ISA, PC/104, RS232, PCI Econo 1 axis

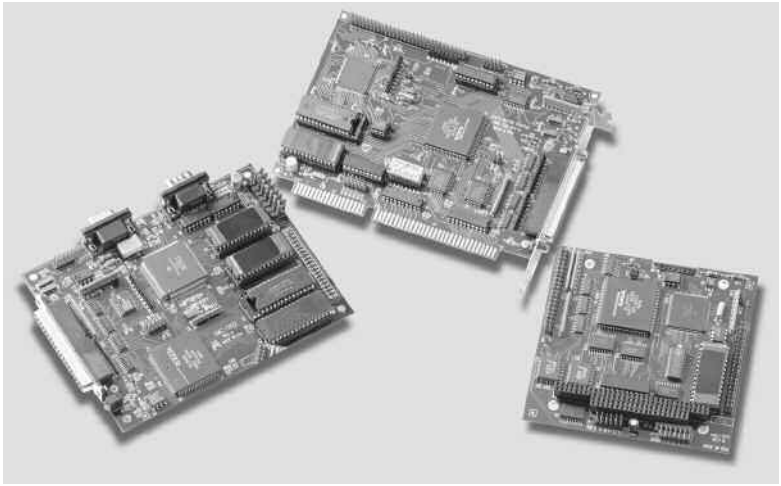
DMC-1410, DMC-1411, DMC-1412, DMC-1417

Product Description

The DMC-1410, DMC-1411, DMC-1412, DMC-1417 are economical, single axis motion control cards with ISA, PC/104, RS/232 and PCI communications, respectively. They have many of the same high-performance features of Galil's multi-axis Optima controllers, but are designed for just one axis. This offers the user both space and cost-savings.

With a 32-bit microcomputer, the single axis controllers provide such advanced features as PID compensation with velocity and acceleration feedforward, program memory with multitasking for simultaneously

Left to right:
DMC-1412, DMC-1410, DMC-1411



running two application programs, and uncommitted I/O for synchronizing motion with external events. It handles various modes of motion including point-to-point positioning, jogging, contouring, electronic gearing and ECAM. Additionally, the controllers accept inputs from two encoders, which is useful for electronic gearing applications. The user can configure the controller for either stepper or servo motor control.

Like all Galil controllers, the DMC-1410, -1411, -1412 and -1417 use a simple, English-like command language which makes them very easy to program. Galil's WSDK servo design software further simplifies system set-up with "one-button" servo tuning and real-time display of position and velocity information. Communication drivers are available for DOS, Linux and all current Windows operating systems.

Features

- *1-axis motion controller*
- *DMC-1410: ISA card*
  DMC-1411: PC/104 card
  DMC-1412: Card with two daisy-chainable RS232 ports up to 38.4 kbaud
  DMC-1412-BOX: Box-level controller
  DMC-1417: PCI card
- *User-configurable for stepper or servo motor control. Sinusoidal commutation for brushless servo motors.**
- *Accepts up to 8 MHz encoder frequencies for servos. Outputs up to 2 MHz for steppers*
- *Advanced PID compensation with velocity and acceleration feedforward, offsets and integration limit*
- *Modes of motion include jogging, point-to-point positioning, contouring, electronic gearing and ECAM. Accepts input from auxiliary encoder for electronic gearing*
- *Over 125 English-like commands including conditional statements and event triggers such as AT TIME and AT POSITION*
- *Memory for application programs, variables and arrays. Multitasking for concurrent execution of two application programs*
- *Home input and forward and reverse limits*
- *7 Uncommitted digital inputs, 3 digital outputs*
- *High-speed position latch*
- *DMC-1410, -1412 and -1417 use 37-pin D connector. DMC-1411 uses a 40-pin IDC connector. ICM-1460 interconnect module breaks-out 37-pin cable into screw terminals.*
- *Communication drivers for all current versions of Windows, DOS and Linux*
- *CE certified — DMC-1410, 1412*
- *Custom hardware and firmware options available*

**DMC-1411 does not support sinusoidal commutation*

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Specifications

System Processor

- Motorola 32-bit microcomputer

Communications Interface

- DMC-1410: ISA with bi-directional, high speed FIFO buffer
- DMC-1411: PC/104 with bi-directional, high speed FIFO buffer
- DMC-1412: (2) daisy-chainable RS232 ports up to 38.4 kbaud
- DMC-1417: PCI with bi-directional, high speed FIFO buffer

Modes of Motion:

- Point-to-point positioning
- Jogging
- Electronic Gearing
- Electronic Cam
- Contouring

Memory

- Program memory size — 250 lines × 40 characters
- 126 variables
- 1000 array elements in up to 6 arrays

Filter

- PID (proportional-integral-derivative) with velocity and acceleration feedforward
- 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)
- Velocity: Up to 8 million counts/sec for servo motors
- Acceleration: Up to 67 million counts/sec^2

