latch Y/Input 2
22	Amp enable Z	72	Latch Z/Input 3
23	Amp enable Y	73	Latch W/Input 4
24	Amp enable X	74	Input 5
25	A+ X	75	Input 6
26	A- X	76	Input 7
27	B+ X	77	Input 8
28	B- X	78	Abort*
29	I+ X	79	Output 1
30	I- X	80	Output 2
31	A+ Y	81	Output 3
32	A - Y	82	Output 4
33	B+ Y	83	Output 5
34	B- Y	84	Output 6
35	I+ Y	85	Output 7
36	I- Y	86	Output 8
37	A+ Z	87	5 V
38	A - Z	88	Ground
39	B+ Z	89	Ground
40	B- Z	90	Ground
41	I+ Z	91	NC
42	I- Z	92	NC
43	A+ W	93	NC
44	A - W	94	NC
45	B+ W	95	NC
46	B- W	96	NC
47	I+ W	97	NC
48	I- W	98	NC
49	+12 V	99	-12 V
50	+12 V	100	-12 V

**Active low*

Connectors—AMP-19540

Interconnect with four 500 W servo drives

J1 Power 8-pin AMP Mate-n-lock II

1	Earth	5	Ground
2	+VM (18 V–80 V)	6	Ground
3	+VM (18 V–80 V)	7	Ground
4	+VM (18 V–80 V)	8	Ground

JX1, JY1, JZ1, JW1 Motor Output 4-pin AMP Mate-n-lock II

1	Earth
2	A
3	C
4	B

J3 I/O 44-pin Hi-density Female D-sub

1	PWM/MCMD Z	23	Latch W/Input 4
2	Output 6	24	Latch X/Input 1
3	Output 8	25	PWM/MCMD X
4	Output 5	26	Home X
5	Output 2	27	Home Y
6	Abort*	28	Home Z
7	Input 6	29	Home W
8	Latch Z/Input 3	30	Error Output*/INCOM
9	SIGN/AEN Y	31	PWM/MCMD W
10	Encoder compare output	32	5 V
11	Reverse limit X	33	5 V
12	Reverse limit Y	34	Ground
13	Reverse limit Z	35	Ground
14	Reverse limit W	36	Input 8
15	Forward limit W	37	Input 5
16	SIGN/AEN W	38	Latch Y/Input 2
17	SIGN/AEN Z	39	PWM/MCMD Y
18	Output 7	40	SIGN/AEN X
19	Output 4	41	Forward limit X
20	Output 1	42	Forward limit Y
21	Output 3	43	Forward limit Z
22	Input 7	44	Reset*/LSCOM

J4 X-axis 15-pin Hi-density Female D-sub

1	I+ X	9	AA- X
2	B+ X	10	Hall A X
3	A+ X	11	AA+ X
4	AB+ X	12	AB- X
5	Ground	13	Hall B X
6	I- X	14	Hall C X
7	B- X	15	5 V
8	A- X		

J5 Y-axis 15-pin Hi-density Female D-sub

1	I+ Y	9	AA- Y
2	B+ Y	10	Hall A Y
3	A+ Y	11	AA+ Y
4	AB+ Y	12	AB- Y
5	Ground	13	Hall B Y
6	I- Y	14	Hall C Y
7	B- Y	15	5 V
8	A- Y		

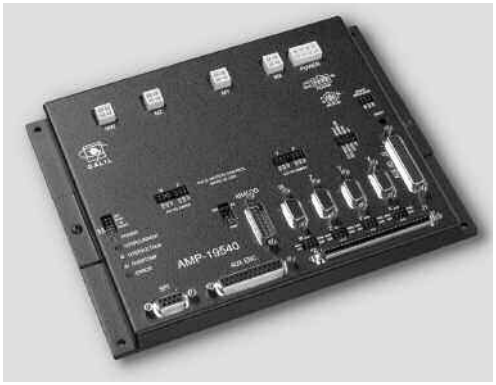
J6 Z-axis 15-pin Hi-density Female D-sub

