

DMC-21x2 & DMC-21x3 ETHERNET/RS232

FEATURES

MOTION

- Modes of motion include jogging, point-to-point positioning, contouring, linear and circular interpolation, electronic gearing and ECAM
- Servo loop update rates as low as 62.5 microsecond/axis
- Encoder frequencies up to 12 MHz; Step motors up to 3 MHz
- Software PID control with velocity and acceleration feedforward, offsets and integration limits, notch, and low-pass filter. Option for piezo-ceramic motors
- Motion smoothing to eliminate jerk
- Linear and circular interpolation includes ellipse scaling, slow-down around corners, infinite segment feed, feedrate override
- Two sets of coordinated axes can execute at the same time

INPUTS/OUTPUTS

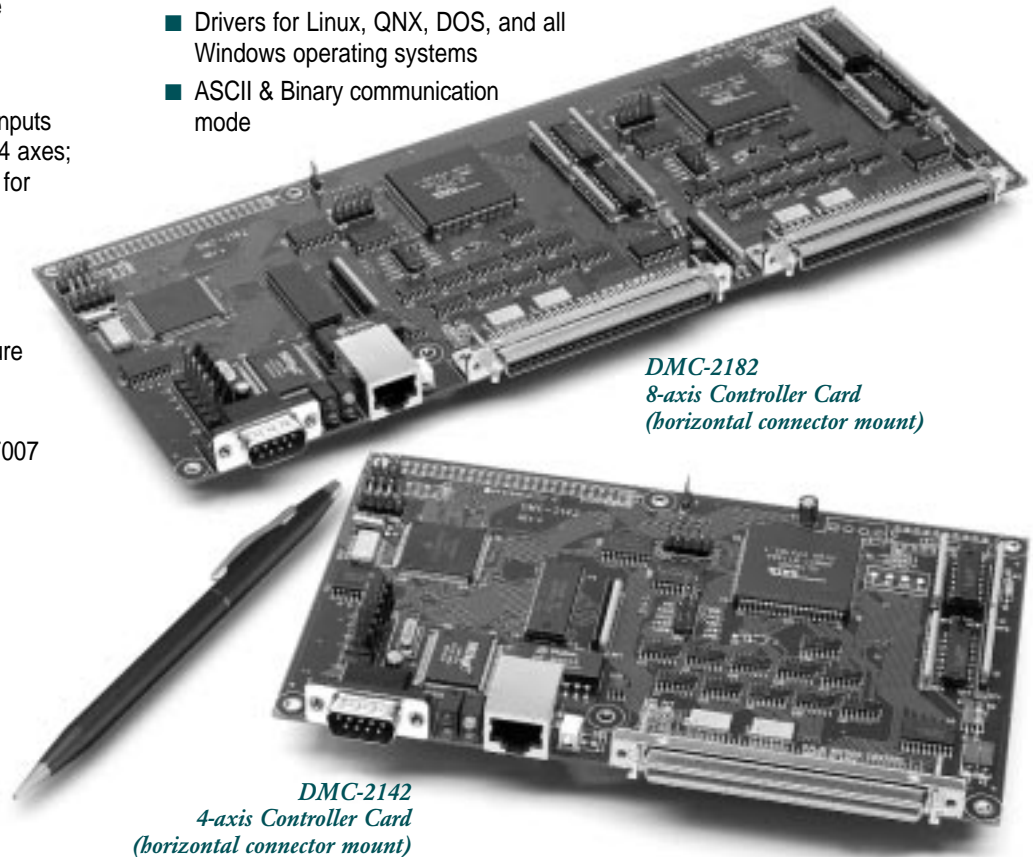
- 8 uncommitted, buffered inputs and 8 TTL outputs for 1–4 axes; 16 inputs and 16 outputs for 5–8 axes
- TTL Forward and Reverse limits and home input for each axis
- High-speed position capture and position compare for each axis
- I/O expansion with IOC-7007 Ethernet I/O controller or DB-14064

PROGRAMMING

- On-board, non-volatile memory for storing application programs, variables and arrays
- Programmable event triggers including At Time, At Position, At Input, At Speed
- Automatic program execution upon power-up
- Intuitive, English-like command language with over 200 commands directly executable by controller
- Multitasking for simultaneous execution of up to eight applications programs
- Flash EEPROM for firmware updates
- Software tools for automatic servo tuning and analysis; ActiveX controls for Visual Basic
- Extensive DLLs and documentation for C/C++ programmers
- Drivers for Linux, QNX, DOS, and all Windows operating systems
- ASCII & Binary communication mode

FORMATS

- 1- through 8-axis formats
- Ethernet 10BASE-T and RS232 (19.2 Kb)
- Controls step motors and servo motors on any combination of axes
- On-board sinusoidal commutation for brushless motors
- DMC-21x2 uses 100-pin high density connector for each set of four axes. DMC-21x3 uses 96-pin DIN connector for each set of four axes
- Small size card-level:
1–4 axes 4.25" × 7.0"
5–8 axes 4.25" × 10.75"
- DIN-rail mount option available
- Accepts +5 V, +/-12 V; DC-to-DC converter options for 18 V to 36 V input or 36 V to 72 V input



