Description

The DigiFlex® Performance™ (DP) Series digital servo drives are designed to drive brushed and brushless servomotors. These fully digital drives operate in torque, velocity, or position mode and employ Space Vector Modulation (SVM), which results in higher bus voltage utilization and reduced heat dissipation compared to traditional PWM. The drive can be configured for a variety of external command signals. Commands can also be configured using the drive's built-in Motion Engine, an internal motion controller used with distributed motion applications. In addition to motor control, these drives feature dedicated and programmable digital and analog inputs and outputs to enhance interfacing with external controllers and devices.

This DP Series drive features a CANopen interface for networking and a RS-232 interface for drive configuration and setup. Drive commissioning is accomplished using DriveWare® 7, available for download at www.a-m-c.com.

All drive and motor parameters are stored in non-volatile memory.

Power Range

Peak Current	60 A (42.4 A_{RMS})
Continuous Current	30 A (21.2 A_{RMS})
Supply Voltage	100 - 240 VAC

Features

- Four Quadrant Regenerative Operation
- Space Vector Modulation (SVM) Technology
- Fully Digital State-of-the-art Design
- Programmable Gain Settings
- Fully Configurable Current, Voltage, Velocity and Position Limits
- PIDF Velocity Loop
- PID + FF Position Loop
- Compact Size, High Power Density
- 16-bit Analog to Digital Hardware
- Built-in brake/shunt regulator
- Internal brake/shunt resistor
- On-the-Fly Mode Switching
- On-the-Fly Gain Set Switching

MODES OF OPERATION
- Profile Current
- Profile Velocity
- Profile Position
- Cyclic Synchronous Current Mode
- Cyclic Synchronous Velocity Mode
- Cyclic Synchronous Position Mode

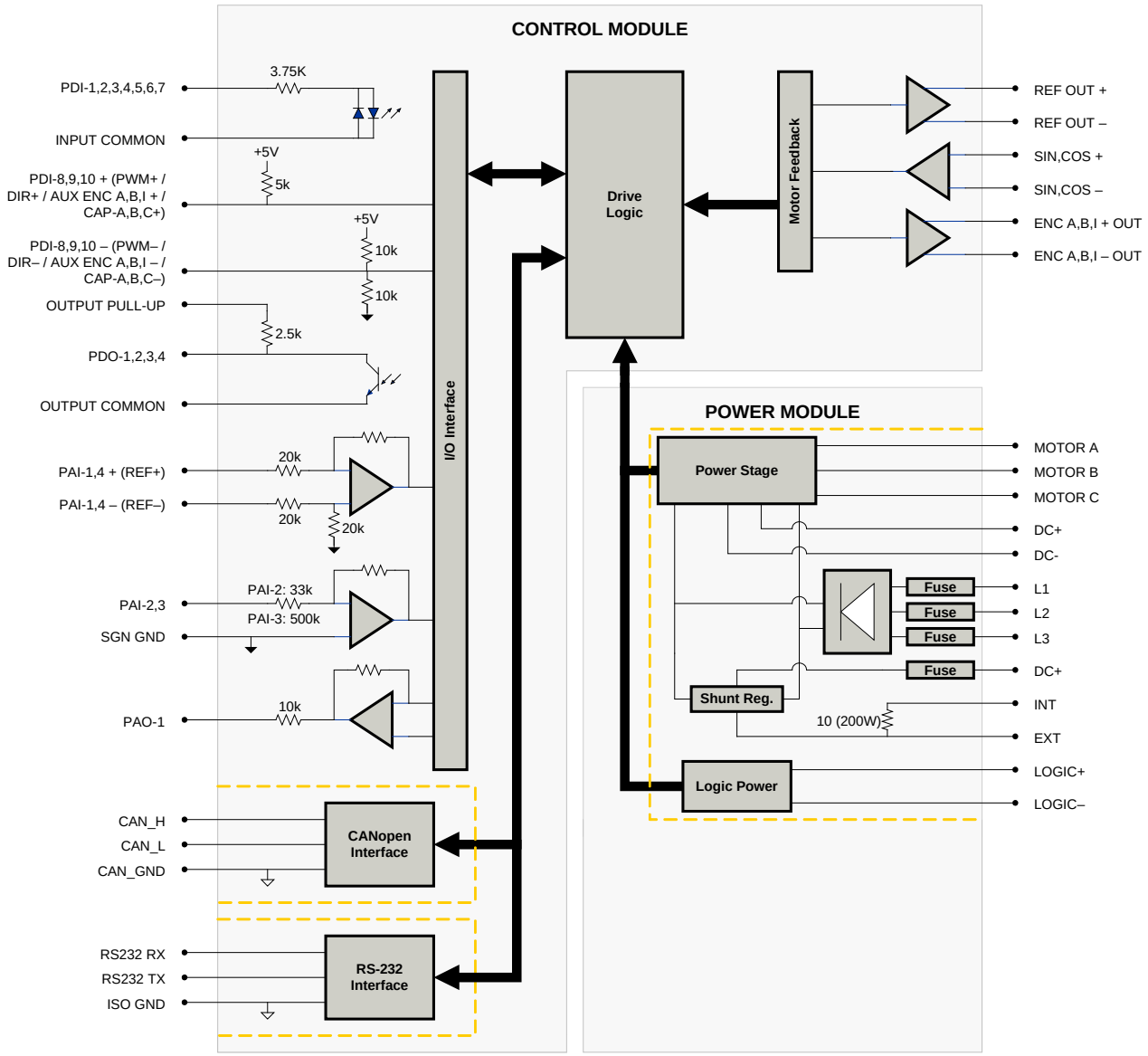
COMMAND SOURCE
- ±10 V Analog
- PWM and Direction
- Encoder Following
- Over the Network
- Indexing
- Jogging

