

**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 single RS-232/RS-485 interface used for drive configuration and setup. Drive commissioning is accomplished using DriveWare® 7, available for download at [www.a-m-c.com](http://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 <sub>RMS</sub> )
Continuous Current	30 A (21.2 A <sub>RMS</sub> )
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**

- Current
- Position
- Velocity

**COMMAND SOURCE**

- PWM and Direction
- Encoder Following
- Over the Network
- ±10 V Analog
- 24V Step and Direction
- Indexing
- Jogging

**FEEDBACK SUPPORTED**

- Resolver
- ±10 VDC Position
- Auxiliary Incremental Encoder
- Tachometer (±10 VDC)

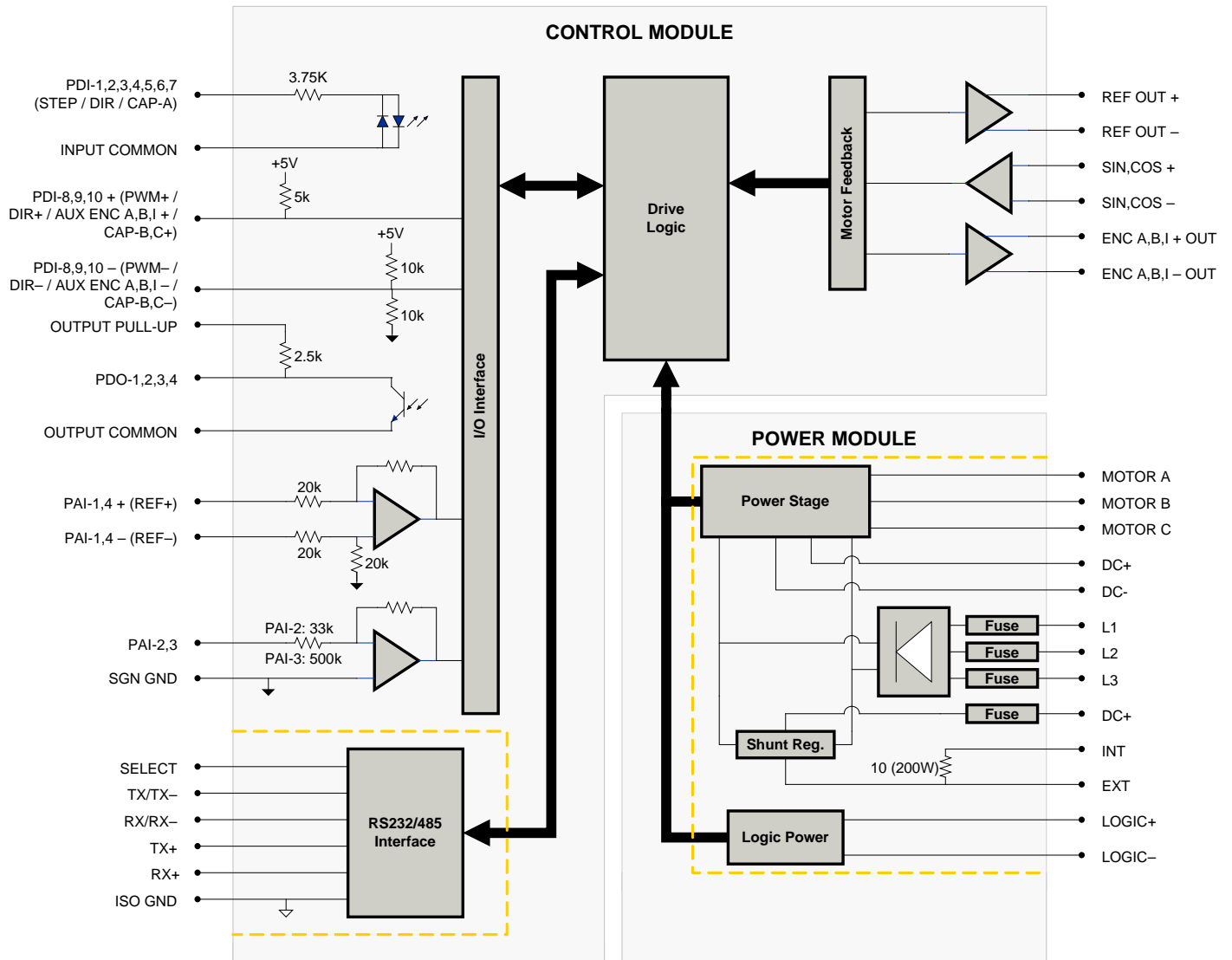
**INPUTS/OUTPUTS**

- 3 High Speed Captures
- 4 Programmable Analog Inputs (16-bit/12-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**



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.



