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RMC200

DATASHEET



Motion Controllers – Standard and Lite

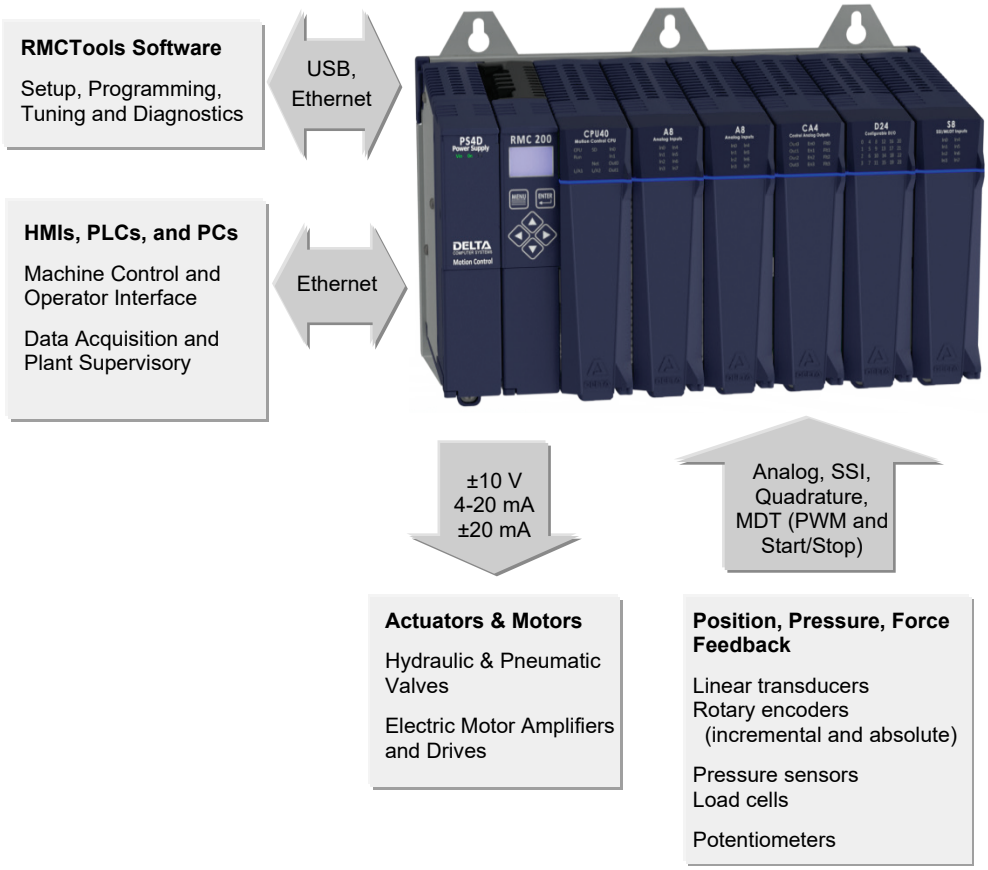
The RMC200, now available in two versions – Standard (up to 50 axes) and Lite (up to 18 axes) – is Delta's highest performance motion control platform for hydraulic, electric servo, and pneumatic industrial applications. User-swappable modules provide flexibility and connectivity to many transducer types.

Powerful control algorithms offer advanced multi-axis synchronized motion, dual-loop control of position and pressure or position and force with bumpless transfer, advanced tuning capabilities specifically for hydraulic motion, and much more.

The RMC200's CPU modules come standard with Ethernet, supporting protocols such as EtherNet/IP, PROFINET, and Modbus/TCP, and are designed to integrate easily with your favorite PLCs, PCs and HMIs.

Delta's RMCTools software handles setup, programming, tuning and diagnostics for the RMC200, as well as the RMC150 and RMC75 controllers. Excellent graphing features and easy-to-use wizards complement its user programs designed specifically for motion sequences.

Flexible Multi-axis Capability
As Delta's largest and most capable motion controller, a variety of base sizes accommodate modules that can be mixed and matched to support up to 50 axes of tightly synchronized motion.



Industrial Applications

- Forest products
- Testing
- Metals
- Presses
- Energy / Petrochemical
- Automotive
- Aerospace
- Plastics and rubber
- Entertainment
- Mining

More application information at deltamotion.com/applications.

Communications

- **Ethernet** (100 Mbps), built-in on CPU. Dual ports (single IP address) supporting star, linear, and ring topologies. Supports the following protocols as slave only:
  - EtherNet/IP
  - PROFINET
  - Modbus/TCP
  - CSP (Allen-Bradley)
  - FINS (Omron)
  - Procedure Exist (Mitsubishi)
  - DMCP
- **USB Port**
  For use with RMCTools software and RMCLink ActiveX and .Net assembly.

Feedback Types

- **Synchronous Serial Interface (SSI)**
  Linear and single- or multi-turn rotary
- **Magnetostrictive Linear Displacement Transducer (MDT)**
  RS-422 Start/Stop and PWM
- **Analog**
  ±10 V and 4-20 mA
- **Quadrature Encoder**

Ordering Information

Use the part numbers below when ordering. A full motion controller requires a base, power supply, CPU, Feature Key, and I/O modules.