FEEDBACK SUPPORTED
- Resolver
- Auxiliary Incremental Encoder
- Tachometer (±10 VDC)

INPUTS/OUTPUTS
- 3 High Speed Captures
- 4 Programmable Analog Inputs (16-bit/12-bit Resolution)
- 1 Programmable Analog Output (10-bit Resolution)
- 3 Programmable Digital Inputs (Differential)
- 7 Programmable Digital Inputs (Single-Ended)
- 4 Programmable Digital Outputs (Single-Ended)

COMPLIANCES & AGENCY APPROVALS
- UL
- cUL
- CE Class A (LVD)
- CE Class A (EMC)
- RoHS

BLOCK DIAGRAM



Information on Approvals and Compliances	
cULus	US and Canadian safety compliance with UL 508c, the industrial standard for power conversion electronics. UL registered under file number E140173. Note that machine components compliant with UL are considered UL registered as opposed to UL listed as would be the case for commercial products.
CE	Compliant with European CE for both the Class A EMC Directive 2004/108/EC on Electromagnetic Compatibility (specifically EN 61000-6-4:2007 and EN 61000-6-2:2005) and LVD requirements of directive 2006/95/EC (specifically EN 60204-1:2006), a low voltage directive to protect users from electrical shock.
RoHS COMPLIANCE	RoHS (Reduction of Hazardous Substances) is intended to prevent hazardous substances such as lead from being manufactured in electrical and electronic equipment.

SPECIFICATIONS

Power Specifications		
Description	Units	Value
Rated Voltage	VAC (VDC)	240 (339)
AC Supply Voltage Range	VAC	100 - 240
AC Supply Minimum	VAC	90
AC Supply Maximum	VAC	264
AC Input Phases[1]	-	3
AC Supply Frequency	Hz	50 - 60
DC Supply Voltage Range[2]	VDC	127 - 373
DC Bus Over Voltage Limit	VDC	429
DC Bus Under Voltage Limit	VDC	55
Logic Supply Voltage	VDC	20 - 30 (@ 850 mA)
Maximum Peak Output Current[3]	A (Arms)	60 (42.4)
Maximum Continuous Output Current	A (Arms)	30 (21.2)
Max. Continuous Output Power @ Rated Voltage[4]	W	6840
Max. Continuous Power Dissipation @ Rated Voltage	W	360
Internal Bus Capacitance	µF	1650
External Shunt Resistor Minimum Resistance	Ω	10
Minimum Load Inductance (Line-To-Line)[5]	µH	600
Switching Frequency	kHz	20
Maximum Output PWM Duty Cycle	%	100
Internal Shunt Fuse Rating	A	5 A time-delay fuse
AC Line Fuse Rating	A	20 A fast-acting fuses
Low Voltage Supply Outputs	-	+5 VDC (250 mA)