*DMC-2182
8-axis Controller Card
(horizontal connector mount)*

*DMC-2142
4-axis Controller Card
(horizontal connector mount)*

ECONO SERIES

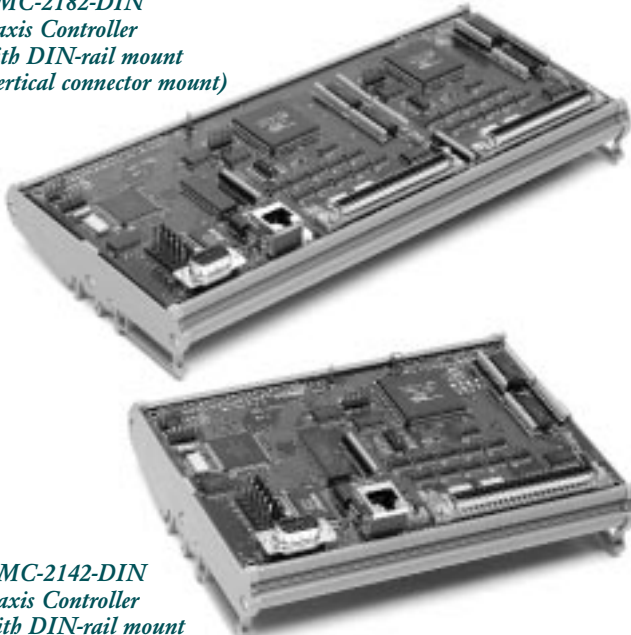
Available from Cross Automation 800.866.4568

DMC-21x2 & DMC-21x3 ETHERNET/RS232

DESCRIPTION

Galil's DMC-21x2 and DMC-21x3 motion controllers for the Ethernet are designed for extremely cost-sensitive and space-sensitive applications. Performance specifications are similar to the 21x0 Optima series, but with some features removed for reduced cost such as uncommitted analog inputs, optoisolation, and enclosure. Standard high-performance features include: program memory with multitasking, symbolic variables and arrays, uncommitted digital I/O and control of both step and servo motors on any combination of axes.

DMC-2182-DIN
8-axis Controller
with DIN-rail mount
(vertical connector mount)



DMC-2142-DIN
4-axis Controller
with DIN-rail mount
(vertical connector mount)

The DMC-21x2/x3 is available in one- through eight-axis versions. Modes of motion include linear and circular interpolation, contouring, electronic gearing and ECAM. Consult the Optima series specifications for a complete description of the modes of motion and programming.

The DMC-21x2 uses a single, high-density, 100-pin connector for each set of four axes. The ICM-2900 interconnect module breaks out the 100-pin cable into screw terminals for easy connection to system elements. The DMC-21x3 provides a 96-pin DIN connector for each set of four axes. The DMC-21x3 comes standard with the 96-pin DIN

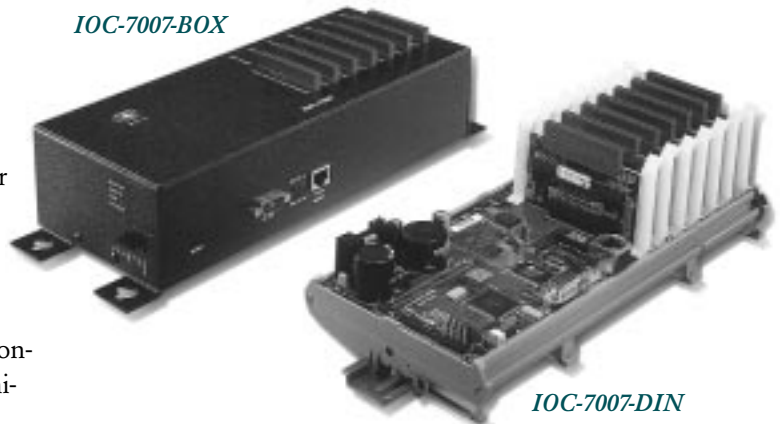
pins sticking straight up allowing for easy mounting of interconnect boards. Interconnect cards are available for the DMC-21x3 which mount directly to the 96-pin connector without a cable between the controller and the interconnect card. Interconnect cards are available with onboard drives for stepper motors or brush-type servo motors or with D-type connectors for easy interface to other motors and drives.

The DMC-21x2 and DMC-21x3 are available as a card-level or DIN-rail mount unit. The one- through four-axes model is 4.25" x 7.0" and the five- through eight-axes model is 4.25" x 10.75".

I/O EXPANSION OPTIONS

Galil's IOC-7007 I/O controller provides an intelligent solution for adding I/O and PLC functionality to the DMC-21x2/21x3 Ethernet control system. The IOC-7007 I/O controller connects to the Ethernet network allowing it to communicate with DMC-21x2/21x3 motion controllers and other devices on the network. The intelligent I/O controller has an on-board microprocessor for coordinating I/O events and performing tasks normally handled by a PLC. The IOC-7007 unit accepts up to seven plug-in I/O modules for easy connection to optoisolated inputs, optoisolated outputs, analog inputs and outputs and dry-contact relays. Packaging options include card-level, box-level and DIN-rail mount. Consult the IOC-7007 datasheet for complete specifications.