Uncommitted Digital I/O

- 7 TTL inputs
- 3 TTL outputs

High Speed Position Latch

- Latches within 0.1 microseconds

Dedicated I/O

- Main encoder inputs—Channel A, A-, B,B-,I, I- (±12 V or TTL)
- Dual encoder—Channel A, A-, B, B-
- Forward and reverse limit inputs
- Home input
- High-speed position latch input
- Analog motor command output with 16-bit DAC resolution
- Pulse and direction output for step motors
- Amplifier enable output
- Error output

Minimum Servo Loop Update Time

- 375 microseconds

Maximum Encoder Feedback Rate

- 8 MHz

Maximum Stepper Rate

- 2 MHz (Full, half or microstep)

Power Requirements

- DMC-1410, DMC-1411, DMC-1412-card, DMC-1417:
  +5V 400 mA
  -12V 40 mA
  +12V 40 mA
- DMC-1412 Box: plugs into 90–260 VAC

Environmental

- Operating temperature: 0–70° C for card; 0–60° C for box
- Humidity: 20–95% RH, non-condensing

Mechanical

- DMC-1410: 7" ISA
- DMC-1411: 4.4" × 4.15"
- DMC-1412-card: 6.0" × 4.375"
- DMC-1412-box: 5.1" × 3.0" × 6.8"
- DMC-1417: 7.3" PCI

DMC-1410, DMC-1411, DMC-1412, DMC-1417

Instruction Set

Motion

AB	Abort motion
AC	Acceleration
BG	Begin motion
CD	Contour data
CM	Contour mode
DC	Deceleration
DT	Contour time interval
EB	Enable cam mode
EG	Start cam motion
EM	Modulus for cam
EP	Master counts per table entry
EQ	Stop cam motion
ET	Cam table entry
FE	Find edge
FI	Find index
GR	Gear ratio
HM	Home
IP	Increment position
IT	Smoothing time constant–independent
JG	Jog mode
KS	Stepper smoothing
PA	Position absolute
PR	Position relative
SP	Speed
ST	Stop

Program Flow

AD	Wait for specified distance
AI	Wait for specified input
AM	Wait for motion complete
AP	Wait for absolute position
AR	Wait for relative distance
AS	Wait for "At Speed"
AT	Wait for elapsed time
EN	End program
HX	Halt task
IN	Input variable
II	Input interrupt
JP	Jump to program location
JS	Jump to subroutine
MG	Message
MC	Wait for "In Position"
MF	Forward motion past position
MR	Reverse motion past position
NO	No operation
RE	Return from error subroutine
RI	Return from interrupt
TW	Timeout for "In Position"
WC	Wait for contour data
WT	Wait for elapsed time
XQ	Execute program
ZS	Zero subroutine stack

Configuration

AL	Arm latch
BN	Save parameters in EEPROM
BP	Burn program (-1412)
BV	Burn variables and array (-1412)
CB	Clear output bit
CC	Configure 2nd RS232 port (-1412)
CE	Configure encoder type
CN	Configure switches
DA	Deallocate arrays
DE	Define dual encoder position
DL	Download program
DM	Dimension arrays
DP	Define position
ED	Edit mode
EI	Enable ISA/PCI interrupts (except -1412)
EO	Echo off
LS	List program
MO	Motor off
MT	Motor type
OB	Define output bit
OP	Output port
PF	Position format
QD	Download array
QU	Upload array
RA	Record array
RC	Record
RD	Record data
RS	Reset
SA	Set address (-1412)
SB	Set output bit
^R^S	Master reset
UI	User interrupt (except -1412)
UL	Upload program
VF	Variable format

Control Filter Settings

DV	Damping for dual loop
FA	Acceleration feedforward
FV	Velocity feedforward
GN	Gain
IL	Integrator limit
KD	Derivative constant
KI	Integrator constant
KP	Proportional constant
OF	Offset
SH	Servo here
TL	Torque limit
TM	Sample time

Interrogation

LA	List arrays
LL	List labels
LS	List program
RL	Report latched position
RP	Report command position
^R^V	Firmware revision
SC	Stop code
TB	Tell status
TC	Tell error code
TD	Tell dual encoder position
TE	Tell position error
TI	Tell input
TP	Tell position
TR	Trace program
TS	Tell switches
TT	Tell torque
TV	Tell velocity

Error and Limits

BL	Reverse software limit
ER	Position error limit
FL	Forward software limit
OE	Off on error

Arithmetic Functions

@SIN	Sine
@COS	Cosine
@ABS	Absolute value
@FRAC	Fraction portion
@INT	Integer portion
@RND	Round
@SQR	Square root
@IN	Return digital input
@OUT	Return digital output
+	Add
-	Subtract
*	Multiply
/	Divide
&	And
|	Or
( )	Parentheses

Brushless Motor (-1410, -1412, -1417)

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

DMC-1410, DMC-1411, DMC-1412, DMC-1417

Connectors

DMC-1410, DMC-1412, DMC-1417 J3

Main 37-pin D-type

1	Reset*	20	Error Output*
2	Amp enable	21	ACMD
3	Output 3	22	Output 2
4	Output 1	23	Reserved
5	PWM or step out	24	Sign or direction
6	Input 7	25	Input 6
7	Input 5	26	Input 4
8	Input 3	27	Input 2
9	Input 1 (and latch)	28	Forward limit
10	+5V	29	Reverse limit
11	Ground	30	Home
12	+12V	31	-12V
13	Ground	32	A+
14	A-	33	B+
15	B-	34	I+
16	I-	35	Auxiliary A+
17	Auxiliary A-	36	Auxiliary B+
18	Auxiliary B-	37	Abort*
19	ACMD Phase B		