Control Specifications		
Description	Units	Value
Communication Interfaces	-	CANopen (RS-232 for configuration)
Command Sources	-	±10 V Analog, Encoder Following, Over the Network, PWM and Direction, Indexing, Jogging
Feedback Supported	-	Auxiliary Incremental Encoder, Resolver, Tachometer (±10 VDC)
Commutation Methods	-	Sinusoidal
Modes of Operation	-	Profile Current, Profile Velocity, Profile Position, Cyclic Synchronous Current Mode, Cyclic Synchronous Velocity Mode, Cyclic Synchronous Position Mode
Motors Supported	-	Closed Loop Vector, Single Phase (Brushed, Voice Coil, Inductive Load), Three Phase (Brushless)
Hardware Protection	-	40+ Configurable Functions, Over Current, Over Temperature (Drive & Motor), Over Voltage, Short Circuit (Phase-Phase & Phase-Ground), Under Voltage
Programmable Digital Inputs/Outputs (PDIs/PDOs)	-	10/4
Programmable Analog Inputs/Outputs (PAIs/PAOs)	-	4/1
Primary I/O Logic Level	-	24 VDC
Current Loop Sample Time	µs	50
Velocity Loop Sample Time	µs	100
Position Loop Sample Time	µs	100
Resolver Reference/Excitation Signal	Vrms	4 Vrms @ 5 kHz
Expected Resolver Transformation Ratio	Vrms	0.5
Feedback Resolution / Emulated Encoder Resolution[6]	bit	High Resolution Setting: 14, Low Resolution Setting: 12
Maximum Motor Speed Per Feedback Resolution	RPM	High Resolution Setting: 5000, Low Resolution Setting: 20000
Internal Shunt Regulator	-	Yes
Internal Shunt Resistor	-	Yes

Mechanical Specifications		
Description	Units	Value
Agency Approvals	-	CE Class A (EMC), CE Class A (LVD), cUL, RoHS, UL
Size (H x W x D)	mm (in)	234.7 x 161.8 x 151.3 (9.2 x 6.4 x 6)
Weight	g (oz)	4504 (158.9)
Heatsink (Base) Temperature Range[7]	°C (°F)	0 - 75 (32 - 167)
Storage Temperature Range	°C (°F)	-40 - 85 (-40 - 185)
Form Factor	-	Panel Mount
Cooling System	-	Natural Convection
IP Rating	-	IP10
+24V LOGIC Connector	-	2-port, 5.08 mm spaced, enclosed, friction lock header with threaded flange
AUX COMM Connector	-	3-pin, 2.5 mm spaced, enclosed, friction lock header
AUX ENCODER Connector	-	15-pin, high-density, male D-sub
COMM Connector	-	Shielded, dual RJ-45 socket with LEDs
DC BUS / BRAKE RESISTOR Connector	-	5-contact, 13 mm spaced, dual-barrier terminal block
FEEDBACK Connector	-	15-pin, high-density, female D-sub
I/O Connector	-	26-pin, high-density, female D-sub
MOTOR POWER / DC BUS Connector	-	5-contact, 13 mm spaced, dual-barrier terminal block
POWER Connector	-	5-contact, 13 mm spaced, dual-barrier terminal block

1. Can operate on single-phase VAC if peak/cont. current ratings are reduced by at least 30%.
2. Large inrush current may occur upon initial DC supply connection to DC Bus.
3. Capable of supplying drive rated peak current for 2 seconds with 10 second foldback to continuous value. Longer times are possible with lower current limits.
4. P = (DC Rated Voltage) * (Cont. RMS Current) * 0.95.
5. Lower inductance is acceptable for bus voltages well below maximum. Use external inductance to meet requirements.
6. Higher and lower resolution options are available. Contact Applications Engineering for more information.
7. Additional cooling and/or heatsink may be required to achieve rated performance.