Base	
Lite	
R200-B5L	5-slot base for CPU20L (3 I/O module slots) ..... p. 7
R200-B7L	7-slot base for CPU20L (5 I/O module slots) ..... p. 7
Standard	
R200-B5	5-slot base for CPU40 (3 I/O module slots) ..... p. 7
R200-B7	7-slot base for CPU40 (5 I/O module slots) ..... p. 7
R200-B11	11-slot base for CPU40 (9 I/O module slots) ..... p. 7
R200-B15	15-slot base for CPU40 (13 I/O module slots) ..... p. 7
Power Supply	
Lite	
n/a	No power supply module required. Power supply is integrated into the CPU.
Standard	
R200-PS4D	24 Vdc-input, 35 W output power supply module for the B5, B7 and B11 bases ..... p. 9
R200-PS6D	24 Vdc-input, 50 W output power supply module for the B15 base ..... p. 9
CPU	
Lite	
R200-CPU20L	RMC200 CPU Lite for up to 18 axes, with dual Ethernet ports, USB, SD card slot, display screen, 2 discrete inputs, 2 discrete outputs. Includes a built-in power supply, and resides in combined slots 0 and 1. ..... p. 10
Standard	
R200-CPU40	RMC200 CPU Standard for up to 50 axes, with dual Ethernet ports, USB, SD card slot, display screen, 2 discrete inputs, 2 discrete outputs ..... p. 10
Feature Key	
R2-KL*nnn*	**Feature Key:** A removable key mounted in the CPU. Must be ordered with desired number of control loops specified by *nnn*, (e.g R2-KL012 for twelve loops) with a minimum of four loops ..... p. 13
R2-Loop	One control loop. This part number to be used only when adding a Control Loop to an existing feature key, not when ordering together with a new feature key. ..... p. 13
I/O Modules	
R200-A8	**Eight analog inputs:** ±10 V or 4-20 mA ..... p. 14
R200-S8	**Eight SSI or MDT inputs, supports one quadrature input:** Synchronous Serial Interface (SSI) or Magnetostrictive Displacement Transducer (MDT) with Start/Stop or PWM signals, supports one quadrature input ..... p. 15
R200-Q4	**Four quadrature encoder inputs:** RS-422, HTL, or TTL, with home and registration inputs ..... p. 17
R200-LC8	**Eight load cell inputs:** Up to 5 mV/V with full Wheatstone bridge configurations ..... p. 20
R200-CA4	**Four analog outputs:** ±10 V, 4-20 mA, or ±20 mA, with fault inputs and enable outputs ..... p. 22
R200-CV8	**Eight analog outputs:** ±10 V only, with eight individually-configurable discrete I/O ..... p. 24
R200-D24	**24 Discrete I/O:** 20 configurable I/O, 4 fixed high-speed inputs for 2 quadrature encoder inputs or 2 pulse counter inputs ..... p. 26
R200-U14	**Universal I/O:** 4 analog inputs; 2 analog outputs; 4 discrete I/O points; 2 channels for SSI, MDT, or Quadrature encoder inputs, each with an additional high-speed discrete input. ..... p. 29
Options	
R2-SC	**Slot Cover:** Cover for empty I/O slots ..... p. 33

Accessories

SD Card ..... p. 33
Cables ..... p. 33
Voltage-to-Current Converters ..... p. 34
Terminal Blocks ..... p. 34

Online Configuration Tool

Create your own RMC200 controller and request a quote!
Go to deltamotion.com and choose **Request a Quote Online**.



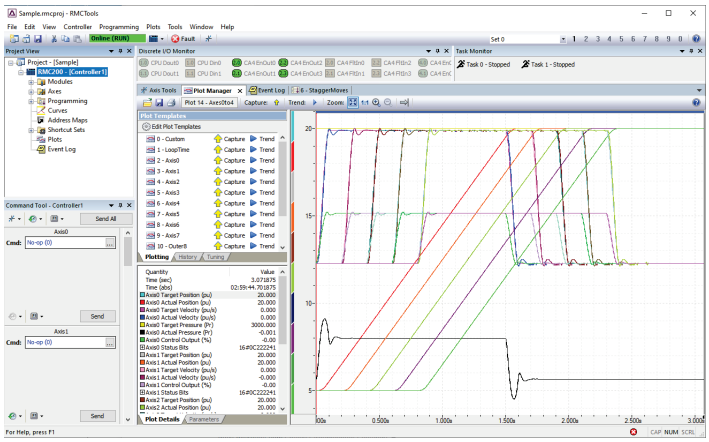
RMCTools Software

RMCTools is a powerful motion control software package for setting up, tuning, troubleshooting, programming, and controlling all features of Delta's multi-axis RMC200 controllers from a PC. RMCTools also supports the RMC75 and RMC150 controllers.

Delta's intuitive and easy-to-use RMCTools software features flexible User Programs with extensive commands and the ability to embed mathematical expressions. Setup and tuning wizards reduce startup times, and the graphical diagnostics tools speed troubleshooting of the entire motion system. Extensive context-sensitive help is included in RMCTools.

RMCTools is available for download from www.deltamotion.com.

Supported Operating Systems: Windows® 7/8.1/10



RMCTools Features

Delta's powerful RMCTools software makes setup, tuning, and troubleshooting motion systems easier than ever.