DMC-1411 J3

Main 40-pin IDC

1	Reset*	2	Error Output*
3	Amp enable	4	Amp command for servo
5	Output 3	6	Output 2
7	Output1	8	Reserved
9	PWM or step out	10	Sign or direction
11	Input 7	12	Input 6
13	Input 5	14	Input 4
15	Input 3	16	Input 2
17	Input 1 (and latch)	18	Forward limit
19	+5V	20	Reverse limit
21	Ground	22	Home
23	+12V	24	-12V
25	Ground	26	A+
27	A-	28	B+
29	B-	30	I+
31	I-	32	Auxiliary A+
33	Auxiliary A-	34	Auxiliary B+
35	Auxiliary B-	36	Abort*
37	Reserved	38	NC
39	NC	40	NC

**Active low*

DMC-1412 J5

Power 7-pin Molex

1	-12V
2	Ground
3	Ground
4	+5V
5	+5V
6	+12V
7	Earth

DMC-1412

RS232 Main port 9-pin male

1	CTS—output	6	CTS—output
2	Transmit data—output	7	RTS—input
3	Receive data—input	8	CTS—output
4	RTS—input	9	NC
5	Ground		

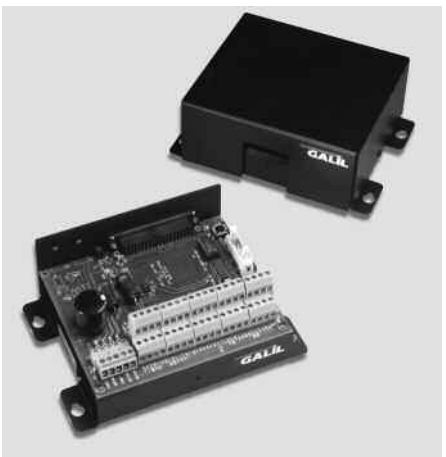
RS232 Auxiliary port 9-pin female

1	CTS—input	6	CTS—input
2	Transmit data—input	7	RTS—output
3	Receive data—output	8	CTS—input
4	RTS—output	9	NC
5	Ground		

Hardware Accessories

ICM-1460

The ICM-1460 Interconnect Module provides screw terminals for the 37-pin D-type cable from the DMC-1410 or DMC-1412, for quick connection of system hardware. A 40-pin to 37-pin cable allows the ICM-1460 to be used with the DMC-1411. The ICM-1460 is contained in a metal enclosure with dimensions of 6.9" × 4.9" × 2.6"and 0.2" diameter key-holes for mounting. The ICM is normally shipped configured for high amp enable, +5 V (-HAEN). For low amp enable, order ICM-1460-LAEN.



ICM-1460 Interconnect Module (shown with and without cover)

ICM-1460-OPTO

For applications requiring optoisolated inputs and outputs, the ICM-1460 option "OPTO" provides 5–24 V and 25 mA optoisolation on all general inputs and outputs, home inputs, and limits.

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Ordering Information

PART NUMBER	DESCRIPTION	QUANTITY 1	QUANTITY 100
DMC-1410	1-axis ISA	$ 595	$ 395
DMC-1411	1-axis PC/104	$ 595	$ 395
DMC-1412-card	1-axis stand-alone with RS232—card	$ 595	$ 395
DMC-1412-box	1-axis stand-alone with RS232 in enclosure with power supply	$ 795	$ 545
DMC-1417	1-axis PCI	$ 595	$ 395
CABLE 37-pin D	37-pin cable for DMC-1410, DMC-1412, DMC-1417	$ 25	
CABLE 40-pin IDC	40-pin to 37-pin cable for DMC-1411	$ 25	
CABLE 9-pin D	9-pin RS232 cable for DMC-1412	$ 10	
ICM-1460	Interconnect Module for DMC-1400 series. Specify -HAEN for high amp enable or -LAEN for low amp enable	$ 145	$ 95
ICM-1460-OPTO	ICM with optoisolated inputs and outputs	$ 195	$ 145
Galil Utilities	Communication drivers, SmartTERM, DMCWIN software	$ 20 for CD; free download	
DMCWIN32	Windows API Tool Kit (VB, C, C++, etc.)	Included with Utilities	
WSDK	Set-up, tuning and analysis software	$ 195	
ActiveX Tool kit	Custom ActiveX controls for Visual Basic, Visual C++, etc.	$ 595	
Upgrade Options	Two sets of PID, anti-friction bias, absolute or SSI sensors, backlash and leadscrew error compensation, profile smoothing, anti-resonance profiling, high-resolution gearing, password protect, memory expansion, closed-loop steppers, coordinate transformation	Consult factory One-time set-up charge	
-CER	Piezo-ceramic motor option	$ 400 set-up charge Consult factory	

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