PIN FUNCTIONS

+24V LOGIC - Logic Power Connector

Pin	Name	Description / Notes	I/O
1	LOGIC GND	Logic Supply Ground	GND
2	LOGIC PWR	Logic Supply Input	I

AUX COMM - RS232 Communication Connector

Pin	Name	Description / Notes	I/O
1	RS232 RX	Receive Line (RS-232)	I
2	RS232 TX	Transmit Line (RS-232)	O
3	ISO GND	Isolated Signal Ground	IGND

AUX ENCODER - Auxiliary Feedback Connector

Pin	Name	Description / Notes	I/O
1	RESERVED	Reserved	-
2	RESERVED	Reserved	-
3	RESERVED	Reserved	-
4	PDI-8 + (PWM+ / AUX ENC A+ / CAP-B+)	Programmable Digital Input or PWM or Auxiliary Encoder or High Speed Capture (For Single-Ended Signals Leave Negative Terminal Open)	I
5	PDI-8 - (PWM- / AUX ENC A- / CAP-B-)		I
6	PDI-9 + (DIR+ / AUX ENC B+ / CAP-C+)	Programmable Digital Input or Direction Input or Auxiliary Encoder or High Speed Capture (For Single-Ended Signals Leave Negative Terminal Open)	I
7	PDI-9 - (DIR- / AUX ENC B- / CAP-C-)		I
8	PDI-10 + (AUX ENC I+ / CAP-A+)	Programmable Digital Input or Auxiliary Encoder or High Speed Capture (For Single-Ended Signals Leave Negative Terminal Open)	I
9	PDI-10 - (AUX ENC I- / CAP-A-)		I
10	SGN GND	Signal Ground	SGND
11	SGN GND	Signal Ground	SGND
12	SGN GND	Signal Ground	SGND
13	+5V OUT	+5V Encoder Supply Output (Short Circuit Protected)	O
14	PAI-4 +	Differential Programmable Analog Input (12-bit Resolution)	I
15	PAI-4 -		I

COMM - CAN Communication Connector

Pin	Name	Description / Notes	I/O
1	CAN_H	CAN_H Line (Dominant High)	I
2	CAN_L	CAN _L Line (Dominant Low)	I
3	CAN_GND	CAN Ground	CGND
4	RESERVED	Reserved	-
5	RESERVED	Reserved	-
6	RESERVED	Reserved	-
7	CAN_GND	CAN Ground	CGND
8	RESERVED	Reserved	-

DC BUS / BRAKE RESISTOR - Power Connector

Pin	Name	Description / Notes	I/O
1	HIGH VOLTAGE	DC Bus Output	O
2	POWER GND		PGND
3	EXT	External Brake Resistor Connection.	-
4	DC+	Brake Resistor DC+. Connection for brake resistor.	O
5	INT	Internal Brake Resistor. Jumper to Brake Resistor DC+ to activate.	-

FEEDBACK - Feedback Connector			
Pin	Name	Description / Notes	I/O
1	RESERVED	Reserved	-
2	RESERVED	Reserved	-
3	RESERVED	Reserved	-
4	REF OUT +	Resolver Reference/Excitation Output	O
5	REF OUT -		O
6	SIN+	Resolver Sine Input	I
7	SIN-		I
8	COS+	Resolver Cosine Input	I
9	COS-		I
10	RESERVED	Reserved	-
11	RESERVED	Reserved	-
12	SGN GND	Signal Ground	SGND
13	+5V OUT	+5V Encoder Supply Output (Short Circuit Protected)	O
14	PAI-3	Programmable Analog Input (12-bit Resolution)	I
15	RESERVED	Reserved	-