Setup

- **Wizards**
  Easy-to-use wizards include New Project, New Controller, Scale & Offset, and Tuning.
- **Full Parameter Set**
  Monitor all axis status registers and modify parameters.

Tuning and Diagnostics

- **Plots**
  Plot any item, up to 128 items per plot, sampled down to the control loop resolution. XY plot view supported.
- **Tuning Wizard**
  Quickly and accurately tune your axes, using a slider bar to choose from a range of gains appropriate for your system.
- **Event Log**
  Speed troubleshooting by recording events such as parameter changes, commands, errors, and communications.

Programming

- **Commands**
  Issue commands directly from RMCTools. Use Shortcut Commands to quickly issue commands to speed the tuning process.
- **User Programs**
  Easily create programs to issue sequences of commands. Supports complex logic with branching and looping.
- **Program Triggers**
  Start user programs automatically based on user-defined events such as discrete inputs, error conditions, etc.
- **Mathematical Expressions**
  Expressions provide flexible programming capability for advanced calculations and machine control sequences.

Communication Software

RMCLink enables full monitoring and control of RMC200 motion controllers via Ethernet and USB communications on Windows®-based PCs from custom applications in languages such as Visual Basic, C++, C#, VBScript, VBA (Microsoft Excel®), PHP, Jscript, Python, and MATLAB®.

RMCLink comes with fully-functioning sample projects to help you get up and running quickly. The help includes detailed walk-throughs and numerous code samples.

RMCLink, with extensive examples, is available for download from www.deltamotion.com. RMCLink also supports the RMC75 and RMC150 controllers.

For non-Windows applications, such as Linux or embedded C, Delta provides sample C code for communicating with the RMC using Delta's simple DMCP protocol.

Microsoft, Windows, and Excel are either registered trademarks or trademarks of Microsoft Corporation in the United States and/or other countries.

Instrument Driver for Use with LabVIEW

VIs created by Delta for use with LabVIEW™ software provide full-fledged examples including plot uploading and trending. The VIs support Ethernet communications and are available from the Instrument Driver portion of National Instruments' website.

LabVIEW is a trademark of National Instruments. Neither Delta, nor any software programs or other goods or services offered by Delta, are affiliated with, endorsed by, or sponsored by National Instruments.

RMC200 Control Features

The RMC200 provides an extensive set of motion commands and programming capability for quick and easy yet flexible motion control for virtually every motion application.

Control Features

Closed Loop Control
Full PID loop control with velocity, acceleration and jerk feed forwards for precise synchronized motion. Directional gain factors support fluid power control.

Position Control
- Point-to-Point moves
- S-curves
- Speed at Position
- Gearing
- Cyclic Sinusoidal Motion
- Splines and Cams
- Rotary motion (incremental and absolute)

Velocity Control
- Velocity control with position or velocity feedback

Pressure and Force Control
- Pressure sensor, load cell or differential force
- Linear or S-curve Ramps
- Gearing
- Cyclic Sinusoidal Profile
- Splines and Cams

Position-Pressure and Position-Force Control
- Transition seamlessly between position or velocity control and pressure or force control.
- Pressure or Force Limit – limit the pressure or force during a position or velocity move.

Synchronized Motion
Many features for various types of synchronized motion:
- Ratioed moves
- Gearing
- Camming
- Tracking with velocity and acceleration limits

Active Damping
For high-performance control of pneumatics and difficult systems.

Higher-Order Control
Includes Double Differential gain and Jerk Feed Forward for systems with a low natural frequency.

Open Loop Control
Seamless transition from open loop to closed loop. Ramp Control Output between two values, or ramp based on position for hard-to-control systems.

Quick Move
Move in open loop and stop in closed loop for fast, smooth motion with accurate stops.

Valve Compensation
Output Deadband for overlapped spools and Valve Linearization for non-linear flow.

Custom Feedback
Control using any calculated value as feedback.
- Sum, difference, average, etc.
- Switch feedback on-the-fly
- Redundant feedback
- Feedback linearization

High-level programming

User Programs
Programs are easy-to-understand sequences of commands. Run multiple programs simultaneously to handle axis commands and machine control functions.

Program Triggers
Start user programs automatically based on user-defined events such as discrete inputs, error conditions, etc.

Variables
Recipes and other user parameters can be stored for use by user programs.

Mathematical Expressions
Expressions provide flexible programming capability for advanced calculations and machine control sequences.

Troubleshooting and Monitoring

Plots
Plot any item, up to 128 items per plot, sampled down to the control loop resolution. XY plot view supported.

Event Log
Speeds troubleshooting by recording events such as parameter changes, commands, errors, and communications.

Fault Handling

Closed Loop stops
Ramp speed to zero at specified rate and hold position.

Open Loop stops
Ramp output voltage to zero at specified rate.

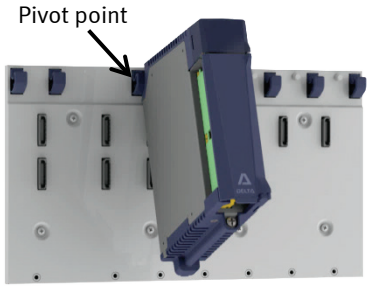
Multi-axis (group) stops
A fault on one axis halts multiple axes when configured as a group.