IOC-7007-BOX



IOC-7007-DIN

DMC-21x2 & DMC-21x3 ETHERNET/RS232

DMC-21x3 INTERCONNECT OPTIONS

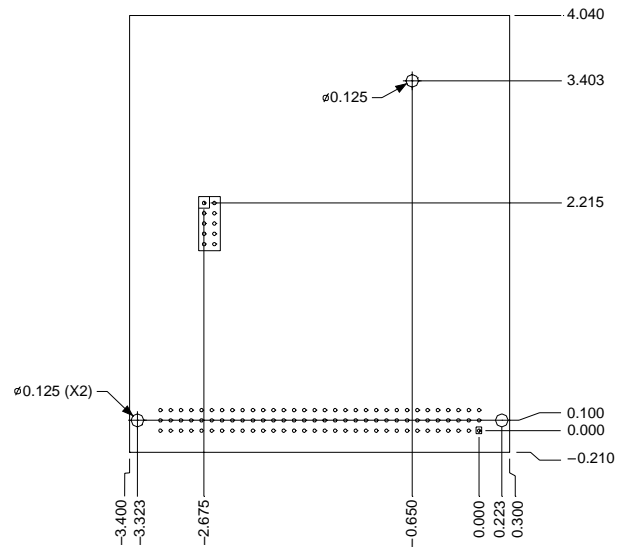
Several interconnect cards are available for the DMC-21x3 controller. These interconnect cards mount directly to the DMC-21x3 96-pin DIN connector and do not require a cable between the controller and interconnect. Interconnect cards are available with on-board drives for stepper motors or brush-type servo motors or with D-type connectors for easy interface to other motors and drives. One interconnect module is required for each set of four axes. The dimensions of each interconnect module is: 4.25" x 3.70".

■ ICM-20100 Interconnect Module

The ICM-20100 provides 15-pin D-sub connectors for each of the four axes and 25-pin D-sub connectors for the auxiliary encoders and I/O. The ICM may be configured for High or Low amp enable. The ICM-20100 mounts directly to the 96-pin connector on the DMC-21x3.

■ SDM-20240 Interconnect Module with Four 1.4A Stepper Drives

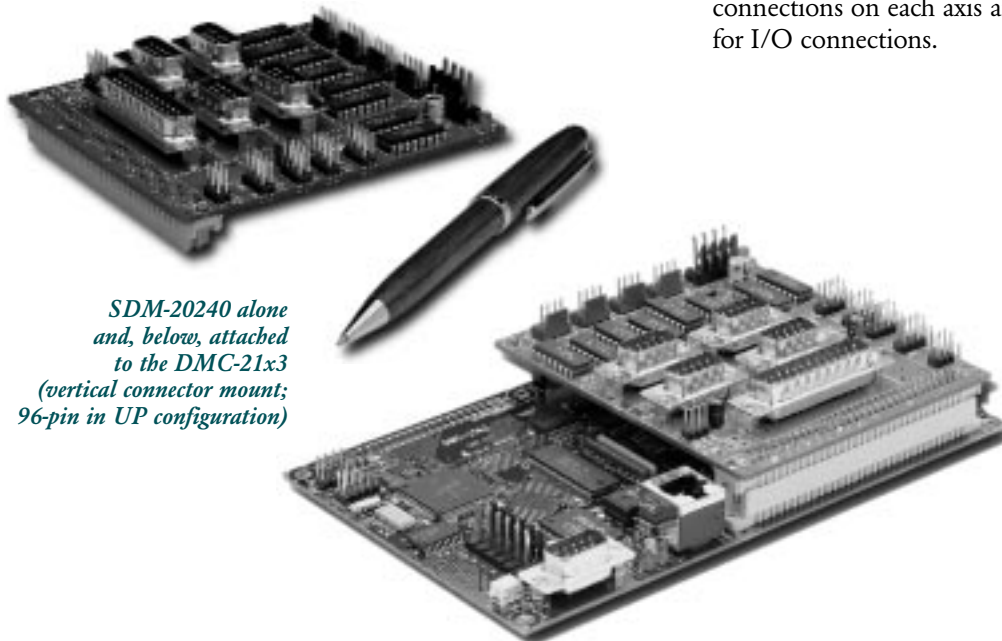
The SDM-20240 contains four drives for operating two-phase bipolar step motors. The SDM-20240 requires a single 12–30 DC Volt input. The SDM is user-configurable for 1.4 A, 1.0 A, .75 A, or .5 A per phase and full or half-step. A heatsink may be required depending on the environment and adequate airflow across the board is recommended. The SDM uses 9-pin D-sub connectors for encoder and limit connections on each axis and a 25-pin D-sub connector for I/O connections.



*DMC-2143 Interconnect Mounting Dimensions
Overall Dimensions: 3.7" x 4.25"*

■ AMP-20340 Interconnect Module with Four 20W Servo Drives

The AMP-20340 contains four drives for operating small brush-type servo motors. The AMP-20340 requires a single 12–36 DC Volt input. Output power is 20 W per amplifier or 60 W total. The gain of each transconductance linear amplifier is .15 A/V at 1.5 A maximum current. The typical current loop bandwidth is 4KHz. The AMP uses 15-pin D-sub connectors for encoder and limit connections on each axis and a 25-pin D-sub connector for I/O connections.