I/O - Signal Connector			
Pin	Name	Description / Notes	I/O
1	PDO-1	Isolated Programmable Digital Output	O
2	OUTPUT COMMON	Digital Output Common	OGND
3	PDO-2	Isolated Programmable Digital Output	O
4	PAI-1 + (REF+)	Differential Programmable Analog Input or Reference Signal Input (16-bit Resolution)	I
5	PAI-1 - (REF-)		I
6	PAI-2	Programmable Analog Input (12-bit Resolution)	I
7	PAO-1	Programmable Analog Output (10-bit Resolution)	O
8	OUTPUT PULL-UP	Digital Output Pull-Up For User Outputs	I
9	PDI-5	Isolated Programmable Digital Input	I
10	PDO-3	Isolated Programmable Digital Output	O
11	PDI-1	Isolated Programmable Digital Input	I
12	PDI-2	Isolated Programmable Digital Input	I
13	PDI-3	Isolated Programmable Digital Input	I
14	PDO-4	Isolated Programmable Digital Output	O
15	INPUT COMMON	Digital Input Common (Can Be Used To Pull-Up Digital Inputs)	IGND
16	SGN GND	Signal Ground	SGND
17	PDI-4	Isolated Programmable Digital Input	I
18	PDI-6	Isolated Programmable Digital Input	I
19	PDI-7	Isolated Programmable Digital Input	I
20	ENC A+ OUT	Emulated Encoder Channel A Output	O
21	ENC A- OUT		O
22	ENC B+ OUT	Emulated Encoder Channel B Output	O
23	ENC B- OUT		O
24	ENC I+ OUT	Emulated Encoder Index Output	O
25	ENC I- OUT		O
26	SGN GND	Signal Ground	SGND

MOTOR POWER / DC BUS - Power Connector			
Pin	Name	Description / Notes	I/O
1	MOTOR A	Motor Phase A	O
2	MOTOR B	Motor Phase B	O
3	MOTOR C	Motor Phase C	O
4	POWER GND	Power Ground (Isolated From Signal Ground)	PGND
5	HIGH VOLTAGE	DC Power Input	I

POWER - Power Connector			
Pin	Name	Description / Notes	I/O
1	L1	AC Supply Input (Three Phase)	I
2	L2		I
3	L3		I
4	PE	Protective Earth Ground	-
5	RESERVED	Reserved	-

HARDWARE SETTINGS

Switch Functions

Switch	Description	Setting	
		On	Off
1	Bit 0 of binary CANopen node ID. Does not affect RS-232 settings.	1	0
2	Bit 1 of binary CANopen node ID. Does not affect RS-232 settings.	1	0
3	Bit 2 of binary CANopen node ID. Does not affect RS-232 settings.	1	0
4	Bit 3 of binary CANopen node ID. Does not affect RS-232 settings.	1	0
5	Bit 4 of binary CANopen node ID. Does not affect RS-232 settings.	1	0
6	Bit 5 of binary CANopen node ID. Does not affect RS-232 settings.	1	0
7	Bit 0 of drive CANopen bit rate setting. Does not affect RS-232 settings.	1	0
8	Bit 1 of drive CANopen bit rate setting. Does not affect RS-232 settings.	1	0

Additional Details

The drive can be configured to use the address and/or bit rate stored in non-volatile memory by setting the address and/or bit rate value to 0. Use the table below to map actual bit rates to a bit rate setting.

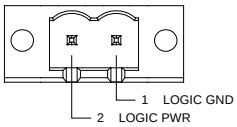
Bit Rate (kbits/sec)	Value For Bit Rate Setting
Load from non-volatile memory	0
500	1
250	2
125	3

Jumper Settings

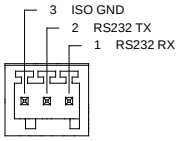
Jumper	Description	Configuration		
	Header Jumper	Not Installed	Pins 1-2	Pins 2-3
J1	CAN bus termination. Install this jumper (2.54mm) on the last drive in a CAN network. This jumper is located on a 4-pin header adjacent to the RS-232 connector. It consists of the two pins furthest from the connector.	Non-terminating Node	Terminating Node	N/A
J2	Reserved.	-	-	N/A

MECHANICAL INFORMATION

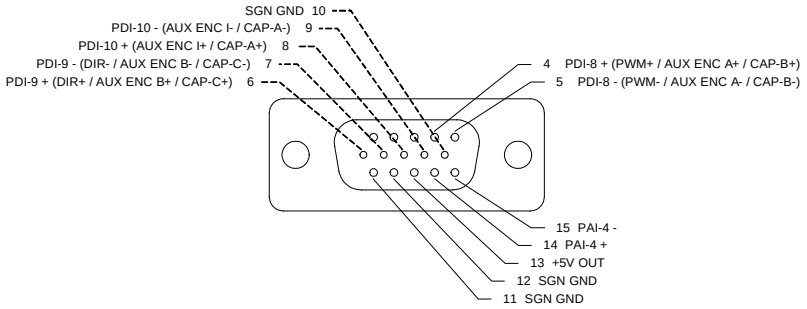
+24V LOGIC - Logic Power Connector		
Connector Information		2-port, 5.08 mm spaced, enclosed, friction lock header with threaded flange
Mating Connector	Details	Phoenix Contact: P/N 1777808
	Included with Drive	Yes