AutoStops
The response of axes to each fault type is easily configurable.

Modular Design

Modules Rock In, Rock Out

The RMC200 modules are designed to be user-installable and removable. The modules rock in and out, rotating around a pivot point. Modules may be installed and removed without being damaged while the RMC200 is powered. The pivot action ensures the electrical pins engage the base pins in a certain order, preventing damage to the module. Note: this is not hot-swapping in the sense of removing modules while equipment is operating.

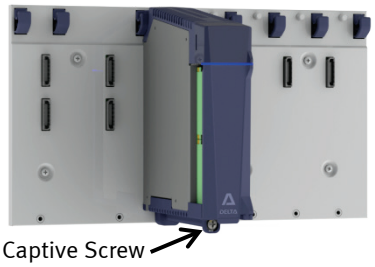


Materials and Construction

An aluminum base and modules composed of 22 gauge nickel-plated steel sheet metal and PC/ABS plastic provide a long-lasting industrial controller. Indicator LEDs on each module aid troubleshooting, and doors make for a clean appearance. The top of the modules are angled downward to help ensure space for airflow, and to allow the modules to be removed while remaining within the footprint of the base.

Module Hold-down Screws

Each module is secured to the base via a captive screw, which extends toward the front of the module for easy screwdriver access.



Unpluggable Terminal Blocks

Wiring connections are made via unpluggable terminal blocks to facilitate removal of modules in the field. Terminal blocks latch into place and the push-in wire capture style facilitates efficient and reliable wiring. A wire hold-down clip and cable tie points help keep wiring organized.

General RMC200 Specifications

Mechanical		
Mounting		Panel-mount
Dimensions with mounting tabs	B5L	7.0 x 7.9 x 5.8 in. (WxHxD) (177 x 200 x 146 mm)
	B7L	9.7 x 7.9 x 5.8 in. (WxHxD) (246 x 200 x 146 mm)
	B5	7.9 x 7.9 x 5.8 in. (WxHxD) (201 x 200 x 146 mm)
	B7	10.7 x 7.9 x 5.8 in. (WxHxD) (270 x 200 x 146 mm)
	B11	16.2 x 7.9 x 5.8 in. (WxHxD) (410 x 200 x 146 mm)
	B15	21.9 x 7.9 x 5.8 in. (WxHxD) (555 x 200 x 146 mm)
Environment		
Operating temperature		-4 to +140°F (-20 to +60°C)
Storage temperature		-40 to +185°F (-40 to +85°C)
Humidity		5-95%, non-condensing
Agency compliance		CE UL and CUL

Electrical Isolation
All isolation on the RMC200 is functional isolation at 500 Vac. This is not safety isolation and is not tested on individual modules.

Power Consumption and Dissipation

Power consumption is the power the module draws from the RMC's power supply. Power dissipation is the heat generated by the module. Power dissipation may be more than the power drawn from the power supply due to power received from devices connected to discrete inputs, discrete outputs, encoder inputs, etc.

Module	Max Consumption	Max Dissipation	Details
B5L		2.0 W	
B7L		2.7 W	
B5		2.5 W	
B7		2.7 W	
B11		3.0 W	
B15		3.2 W	
PS4D		7.0 W	
PS6D		10.0 W	
CPU20L		9.0 W	Includes power dissipation of integrated power supply
CPU40		8.0 W	
CA4	1.4 W, voltage outputs 2.8 W, current outputs	1.4 W, voltage outputs 2.8 W, current outputs	Dissipation in current mode is dependent on the resistance of the load
CV8	2.0 W	2.0 W	
S8	1.8 W	1.8 W	
A8	1.2 W, no Exciter Output 2.4 W, with Exciter Output	1.4 – 2.4 W, depending on use of Exciter Output	Power dissipation with Exciter Output can be much lower than 2.4W if most of the power goes into the potentiometers.
Q4	1.4 W	1.4 W	
LC8	1.3 W, no Exciter Output 3.2 W, with Exciter Output	1.4 - 2.4 W	Depends on use of Exciter Output
U14	2.6 W, voltage outputs 3.2 W, current outputs	2.6 W, voltage outputs 3.2 W, current outputs	All analog outputs in voltage mode All analog outputs in current mode
D24	1.1 W	1.0 W, plus 50 mW per I/O point used	

Base Modules

Base modules are available in multiple sizes to accommodate any application.

Base	Total Slots	I/O Module Slots	Compatible CPU
Lite:			
B5L	5	3	CPU20L
B7L	7	5	CPU20L
Standard:			
B5	5	3	CPU40
B7	7	5	CPU40
B11	11	9	CPU40
B15	15	13	CPU40



B5L Base



B7 Base

Lite bases (B5L and B7L):
Slots 0 and 1 are combined into a single physical slot and support the Lite CPU module that has an integrated power supply.

Standard bases:
Slot 0 supports a power supply module, and slot 1 supports the CPU module.

All bases:
The first I/O slot (slot 2) supports any I/O module or a high-speed communications module (available in a future release).