*SDM-20240 alone
and, below, attached
to the DMC-21x3
(vertical connector mount;
96-pin in UP configuration)*

DMC-21x2 & DMC-21x3 ETHERNET/RS232

CONNECTORS—DMC-21x2

Axis 1–4 DMC-21x2 J4

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

1 Internal ground	51 NC
2 Ground	52 Ground
3 5 V	53 5 V
4 Error output	54 NC
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 NC
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 AA+ X
42 I- Z	92 AA- X
43 A+ W	93 AB+ X
44 A- W	94 AB- X
45 B+ W	95 AA+ Y
46 B- W	96 AA- Y
47 I+ W	97 AB+ Y
48 I- W	98 AB- Y
49 +12 V	99 -12 V
50 +12 V	100 -12 V

Axis 5–8 DMC-21x2 J5

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

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

CONNECTORS—DMC-21x2 CONTINUED

DMC-21x2 & DMC-21x3 JP6

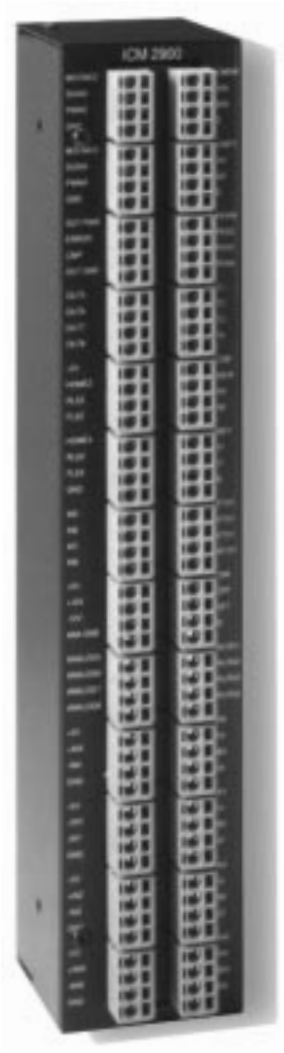
10-pin Header Z & W axes auxiliary encoder

- 1 VCC
- 2 Ground
- 3 AA+ Z
- 4 AA- Z
- 5 AB+ Z
- 6 AB- Z
- 7 AA+ W
- 8 AA- W
- 9 AB+ W
- 10 AB- W

DMC-21x2 & DMC-21x3 JP8

10-pin Header G & H axes auxiliary encoder

- 1 VCC
- 2 Ground
- 3 AA+ G
- 4 AA- G
- 5 AB+ G
- 6 AB- G
- 7 AA+ H
- 8 AA- H
- 9 AB+ H
- 10 AB- H



For the DMC-21x2, the ICM-2900 Interconnect Module breaks out 100-pin cable into screw terminals.