1	I+ Z	9	AA- Z
2	B+ Z	10	Hall A Z
3	A+ Z	11	AA+ Z
4	AB+ Z	12	AB- Z
5	Ground	13	Hall B Z
6	I- Z	14	Hall C Z
7	B- Z	15	5 V
8	A- Z		

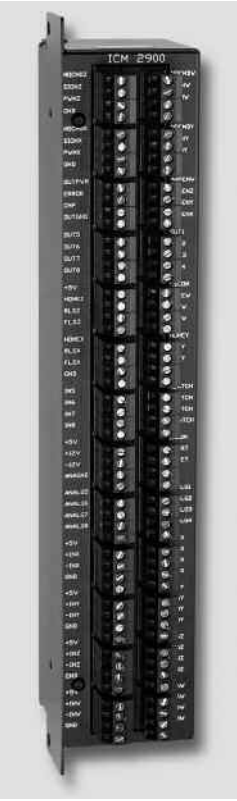
J7 W-axis 15-pin Hi-density Female D-sub

1	I+ W	9	AA- W
2	B+ W	10	Hall A W
3	A+ W	11	AA+ W
4	AB+ W	12	AB- W
5	Ground	13	Hall B W
6	I- W	14	Hall C W
7	B- W	15	5 V
8	A- W		

AMP-19540



Hardware Accessories



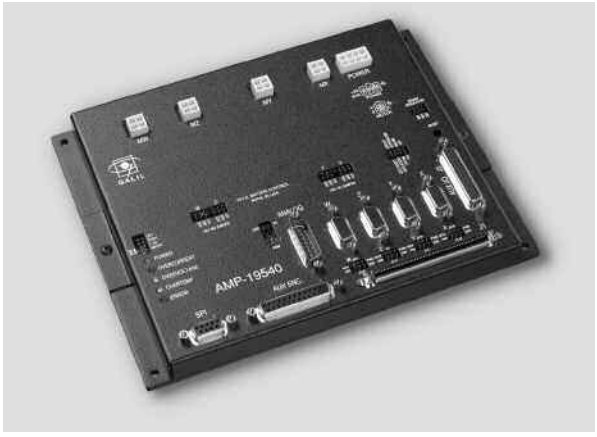
ICM-2900 Interconnect Module with flange

ICM-2900 Interconnect Module

The ICM-2900 breaks-out the 100-pin SCSI cable into screw-type terminals. The ICM-2900-FL has flanges which allow standard screw-type mounting. Specify -OPTO for optoisolated outputs. Specify -HAEN for high amp enable and -LAEN for low amp enable. .

AMP-19540 Interconnect with Four 500 Watt Servo Drives

Galil's AMP-19540 is a 4-axis amplifier for driving brush or brushless motors up to 500 Watts each. By interfacing directly to Galil's DMC-18x2 PCI bus controllers, it provides a cost-effective controller/drive solution for multi-axis applications. The AMP-19540 contains four transconductance, PWM amplifiers for driving brush or brushless motors. Each amplifier operates at 18 V to 80 V DC, up to 7 Amps continuous, 10 Amps peak. The AMP-19540 gain setting is easily configured with jumpers. The PWM switching frequency is 60 kHz. The AMP-19540 enclosure has dimensions of 6.8" × 8.75" × 1". It interfaces to a PCI bus controller with a single, 100-pin high density SCSI cable. Signals for each axis are brought out through D-type connectors located on the AMP-19540. For applications with less than three axes, the AMP-19520 two-axis model is available. A shunt regulator option is also available. CE certified.



AMP-19540

DB-14064 I/O Expansion

The DB-14064 is an optional board which provides 64 additional I/O for the DMC-18x2 controllers. This board mounts directly onto the back of the controller and provides 64 I/O points configurable by the user for inputs or outputs. The I/O is accessible through two 50-pin headers.