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 (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 <sup>1</sup>	-	3	
AC Supply Frequency	Hz	50 - 60	
DC Supply Voltage Range <sup>2</sup>	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 <sup>3</sup>	A (Arms)	60 (42.4)	
Maximum Continuous Output Current	A (Arms)	30 (21.2)	
Max. Continuous Output Power @ Rated Voltage <sup>4</sup>	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) <sup>5</sup>	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	-	RS-485/232	
Command Sources	-	±10 V Analog, 24V Step and Direction, Encoder Following, Over the Network, PWM and Direction, Indexing, Jogging	
Feedback Supported	-	±10 VDC Position, Auxiliary Incremental Encoder, Resolver, Tachometer (±10 VDC)	
Commutation Methods	-	Sinusoidal	
Modes of Operation	-	Current, Position, Velocity	
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)	-	4/0	
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 <sup>6</sup>	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)	4495 (158.6)	
Heatsink (Base) Temperature Range <sup>7</sup>	°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 ENCODER Connector	-	15-pin, high-density, male D-sub	
COMM Connector	-	9-pin, female D-sub	
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	

**Notes**

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

**PIN FUNCTIONS**

<b>+24V LOGIC - Logic Power Connector</b>			
Pin	Name	Description / Notes	I/O
1	LOGIC GND	Logic Supply Ground	GND
2	LOGIC PWR	Logic Supply Input	I

<b>AUX ENCODER - Auxiliary Feedback Connector</b>			
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-)	Programmable Digital Input or PWM or Auxiliary Encoder or High Speed Capture (For Single-Ended Signals Leave Negative Terminal Open)	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-)	Programmable Digital Input or Direction Input or Auxiliary Encoder or High Speed Capture (For Single-Ended Signals Leave Negative Terminal Open)	I
8	PDI-10 +	Programmable Digital Input (For Single-Ended Signals Leave Negative Terminal Open)	I
9	PDI-10 -	Programmable Digital Input (For Single-Ended Signals Leave Negative Terminal Open)	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 -	Differential Programmable Analog Input (12-bit Resolution)	I

<b>COMM - RS232/RS485 Communication Connector</b>			
Pin	Name	Description / Notes	I/O
1	SELECT	RS232/485 selection. Pull to ground (CN1-5) for RS485.	I
2	RS232 TX / RS485 TX-	Transmit Line (RS-232 or RS-485)	O
3	RS232 RX / RS485 RX-	Receive Line (RS-232 or RS-485)	I
4	RESERVED	Reserved	-
5	ISO GND	Isolated Signal Ground	IGND
6	RS485 TX+	Transmit Line (RS-485)	O
7	RESERVED	Reserved	-
8	RS485 RX+	Receive Line (RS-485)	I
9	RESERVED	Reserved	-

<b>DC BUS / BRAKE RESISTOR - Power Connector</b>			
Pin	Name	Description / Notes	I/O
1	HIGH VOLTAGE	DC Bus Output	O
2	POWER GND	DC Bus Output	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.	-

<b>FEEDBACK - Feedback Connector</b>			
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 -	Resolver Reference/Excitation Output	O
6	SIN+	Resolver Sine Input	I
7	SIN-	Resolver Sine Input	I
8	COS+	Resolver Cosine Input	I
9	COS-	Resolver Cosine Input	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	SGN GND	Signal Ground	SGND
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 (STEP)	Isolated Programmable Digital Input or Step	I
18	PDI-6 (DIR)	Isolated Programmable Digital Input or Direction	I
19	PDI-7 (CAP-A)	Isolated Programmable Digital Input or High Speed Capture	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 RS-485 drive address. Does not affect RS-232 settings.	1	0
2	Bit 1 of binary RS-485 drive address. Does not affect RS-232 settings.	1	0
3	Bit 2 of binary RS-485 drive address. Does not affect RS-232 settings.	1	0
4	Bit 3 of binary RS-485 drive address. Does not affect RS-232 settings.	1	0
5	Bit 4 of binary RS-485 drive address. Does not affect RS-232 settings.	1	0
6	Bit 5 of binary RS-485 drive address. Does not affect RS-232 settings.	1	0
7	Bit 0 of drive RS-485 baud rate setting. Does not affect RS-232 settings.	1	0
8	Bit 1 of drive RS-485 baud 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.