MOTION CONTROLLERS

ECONO SERIES

Available from Cross Automation 800.866.4568

DMC-21x2 & DMC-21x3 ETHERNET/RS232

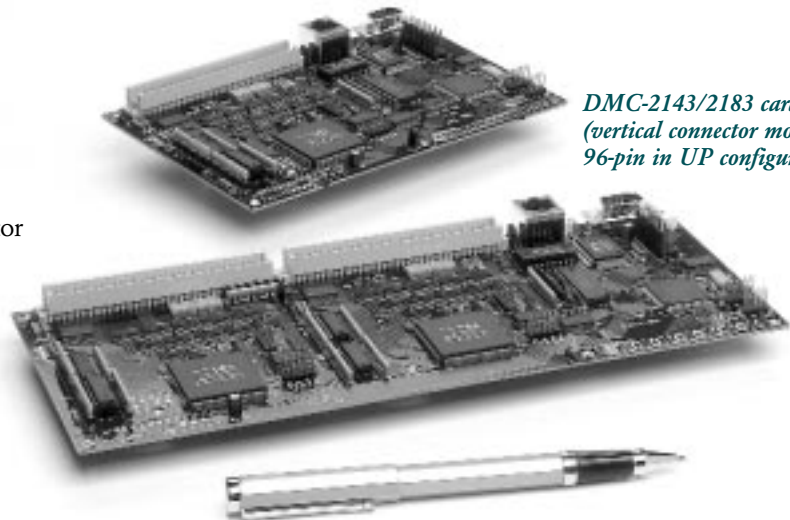
CONNECTORS—DMC-21x3

Axis 1–4 DMC-21x3 J4; 96-pin DIN; Connector DIN 41612

RA	UP	DN	SIGNAL	RA	UP	DN	SIGNAL	RA	UP	DN	SIGNAL
A1	A32	C32	Ground	B1	B32	B32	Ground	C1	C32	A32	Ground
A2	A31	C31	PWM/step W	B2	B31	B31	Sign/dir W	C2	C31	C31	Motor command W
A3	A30	C30	PWM/step Z	B3	B30	B30	Sign/dir Z	C3	C30	A30	Motor command Z
A4	A29	C29	PWM/step Y	B4	B29	B29	Sign/dir Y	C4	C29	A29	Motor command Y
A5	A28	C28	PWM/step X	B5	B28	B28	Sign/dir X	C5	C28	A28	Motor command X
A6	A27	C27	Amp enable W	B6	B27	B27	Ground	C6	C27	A27	Output compare
A7	A26	C26	Amp enable X	B7	B26	B26	Amp enable Y	C7	C26	A26	Amp enable Z
A8	A25	C25	Home W	B8	B25	B25	Reverse limit W	C8	C25	A25	Forward limit W
A9	A24	C24	Home Z	B9	B24	B24	Reverse limit Z	C9	C24	A24	Forward limit Z
A10	A23	C23	Home Y	B10	B23	B23	Reverse limit Y	C10	C23	A23	Forward limit Y
A11	A22	C22	Home X	B11	B22	B22	Reverse limit X	C11	C22	A22	Forward limit X
A12	A21	C21	Latch X/Input 1	B12	B21	B21	Latch Y/Input 2	C12	C21	A21	Latch Z/Input 4
A13	A20	C20	Latch W/Input 3	B13	B20	B20	Input 5	C13	C20	A20	Input 6
A14	A19	C19	Input 7	B14	B19	B19	Input 8	C14	C19	A19	Abort
A15	A18	C18	Output 3	B15	B18	B18	Output 2	C15	C18	A18	Output 1
A16	A17	C17	Output 5	B16	B17	B17	Ground	C16	C17	A17	Output 4
A17	A16	C16	Output 8	B17	B16	B16	Output 7	C17	C16	A16	Output 6
A18	A15	C15	A+ X	B18	B15	B15	A- X	C18	C15	A15	B+ X
A19	A14	C14	B- X	B19	B14	B14	I+ X	C19	C14	A14	I- X
A20	A13	C13	A+ Y	B20	B13	B13	A- Y	C20	C13	A13	B+ Y
A21	A12	C12	B- Y	B21	B12	B12	I+ Y	C21	C12	A12	I- Y
A22	A11	C11	A+ Z	B22	B11	B11	A- Z	C22	C11	A11	B+ Z
A23	A10	C10	B- Z	B23	B10	B10	I+ Z	C23	C10	A10	I- Z
A24	A9	C9	A+ W	B24	B9	B9	A- W	C24	C9	A9	B+ W
A25	A8	C8	B- W	B25	B8	B8	I+ W	C25	C8	A8	I- W
A26	A7	C7	Ground	B26	B7	B7	Ground	C26	C7	A7	Ground
A27	A6	C6	+AA X	B27	B6	B6	-AA X	C27	C6	A6	+AB X
A28	A5	C5	-AB X	B28	B5	B5	+AA Y	C28	C5	A5	-AA Y
A29	A4	C4	+AB Y	B29	B4	B4	-AB Y	C29	C4	A4	+AA Z
A30	A3	C3	+AB Z	B30	B3	B3	+AA W	C30	C3	A3	Error Output
A31	A2	C2	-12 V Output	B31	B2	B2	Reset	C31	C2	A2	+12 V Output
A32	A1	C1	Vcc (+5 V) Output	B32	B1	B1	Vcc (+5 V) Output	C32	C1	A1	Vcc (+5 V) Output

RA = right angle mount
 UP = pins mounted up
 DN = pins mounted down

The DMC-21x3 comes standard with 96-pin DIN pins UP. It is also available with connector pins at a right angle and facing down.



DMC-2143/2183 cards
 (vertical connector mount;
 96-pin in UP configuration)

CONNECTORS—DMC-21x3 CONTINUED

Axis 5–8 DMC-21x3 J5; 96-pin DIN; Connector DIN 41612

<i>RA</i>	<i>UP</i>	<i>DN</i>	<i>SIGNAL</i>	<i>RA</i>	<i>UP</i>	<i>DN</i>	<i>SIGNAL</i>	<i>RA</i>	<i>UP</i>	<i>DN</i>	<i>SIGNAL</i>
A1	A32	C32	Ground	B1	B32	B32	Ground	C1	C32	A32	Ground
A2	A31	C31	PWM/step H	B2	B31	B31	Sign/dir H	C2	C31	C31	Motor command H
A3	A30	C30	PWM/step G	B3	B30	B30	Sign/dir G	C3	C30	A30	Motor command G
A4	A29	C29	PWM/step F	B4	B29	B29	Sign/dir F	C4	C29	A29	Motor command F
A5	A28	C28	PWM/step E	B5	B28	B28	Sign/dir E	C5	C28	A28	Motor command E
A6	A27	C27	Amp enable H	B6	B27	B27	Ground	C6	C27	A27	Output compare 2
A7	A26	C26	Amp enable E	B7	B26	B26	Amp enable F	C7	C26	A26	Amp enable G
A8	A25	C25	Home H	B8	B25	B25	Reverse limit H	C8	C25	A25	Forward limit H
A9	A24	C24	Home G	B9	B24	B24	Reverse limit G	C9	C24	A24	Forward limit G
A10	A23	C23	Home F	B10	B23	B23	Reverse limit F	C10	C23	A23	Forward limit F
A11	A22	C22	Home E	B11	B22	B22	Reverse limit E	C11	C22	A22	Forward limit E
A12	A21	C21	Latch E/Input 9	B12	B21	B21	Latch F/Input 10	C12	C21	A21	Latch G/Input 11
A13	A20	C20	Latch H/Input 12	B13	B20	B20	Input 13	C13	C20	A20	Input 14
A14	A19	C19	Input 15	B14	B19	B19	Input 16	C14	C19	A19	Reserved
A15	A18	C18	Output 11	B15	B18	B18	Output 10	C15	C18	A18	Output 9
A16	A17	C17	Output 13	B16	B17	B17	Ground	C16	C17	A17	Output 12
A17	A16	C16	Output 16	B17	B16	B16	Output 15	C17	C16	A16	Output 14
A18	A15	C15	A+ E	B18	B15	B15	A- E	C18	C15	A15	B+ E
A19	A14	C14	B- E	B19	B14	B14	I+ E	C19	C14	A14	I- E
A20	A13	C13	A+ F	B20	B13	B13	A- F	C20	C13	A13	B+ F
A21	A12	C12	B- F	B21	B12	B12	I+ F	C21	C12	A12	I- F
A22	A11	C11	A+ G	B22	B11	B11	A- G	C22	C11	A11	B+ G
A23	A10	C10	B- G	B23	B10	B10	I+ G	C23	C10	A10	I- G
A24	A9	C9	A+ H	B24	B9	B9	A- H	C24	C9	A9	B+ H
A25	A8	C8	B- H	B25	B8	B8	I+ H	C25	C8	A8	I- H
A26	A7	C7	Ground	B26	B7	B7	Ground	C26	C7	A7	Ground
A27	A6	C6	+AA E	B27	B6	B6	-AA E	C27	C6	A6	+AB E
A28	A5	C5	-AB E	B28	B5	B5	+AA F	C28	C5	A5	-AA F
A29	A4	C4	+AB F	B29	B4	B4	-AB F	C29	C4	A4	+AA G
A30	A3	C3	+AB G	B30	B3	B3	+AA H	C30	C3	A3	Error Output
A31	A2	C2	-12 V Output	B31	B2	B2	Reset	C31	C2	A2	+12 V Output
A32	A1	C1	Vcc (+5 V) Output	B32	B1	B1	Vcc (+5 V) Output	C32	C1	A1	Vcc (+5 V) Output