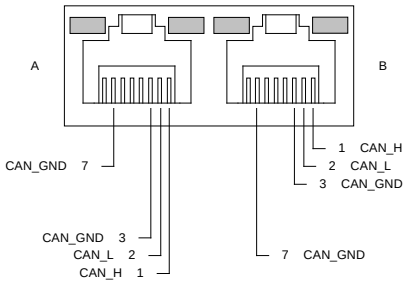
AUX COMM - RS232 Communication Connector		
Connector Information		3-pin, 2.5 mm spaced, enclosed, friction lock header
Mating Connector	Details	Phoenix: Plug P/N 1881338
	Included with Drive	Yes



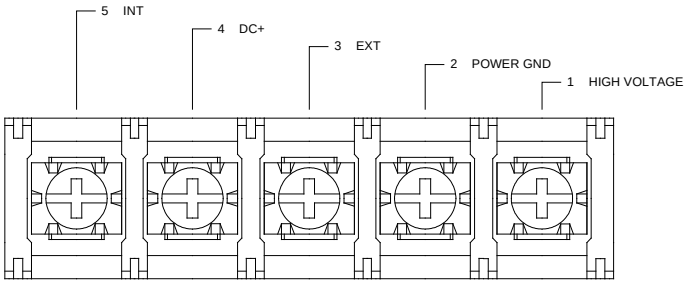
AUX ENCODER - Auxiliary Feedback Connector		
Connector Information		15-pin, high-density, male D-sub
Mating Connector	Details	TYCO: Plug P/N 1658681-1; Housing P/N 5748677-1; Terminals P/N 1658686-2 (loose) or 1658686-1 (strip)
	Included with Drive	No



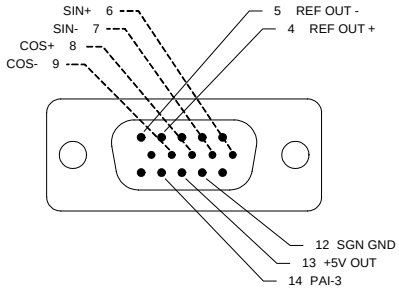
COMM - CAN Communication Connector		
Connector Information		Shielded, dual RJ-45 socket with LEDs
Mating Connector	Details	AMP: Plug P/N 5-569552-3
	Included with Drive	No



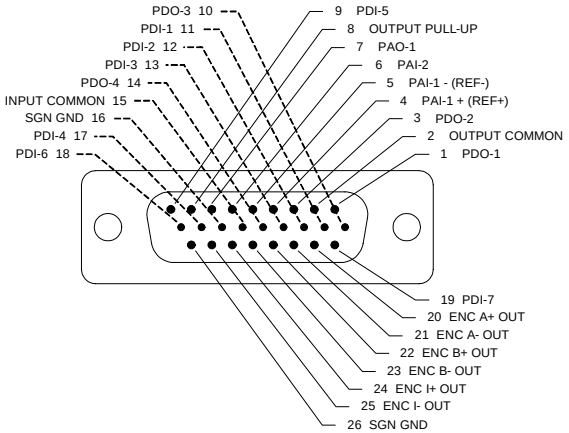
DC BUS / BRAKE RESISTOR - Power Connector		
Connector Information		5-contact, 13 mm spaced, dual-barrier terminal block
Mating Connector	Details	Not applicable
	Included with Drive	Not applicable



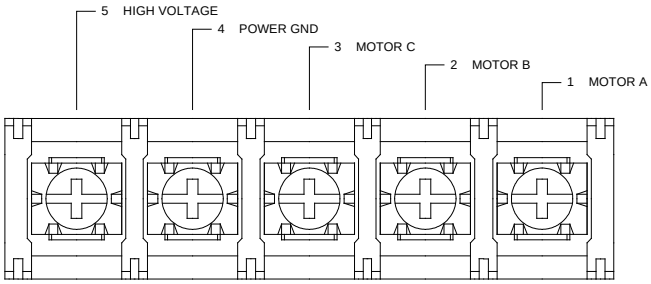
FEEDBACK - Feedback Connector		
Connector Information		15-pin, high-density, female D-sub
Mating Connector	Details	TYCO: Plug P/N 748364-1; Housing P/N 5748677-1; Terminals P/N 1658670-2 (loose) or 1658670-1 (strip)
	Included with Drive	No