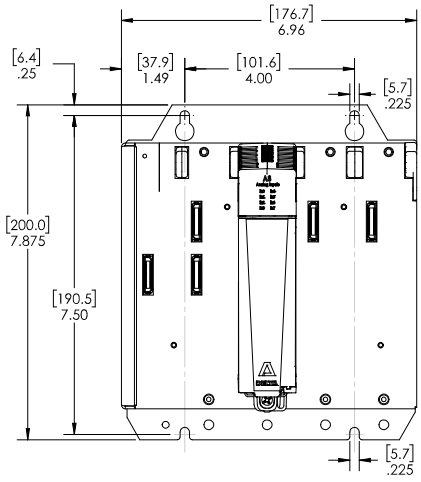
Specifications and Dimensions

Base modules are aluminum with a conductive finish. Base modules are panel-mounted. An 8-32 threaded stud is provided on the bottom flange for a ground connection.

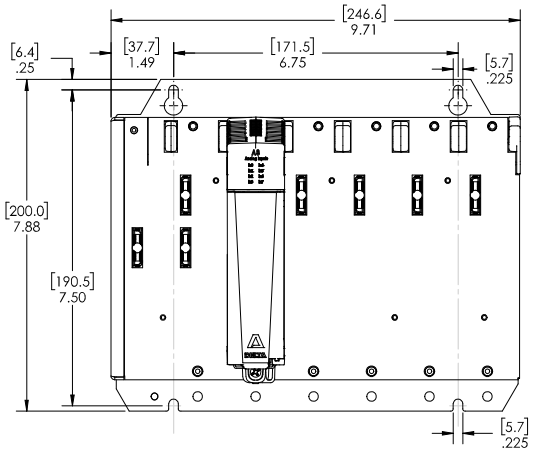
See also General Specifications on page 5.

Units are in inches [mm]. Mounting holes sized for #10 or 5mm screws.

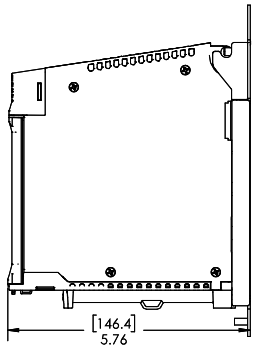
B5L



B7L



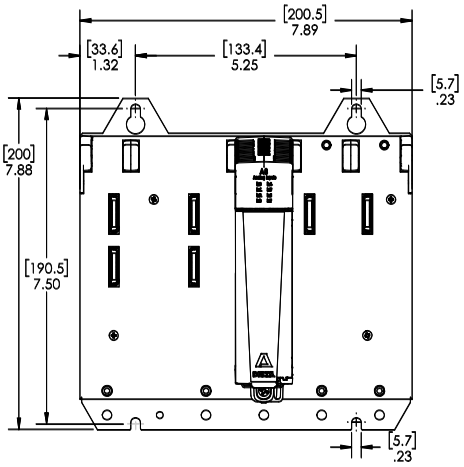
Side View (with I/O modules)
B5L, B7L, B5, B7, B11, B15



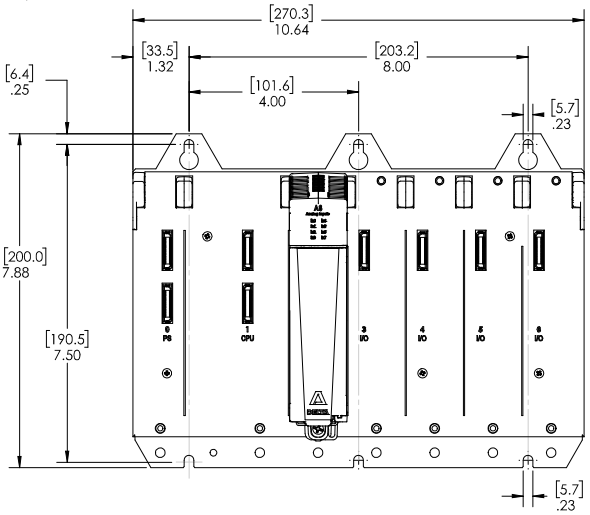
See http://www.deltamotion.com/dloads/ for CAD files.

Units are in inches [mm]. Mounting holes sized for #10 or 5mm screws.