RA = right angle mount

UP = pins mounted up

DN = pins mounted down

CONNECTORS—AMP-20340

AMP-20340 Interconnect with four 20 W servo drives

J2 Power 4-pin

- 1 +24V
- 2 Ground
- 3 +24V
- 4 Ground

J3 X-axis 15-pin D-sub

- 1 Forward limit X
- 2 Home X
- 3 VCC
- 4 A- X
- 5 B- X
- 6 I- X
- 7 -AA X
- 8 -AB X
- 9 Reverse limit X
- 10 Ground
- 11 A+ X
- 12 B+ X
- 13 I+ X
- 14 +AA X
- 15 +AB X

J4 Y-axis 15-pin D-sub

- 1 Forward limit Y
- 2 Home Y
- 3 VCC
- 4 A- Y
- 5 B- Y
- 6 I- Y
- 7 -AA Y
- 8 -AB Y
- 9 Reverse limit Y
- 10 Ground
- 11 A+ Y
- 12 B+ Y
- 13 I+ Y
- 14 +AA Y
- 15 +AB Y

J5 W-axis 15-pin D-sub

- 1 Forward limit W
- 2 Home W
- 3 VCC
- 4 A- W
- 5 B- W
- 6 I- W
- 7 -AA W
- 8 -AB W
- 9 Reverse limit W
- 10 Ground
- 11 A+ W
- 12 B+ W
- 13 I+ W
- 14 +AA W
- 15 +AB W

J6 Z-axis 15-pin D-sub

- 1 Forward limit Z
- 2 Home Z
- 3 VCC
- 4 A- Z
- 5 B- Z
- 6 I- Z
- 7 -AA Z
- 8 -AB Z
- 9 Reverse limit Z
- 10 Ground
- 11 A+ Z
- 12 B+ Z
- 13 I+ Z
- 14 +AA Z
- 15 +AB Z

J12 I/O 25-pin D-sub

- 1 Ground
- 2 Latch X/Input 1
- 3 Latch Z/Input 3
- 4 Input 5
- 5 Input 7
- 6 ABORT
- 7 Output 1
- 8 Output 3
- 9 Output 5
- 10 Output 7
- 11 Ground
- 12 Reset
- 13 nc
- 14 VCC
- 15 Latch Y/Input 2
- 16 Latch W/Input 4
- 17 Input 6
- 18 Input 8
- 19 Encoder-compare output
- 20 Output 2
- 21 Output 4
- 22 Output 5
- 23 Output 8
- 24 VCC
- 25 Error output

JX, JY, JZ, JW Motor Outputs

- JW1 WMO+
- JW2 WMO-
- JX1 XMO+
- JX2 XMO-
- JY1 YMO+
- JY2 YMO-
- JZ1 ZMO+
- JZ2 ZMO-

CONNECTORS—ICM-20100

ICM-20100 Interconnect with D-Sub Connectors

J1 Power

- 1 +12 V
- 2 VCC
- 3 Ground
- 4 -12 V

J3 W-Axis 15-pin D-sub

- 1 Forward Limit W
- 2 Home W
- 3 VCC
- 4 A- W
- 5 B- W
- 6 I- W
- 7 Amp enable W
- 8 Sign/dir W
- 9 Reverse limit W
- 10 Ground
- 11 A+ W
- 12 B+ W
- 13 I+ W
- 14 Motor command W
- 15 PWM/step W

J4 Z-Axis 15-pin D-sub

- 1 Forward Limit Z
- 2 Home Z
- 3 VCC
- 4 A- Z
- 5 B- Z
- 6 I- Z
- 7 Amp enable Z
- 8 Sign/dir Z
- 9 Reverse limit Z
- 10 Ground
- 11 A+ Z
- 12 B+ Z
- 13 I+ Z
- 14 Motor command Z
- 15 PWM/step Z