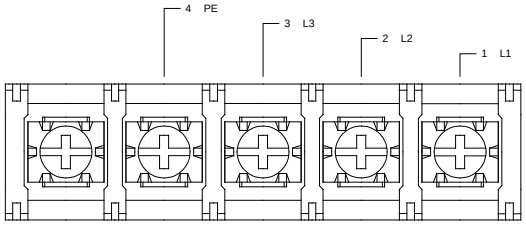
I/O - Signal Connector		
Connector Information		26-pin, high-density, female D-sub
Mating Connector	Details	TYCO: Plug P/N 1658671-1; Housing P/N 5748677-2; Terminals P/N 1658670-2 (loose) or 1658670-1 (strip)
	Included with Drive	No



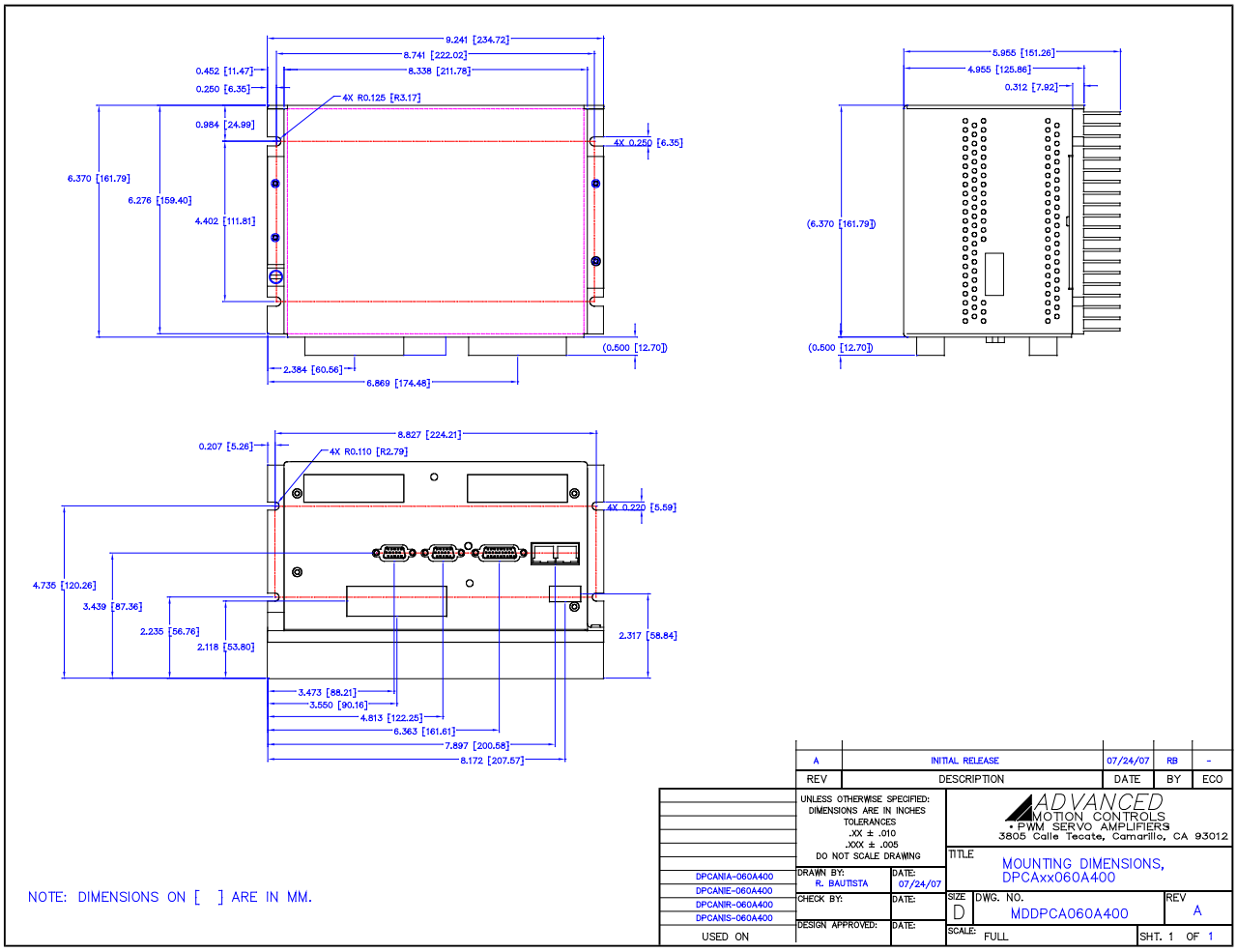
MOTOR POWER / DC BUS - Power Connector		
Connector Information		5-contact, 13 mm spaced, dual-barrier terminal block
Mating Connector	Details	Not applicable
	Included with Drive	Not applicable