Baud Rate (kbps)	Value For Bit Rate Setting
Load from non-volatile memory	0
9.6	1
38.4	2
115.2	3

**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 ENCODER - Auxiliary Feedback Connector**

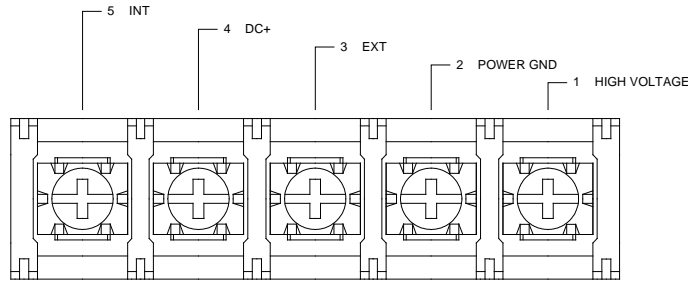
Connector Information		15-pin, high-density, male D-sub
Mating Connector	Details	TYCO: Plug P/N 1658681-1; Housing P/N 5748677-1; Terminals P/N 1658686-2 (loose) or 1658686-1 (strip)
	Included with Drive	No

**COMM - RS232/RS485 Communication Connector**

Connector Information		9-pin, female D-sub
Mating Connector	Details	TYCO: Plug P/N 205204-4; Housing P/N 5748677-1; Terminals P/N 1658540-5 (loose) or 1658540-4 (strip)
	Included with Drive	No

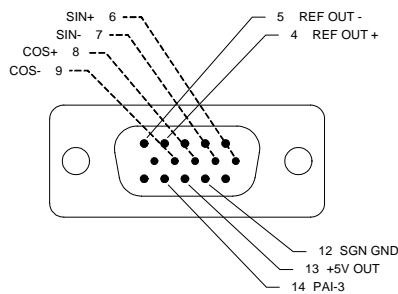
**DC BUS / BRAKE RESISTOR - Power Connector**

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



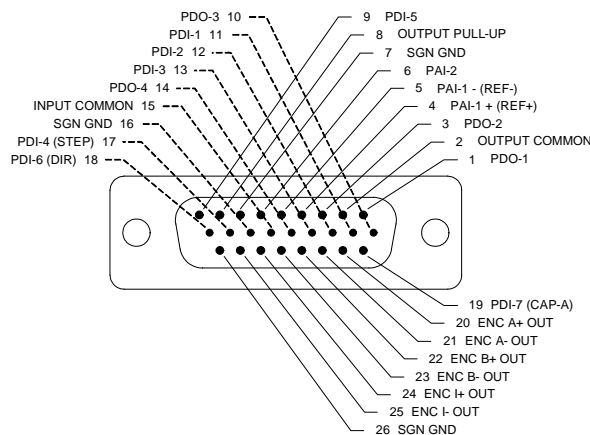
**FEEDBACK - Feedback Connector**

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**

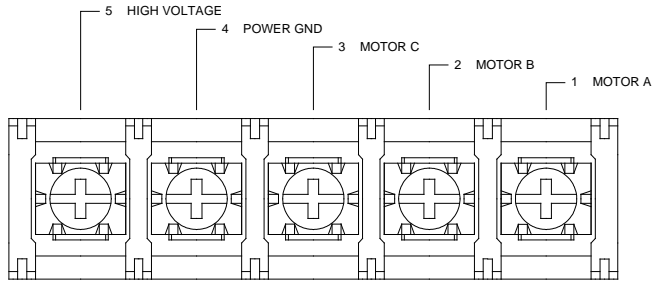
Connector Information		26-pin, high-density, female D-sub
Mating Connector	Details	TYCO: Plug P/N 1658671-1; Housing P/N 5748677-2; Terminals P/N 1658670-2 (loose) or 1658670-1 (strip)
	Included with Drive	No