J5 Y-Axis 15-pin D-sub

- 1 Forward limit Y
- 2 Home Y
- 3 VCC
- 4 A- Y
- 5 B- Y
- 6 I- Y
- 7 Amp enable Y
- 8 Sign/dir Y
- 9 Reverse limit Y
- 10 Ground
- 11 A+ Y
- 12 B+ Y
- 13 I+ Y
- 12 Motor command Y
- 15 PWM/step Y

J6 X-Axis 15-pin D-sub

- 1 Forward limit X
- 2 Home X
- 3 VCC
- 4 A- X
- 5 B- X
- 6 I- X
- 7 Amp enable X
- 8 Sign/dir X
- 9 Reverse limit X
- 10 Ground
- 11 A+ X
- 12 B+ X
- 13 I+ X
- 14 Motor command X
- 15 PWM/step X

J10 Auxiliary Encoders

for X, Y, Z, W 25-pin D-Sub

- 1 Reset -
- 2 -AB W
- 3 -AA W
- 4 -AB Z
- 5 -AA Z
- 6 -AB Y
- 7 -AA Y
- 8 -AB X
- 9 -AA X
- 10 nc
- 11 nc
- 12 nc
- 13 nc
- 14 Error Output
- 15 +AB W
- 16 +AA W
- 17 +AB Z
- 18 +AA Z
- 19 +AB Y
- 20 +AA Y
- 21 +AB X
- 22 +AA X
- 23 nc
- 24 nc
- 25 nc

J11 I/O 25-pin D-Sub

- 1 Ground
- 2 Latch X/Input 1
- 3 Latch Z/Input 3
- 4 Input 5
- 5 Input 7
- 6 Abort
- 7 Output 1
- 8 Output 3
- 9 Output 5
- 10 Output 7
- 11 Ground
- 12 nc
- 13 nc
- 14 VCC
- 15 Latch Y/Input 2
- 16 Latch W/Input 4
- 17 Input 6
- 18 Input 8
- 19 Encoder-compare output
- 20 Output 2
- 21 Output 4
- 22 Output 6
- 23 Output 8
- 24 VCC
- 25 nc

CONNECTORS—SDM-20240

SDM-20240 Interconnect with four 1.4A stepper drives

J1 Power	J8 Z-axis 9-pin D-sub	JP1 Stepper Configuration Jumpers
1 +24V	1 Forward limit Z	JP1.1 Ground
2 Ground	2 Home Z	JP1.2 Amp enable
3 +24V	3 VCC	JP1.3 Ground
4 Ground	4 A- Z	JP1.4 Amp enable-low
	5 B- Z	JP1.5 Ground
	6 Reverse limit Z	JP1.6 FULL/HALF
	7 Ground	
	8 A+ Z	JP3 Current Control Jumpers
	9 B+ Z	JP3.1 REF1
J2 Motor Output X		JP3.2 XREF
1 XMOA+	J9 W-axis 9-pin D-sub	JP3.3 REF2
2 XMOA-	1 Forward limit W	JP3.4 XREF
3 XMOB+	2 Home W	JP3.5 REF3
4 XMOB-	3 VCC	JP3.6 XREF
	4 A- W	JP3.7 REF4
	5 B- W	JP3.8 XREF
	6 Reverse limit W	JP4.1 REF1
	7 Ground	JP4.2 YREF
	8 A+ W	JP4.3 REF2
	9 B+ W	JP4.4 YREF
J3 Motor Output Y		JP4.5 REF3
1 YMOA+	J11 I/O 25-pin D-sub	JP4.6 YREF
2 YMOA-	1 Ground	JP4.7 REF4
3 YMOB+	2 Latch X/Input 1	JP4.8 YREF
4 YMOB-	3 Latch Z/Input 3	JP5.1 REF1
	4 Input 5	JP5.2 ZREF
	5 Input 7	JP5.3 REF2
	6 Abort	JP5.4 ZREF
	7 Output 1	JP5.5 REF3
	8 Output 3	JP5.6 ZREF
	9 Output 5	JP5.7 REF4
	10 Output 7	JP5.8 ZREF
	11 Ground	JP6.1 REF1
	12 nc	JP6.2 WREF
	13 nc	JP6.3 REF2
	14 VCC	JP6.4 WREF
	15 Latch Y/Input 2	JP6.5 REF3
	16 Latch W/Input 4	JP6.6 WREF
	17 Input 6	JP6.7 REF4
	18 Input 8	JP6.8 WREF
	19 Encoder-compare output	
	20 Output 2	
	21 Output 4	
	22 Output 6	
	23 Output 8	
	24 VCC	
	25 nc	
J4 Motor Output Z		
1 ZMOA+		
2 ZMOA-		
3 ZMOB+		
4 ZMOB-		
J5 Motor Output W		
1 WMOA+		
2 WMOA-		
3 WMOB+		
4 WMOB-		
J6 X-axis 9-pin D-sub		
1 Forward limit X		
2 Home X		
3 VCC		
4 A- X		
5 B- X		
6 Reverse limit X		
7 Ground		
8 A+ X		
9 B+ X		
J7 Y-axis 9-pin D-sub		
1 Forward limit Y		
2 Home Y		
3 VCC		
4 A- Y		
5 B- Y		
6 Reverse limit Y		
7 Ground		
8 A+ Y		
9 B+ Y		