POWER - Power Connector		
Connector Information		5-contact, 13 mm spaced, dual-barrier terminal block
Mating Connector	Details	Not applicable
	Included with Drive	Not applicable



MOUNTING DIMENSIONS



PART NUMBERING INFORMATION

Example: D P R A N I E - 0 1 5 A 4 0 0 -

Drive Series	
DP	DigiFlex Performance

Communication	
R	RS232/RS485
C	CANopen or RS232
E	EtherCAT
Q	SynqNet

Command Inputs	
AN	Analog (±10V) No Step & Direction
AL	Analog (±10V) Low Voltage Step & Direction (5V)
AH	Analog (±10V) High Voltage Step & Direction (24V)
NL	No Analog Low Voltage Step & Direction (5V)
NN	No Analog, No Step & Direction (Communication Interface Only)

Digital I/O	
I	Isolated (24V)
T	TTL (5V) Non-Isolated

Motor Feedback	
E	Incremental Encoder and/or Halls
R	Resolver
A	Absolute Sin/Cos (Hiperface & Endat)
S	Sin/Cos with Halls
U	Universal (Halls, Inc. Enc., Abs. Enc., 1Vp-p Sin/Cos Enc.)

Customer Special
Code used to identify customer specials

Max DC Bus Voltage (V_{DC})	
080	80
200	200
400	400
800	800

Power and Logic Supply	
A	AC Input +24V_{DC} User Logic Supply Required
S	AC Input Single Phase Only +24V_{DC} User Logic Supply Required
B	DC Input Both Logic Supply Options (Internal or User)
L	DC Input Logic Supply Required

Peak Current ($A_{0\ to\ Peak}$)	
015	15
016	16
020	20
025	25
030	30
040	40
060	60
100	100

DigiFlex® Performance™ series of products are available in many configurations. Note that not all possible part number combinations are offered as standard drives. All models listed in the selection tables of the website are readily available, standard product offerings.

ADVANCED Motion Controls also has the capability to promptly develop and deliver specified products for OEMs with volume requests. Our Applications and Engineering Departments will work closely with your design team through all stages of development in order to provide the best servo drive solution for your system. Equipped with on-site manufacturing for quick-turn customs capabilities, *ADVANCED* Motion Controls utilizes our years of engineering and manufacturing expertise to decrease your costs and time-to-market while increasing system quality and reliability. Feel free to contact Applications Engineering for further information and details.

Examples of Customized Products

- Optimized Footprint
- Private Label Software
- OEM Specified Connectors
- No Outer Case
- Increased Current Resolution
- Increased Temperature Range
- Custom Control Interface
- Integrated System I/O
- Tailored Project File
- Silkscreen Branding
- Optimized Base Plate
- Increased Current Limits
- Increased Voltage Range
- Conformal Coating
- Multi-Axis Configurations
- Reduced Profile Size and Weight

Available Accessories

ADVANCED Motion Controls offers a variety of accessories designed to facilitate drive integration into a servo system. Visit www.a-m-c.com to see which accessories will assist with your application design and implementation.

Drive(s)

Filter Cards

To Motor

All specifications in this document are subject to change without written notice. Actual product may differ from pictures provided in this document.