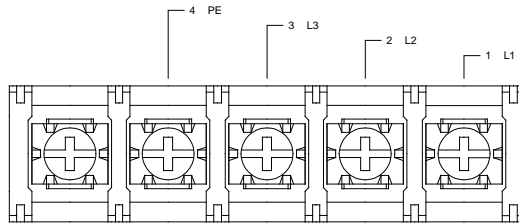
**MOTOR POWER / DC BUS - Power Connector**

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

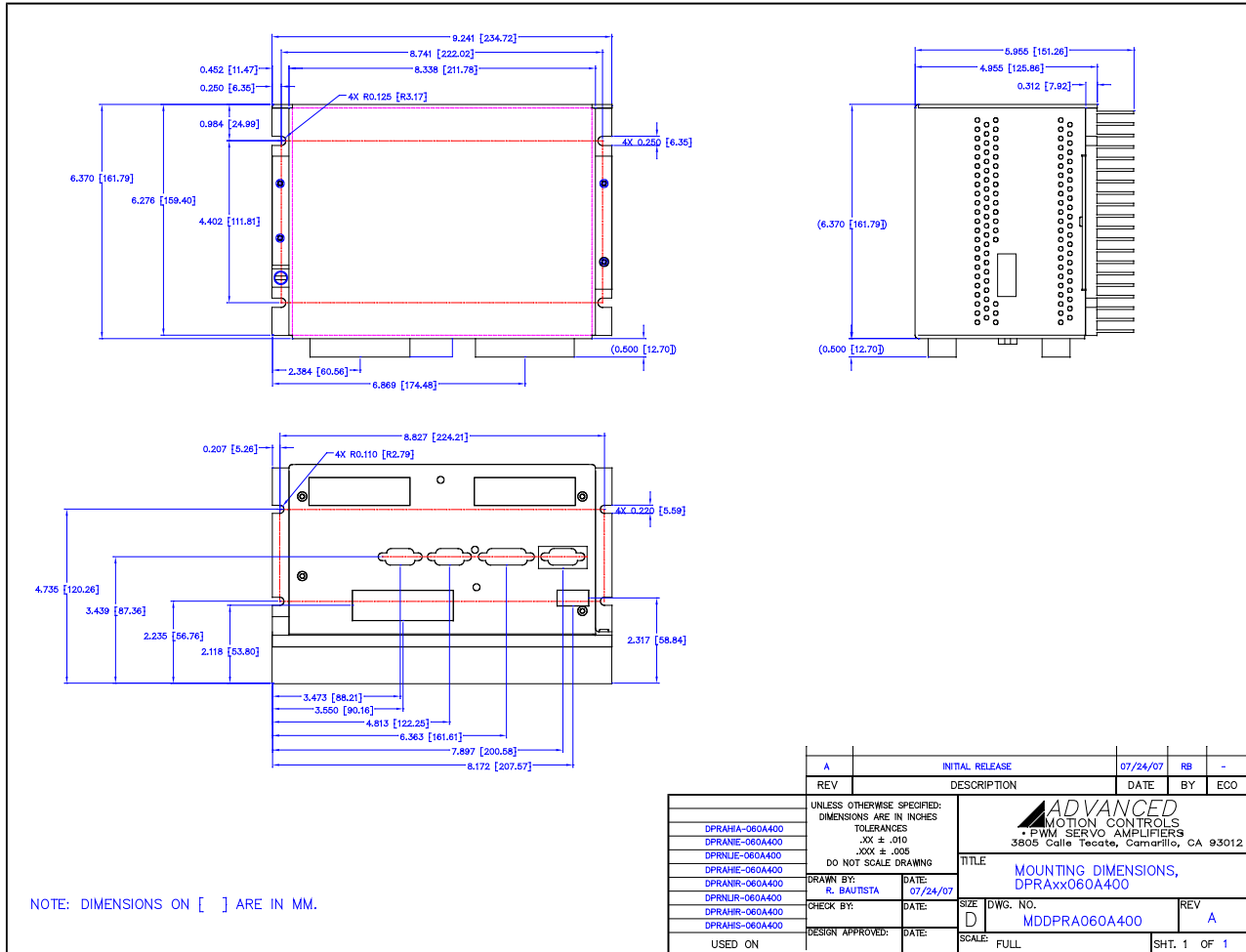


**POWER - Power Connector**

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



**MOUNTING DIMENSIONS**

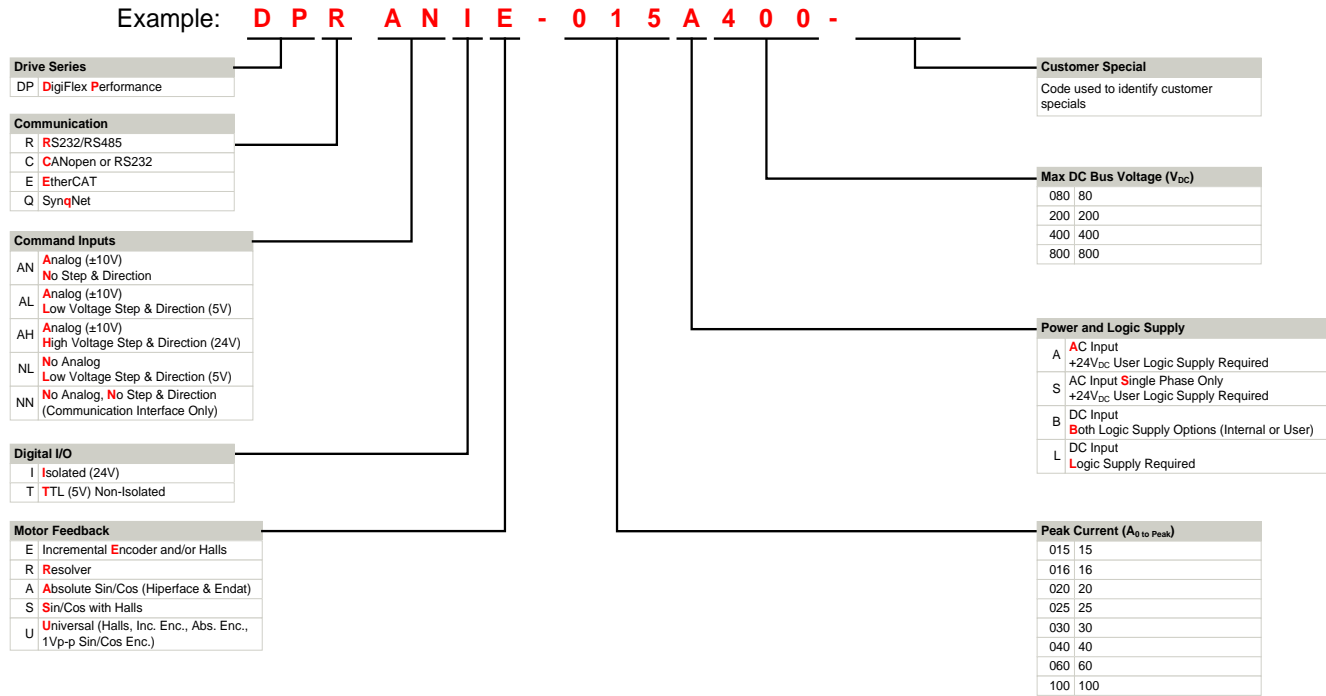


REV	DESCRIPTION	DATE	BY	ECO
A	INITIAL RELEASE	07/24/07	RB	-

UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES TOLERANCES XX ± .010 XXX ± .005 DO NOT SCALE DRAWING		 ADVANCED MOTION CONTROLS P.W.M. SERVO AMPLIFIERS 3805 Calle Tecate, Camarillo, CA 93012	
DRAWN BY: R. BAUTISTA	DATE: 07/24/07	TITLE MOUNTING DIMENSIONS, DPRAxx060A400	
CHECK BY:	DATE:	SIZE D	DWG. NO. MDDPRA060A400
DESIGN APPROVED:	DATE:	SCALE: FULL	REV A
USED ON			SHT. 1 OF 1

**PART NUMBERING INFORMATION**



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](http://www.a-m-c.com) to see which accessories will assist with your application design and implementation.



→  
**To Motor**