SPECIFICATIONS

SYSTEM PROCESSOR

- Motorola 32-bit microcomputer

COMMUNICATIONS INTERFACE

- Ethernet 10BASE-T. (1) RS232 port up to 19.2 Kb

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

MODES OF MOTION

- Point-to-point positioning
- Jogging
- 2D Linear and Circular Interpolation with feedrate override
- Linear Interpolation
- Tangential Following
- Helical
- Electronic Gearing with multiple masters
- Gantry Mode
- Electronic Cam
- Contouring
- Teach

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 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/sec²

UNCOMMITTED DIGITAL I/O

- 8 buffered inputs for 1–4 axes; 16 for 5–8 axes
- 8 TTL outputs for 1–4 axes; 16 for 5–8 axes
- I/O expansion with IOC-7007
- 64 configurable I/O with DB-14064 expansion

HIGH SPEED POSITION LATCH

- Uncommitted inputs 1–4 latch X, Y, Z, W; 9–12 latch E, F, G, H (latches within .1 microsecond)

DEDICATED INPUTS (PER AXIS)

- Main encoder inputs—Channel A, A-, B, B-, I, I- (± 12 V or TTL)
- Auxiliary encoder inputs for each servo axis
- Forward and reverse limit inputs—TTL
- Home input—TTL
- High-speed position latch input

DEDICATED OUTPUTS (PER AXIS)

- Analog motor command output with 16-bit DAC resolution
- Pulse and direction output for step motors
- Amplifier enable output
- Error output
- High-speed position compare output

MINIMUM SERVO LOOP UPDATE RATE

- 1–2 axes: 125 microsecond
- 3–4 axes: 250 microsecond
- 5–6 axes: 375 microsecond
- 7–8 axes: 500 microsecond

MAXIMUM ENCODER FEEDBACK RATE

- 12 MHz

MAXIMUM STEPPER RATE

- 3 MHz (Full, half or microstep)

POWER REQUIREMENTS

- | | 1–4 axes | 5–8 axes |
|--------|----------|----------|
| ■ +5V | .8A | 1.4A |
| ■ -12V | 20mA | 40mA |
| ■ +12V | 20mA | 40mA |
- *DC-to-DC converter option:* 18 V to 36 V input for DC24
36 V to 72 V input for DC48

ENVIRONMENTAL

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

MECHANICAL

- 1–4 axes card: 4.25" × 7.0"
- 5–8 axes card: 4.25" × 10.75"

INSTRUCTION SET

SERVO MOTOR COMMANDS

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
OF	Offset
PL	Pole
SH	Servo here
TL	Torque limit
TM	Sample time

STEPPER MOTOR COMMANDS

DE	Define encoder position
DP	Define reference position
KS	Stepper motor smoothing
MT	Motor type
RP	Report commanded position
TD	Step counts output
TP	Tell position of encoder

BRUSHLESS MOTOR COMMANDS

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 COMMANDS

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

SYSTEM CONFIGURATION

AO	Analog output
BN	Burn parameters
BP	Burn program
BV	Burn variables and arrays
CE	Configure encoder type
CN	Configure switches

SYSTEM CONFIGURATION (Cont.)

CO	Configure I/O points
CW	Data adjustment bit
DE	Define dual encoder position
DP	Define position
DV	Dual velocity (dual loop)
EO	Echo off
IA	Set IP address
IH	Internet handle
IT	Independent smoothing
LZ	Leading zeros format
MB	ModBus
MO	Motor off
MT	Motor type
PF	Position format
QD	Download array
QU	Upload array
RS	Reset
VF	Variable format

MATH/SPECIAL FUNCTIONS

@SIN[x]	Sine of x
@COS[x]	Cosine of x
@COM[x]	1's compliment 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
@IN[x]	State of digital input x
@OUT[x]	State of digital output x
@AN[x]	Value of analog input x

INTERROGATION COMMANDS

LA	List arrays
LL	List labels
LS	List program
LV	List variables
MG	Message command
QR	Data record
QZ	Return DMA information
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
TP	Tell position

INTERROGATION COMMANDS (Cont.)

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

PROGRAMMING COMMANDS

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 remarks
RA	Record array
RC	Record interval
RD	Record data
REM	Remark program
UL	Upload program
ZS	Zero stack

ERROR CONTROL COMMANDS

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 COMMANDS

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 COMMANDS

AB	Abort motion
AC	Acceleration
BG	Begin motion
DC	Deceleration
FE	Find edge

INDEPENDENT MOTION COMMANDS (Cont.)

FI	Find index
HM	Home
IP	Increment position
IT	Smoothing time constant
JG	Jog mode
PA	Position absolute
PR	Position relative
SP	Speed
ST	Stop

CONTOUR MODE COMMANDS

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

ECAM/GEARING

EA	Ecram master
EB	Enable ECAM
EC	Ecram table index
EG	Ecram go
EM	ECAM cycle
EP	ECAM interval
EQ	Disengage ECAM
ET	Ecram table entry
GA	Master axis for gearing
GM	Gantry mode
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