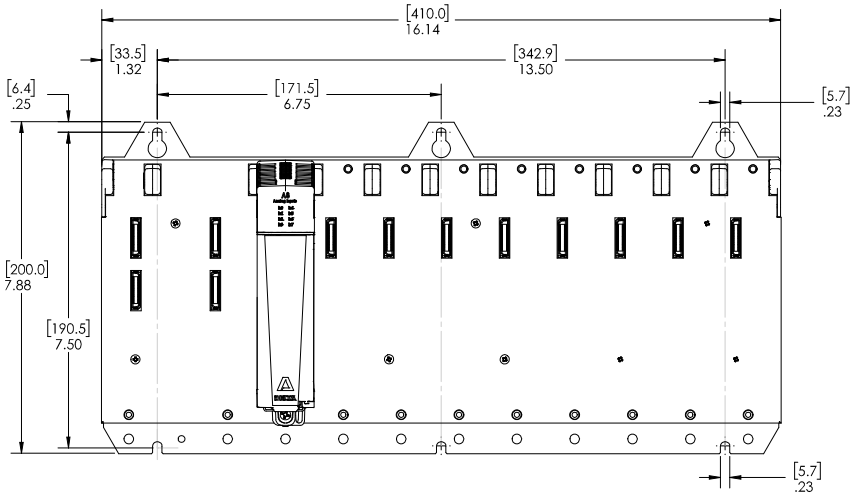
B5



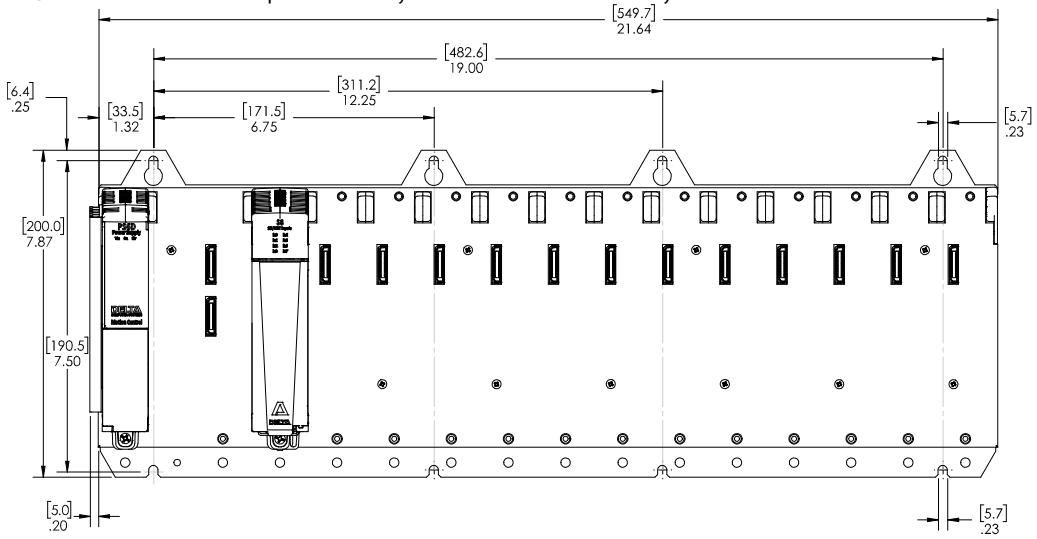
B7



B11



B15 The PS6D heat sink protrudes beyond the left of the base by 0.20 inches.



See http://www.deltamotion.com/dloads/ for CAD files.

Power Supply Modules: PS4D and PS6D

A power supply module is required for the Standard Bases (B5, B7, B11, B15). The Lite Bases (B5L, B7L) do not require a separate power supply since the power supply is built into the CPU.

PS4D: 24 Vdc input, applies 35 W to the B5, B7 or B11 base

PS6D: 24 Vdc input, applies 50 W to the B15 base

The PS4D and PS6D power supply modules require a nominal 24 Vdc supply. The PS4D is able to power a fully-loaded B5, B7 or B11 base. The PS6D is able to power a fully-loaded B15 base. Both include status indicator LEDs and an unpluggable terminal block.



Shown without doors

Specifications

See also General Specifications on page 5.

Power	
Input Power	PS4D: 42 W max (1.8 A at 24 Vdc) PS6D: 60 W max (2.5 A at 24 Vdc)
Input Voltage	Recommended 24 Vdc ± 15% (20.4 – 27.6 V), 30 V max. Overvoltage shutdown at 36 V.
Output Power	PS4D: 35 W max PS6D: 50 W max
Max Power Dissipation	PS4D: 7.0 W PS6D: 10.0 W
LEDs	
Vin	Input voltage level indicator: Green: Normal range (20.4 – 27.6 Vdc) Orange: Voltage high or low, still operating Steady Red: Under- or over-voltage (outside of 18 – 36 V), or reverse voltage, not operating
On	Output power indicator: Off: Not providing power to base Green: Providing power to base
Flt	Faults indicator: Orange: Temperature high or power draw high, still operating Flashing Red: Under- or over-voltage, over-power, or over-temperature, output shut down Flashing Red/Green: Module not plugged into base, output shut down

Pin-out

The unpluggable terminal block with spring-cage connections accepts stranded wire up to 12 gauge.

Terminal Block	
+24V	24 Volt input power
24Cmn	24 Volt input power common
Case	Electrically connected to the power supply metal and base metal.

Stranded Wire and Ferrule Size	
Conductor cross section	24 – 12 AWG 0.2 – 2.5 mm^2
Conductor cross section, ferrule no plastic sleeve	0.25 – 2.5 mm^2
Conductor cross section, ferrule with plastic sleeve	0.25 – 2.5 mm^2
Stripping Length	10 mm
Ferrule Length	10 – 12 mm

CPU Modules: CPU20L and CPU40

Motion controller central processing unit

CPU	Max Physical Control Axes	Max Control Loops	Max Total Axes, Including Virtual and Reference
CPU20L	18	36	48
CPU40	50	100	128

The Standard CPU40 and Lite CPU20L include:

- 2 Ethernet ports (single IP address) supporting star, linear, and ring topologies.
- Supports the following protocols as a slave:
  - EtherNet/IP
  - PROFINET
  - Modbus/TCP
  - CSP (Allen-Bradley)
  - FINS (Omron)
  - DMCP (Delta Motion Control Protocol)
  - Procedure Exist (Mitsubishi)
- USB 2.0 port (480 Mbps) for communications with RMCTools and RMCLink
- Two 12-24 Vdc discrete inputs, individually isolated
- Two solid state relay (SSR) discrete outputs, individually isolated
- Display screen with navigation buttons
- SD card slot for saving and restoring the controller project and for general-purpose file storage (SD card sold separately)
- Indicator LEDs
- Feature Key slot, accessible from the back of the module



shown without doors

Bases and Power Supply

The CPU20L is compatible with the B5L and B7L bases. The CPU20L includes a built-in power supply that supplies power to all the modules via the base. The CPU20L fits into the combined slots 0 and 1.

The CPU40 is compatible with the B5, B7, B11, and B15 bases. The CPU40 requires a separate power supply module that supplies power to all the modules via the base.

CPU20L and CPU40 Specifications

See also General Specifications on page 5.

Motion Control	
Control loop times	125 µs, 250 µs, 500 µs, 1 ms, 2 ms, or 4 ms
Power	
Max Power Dissipation	CPU20L: 9.0 W, including dissipation of integrated power supply CPU40: 8.0 W
USB Monitor Port (for setup, programming and maintenance only)	
Connector	USB “B” Receptacle
Data Rate	High-speed (480 Mbps)
Discrete Inputs (2)	
Input type	12-24 Vdc inputs; polarity independent, individually isolated
Logic polarity	True “High”
Input “High” range	9 to 26.4 Vdc, 3 mA maximum
Input “Low” range	0 to 5 Vdc, <1 mA
Maximum propagation delay	100 µs Off to On 750 µs On to Off (open collector drive)
Discrete Outputs (2)	
Output type	Solid State Relays (SSR), individually isolated
Load types	DC general use, DC resistance, DC Pilot Duty
Rated voltage	max ±30 Vdc
Maximum current	±75 mA
Maximum propagation delay	2 ms turn-on, 0.5 ms turn-off
Logic 1 (True, On)	Low impedance (15 Ω maximum)
Logic 0 (False, Off)	High impedance (<1 µA leakage current at 30 V)

CPU20L and CPU40 Specifications (continued)

Ethernet Interface	
Ports	2 ports (single IP address)
Supported Topologies	Star, linear, or ring
Hardware interface	IEEE 802.3 for 100BASE-T (twisted pair)
Data Rate	100 Mbps
Duplex	Full Duplex
Features	Auto-negotiation, Auto-crossover (MDI/MDI-X)
Connectors	RJ-45 (2)
Cable	CAT5, CAT5e or CAT6, UTP or STP
Ethernet Configuration	
Configuration parameters	IP address, subnet mask, gateway address, enable/disable ports, auto-negotiation
Configuration methods	BOOTP, DHCP, or static
Ethernet Protocol Support	
Application protocols (slave only for all)	EtherNet/IP I/O and messaging PROFINET RT (I/O) and data records Modbus/TCP CSP (Allen-Bradley) FINS (Omron) DMCP (Delta Motion Control Protocol) Procedure Exist (Mitsubishi)
Framing protocol	Ethernet II
Internet protocol	IP (includes ICMP, ARP, and Address Collision Detection)
Transport protocols	TCP, UDP
Network management protocols	SNMPv1, SNMPv2c, LLDP
Ring management protocols	Device Level Ring (DLR), Media Redundancy Protocol (MRP)
SD Card Slot (card sold separately)	
Form factor	Standard size (32 mm × 24 mm × 2.1 mm)
Supported families	SD (SDSC) (standard capacity) and SDHC (high capacity)
Supported file system	FAT32 and FAT16
Supported capacities	Up to 32 GB

Discrete I/O Pin-out

The discrete inputs and outputs are individually isolated. Inputs are polarity-independent.

Terminal Block 1 (TB1)	
DIn0+ DIn0-	General-purpose input 0, 12 -24 Vdc
DIn1+ DIn1-	General-purpose input 1, 12 -24 Vdc
DOut0+ DOut0-	General-purpose output 0, Solid State Relay up to 30 Vdc
DOut1+ DOut1-	General-purpose output 1, Solid State Relay up to 30 Vdc

Discrete I/O Terminal Block

The unpluggable terminal block includes spring-cage terminals. User-supplied ferrules provide for push-in connections.

Stranded Wire and Ferrule Size	
Conductor cross section	24 – 16 AWG 0.2 – 1.5 mm^2
Conductor cross section, ferrule no plastic sleeve	0.2 – 1.5 mm^2
Conductor cross section, ferrule with plastic sleeve	0.2 – 0.75 mm^2
Stripping Length	10 mm
Ferrule Length	10 – 12 mm

Power Input Specifications (CPU20L Only)

Power Input (CPU20L Only)	
Input Power	28 W max (1.2 A at 24 Vdc)
Input Voltage	Recommended 24 Vdc ± 15% (20.4 – 27.6 V), 30 V max. Overvoltage shutdown at 36 V.
Output Power	19 W max
Power Input LEDs (CPU20L Only)	
Vin	Input voltage level indicator: Green: Normal range (20.4 – 27.6 Vdc) Orange: Voltage high or low, still operating Steady Red: Under- or over-voltage (outside of 18 – 36 V), or reverse voltage, not operating
On	Output power indicator: Off: Not providing power to base Green: Providing power to base
Flt	Faults indicator: Orange: Temperature high or power draw high, still operating Flashing Red: Under- or over-voltage, over-power, or over-temperature, output shut down Flashing Red/Green: Module not plugged into base, output shut down

Power Input Pin-out (CPU20L Only)

The unpluggable terminal block with spring-cage connections accepts stranded wire up to 16 gauge. This power input terminal block is different than the power input terminal block on the PS4D and PS6D power supply modules.

Power Input Pin-out	
+24V	24 Volt input power
24Cmn	24 Volt input power common
Case	Electrically connected to the CPU module metal and base metal.

Stranded Wire and Ferrule Size	
Conductor cross section	24 – 16 AWG 0.2 – 1.5 mm^2
Conductor cross section, ferrule no plastic sleeve	0.25 – 1.5 mm^2
Conductor cross section, ferrule with plastic sleeve	0.25 – 0.75 mm^2
Stripping Length	10 mm
Ferrule Length	10 – 12 mm

Feature Key

The Feature Key is a rugged, removable and field-upgradable token that is mounted in the CPU. The Feature Key provides the user-specified control features available to the motion controller.



Feature Keys are normally ordered together with the CPU module and are ordered with specified features. Features can also be added to an existing Feature Key via a remote process.

The Feature Key is required for RMC200 operation of closed-loop control.

Feature Key Control Features

The following features are available on the Feature Key:

Control Loops

The control loops on the feature key define the number of control axes. Four control loops are included for the nominal price of the Key itself. The number of control loops required per axis are:

- **Single-loop axis: 1 control loop**
  An axis is a single-loop axis if it controls one quantity, such as only position, or only force. A cascading outer loop axis that controls one quantity is a single-loop axis.
- **Dual-loop axis: 2 control loops**
  An axis that controls two quantities such as position and force. A cascading outer loop axis that controls two quantities is a dual-loop axis.
- **Reference axis: 0 control loops**
  An axis with only an input, and no control output.
- **Virtual axis: 0 control loops**
  A type of reference axis with no input and no control output, and provides virtual motion.
- **Output only axis: 0 control loops**
  An axis with only an analog output.

Ordering a Feature Key with Control Loops

Part number: R2-KL*nnn*, where *nnn* is the number of control loops:

- ▲ CPU20L: minimum of four (004) loops, maximum 36 (036) loops
- ▲ CPU40: minimum of four (004) loops, maximum 100 (100) loops

Adding Loops to an Existing Feature Key

Control loops may be added to existing feature keys via a remote process. This requires that the customer use RMCTools to connect to the RMC200 that has the feature key installed, generate a feature request file, email the file to Delta, and then apply the received response file using RMCTools.

Part number: R2-Loop

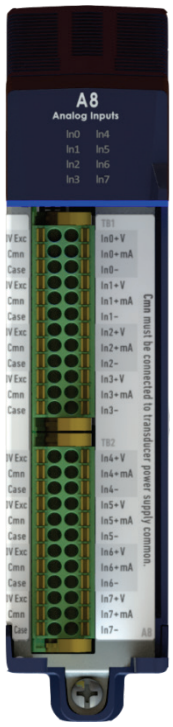
Feature Key Specifications

Specifications – Apply only to the Feature Key, not the CPU or other modules	
Contact Life	10,000 cycles min.
ESD Protection	15 kV
Read Cycles	Unlimited
Write Cycles	100,000 minimum (writes are performed only when applying new features)
Data Life (Storage) at 35°C	30 years minimum, 50 years typical
Operational Temperature	-40°C to +85°C (-40°F to +185°F)
Storage Temperature	-40°C to +100°C (-40°F to +212°F)

I/O Module: A8

8 Analog Inputs, ±10 V or 4-20 mA

The A8 module provides eight analog inputs for ±10 V or 4-20 mA signals, with 18 bits resolution ADCs with oversampling for increased effective resolution and noise reduction. The A8 module also includes 10 Vdc exciter outputs intended for use with potentiometers. One LED per channel indicates the state of the respective input.



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A8 Specifications

See also General Specifications on page 5.

Inputs	
Inputs	Eight 18-bit differential (higher resolution obtained by oversampling)
Overvoltage protection	±24 V, momentary
Input ranges	±10 V, 4-20 mA, ±20 mA (each input independently configurable)
Max differential ranges	Voltage: ±10.5 V; Current: ±20 mA (continuous), -25 mA to +25 mA (peak)
Max input voltage ranges	In+ or In- relative to Cmn: -14 V to +14 V typical
Input impedance	Voltage input: 1 MΩ, Current input: 250Ω
Input filter slew rate	25 V/ms
Sampling frequency	200 kHz internal. Provides one filtered sample per control loop (e.g. 1 msec) to CPU.
Sampling filter	250 Hz – 4 kHz, user-selectable internal low-pass sampling filter.
Offset drift with temperature	0.2 LSB/°C typical (±10 V range)
Gain drift with temperature	20 ppm/°C typical (±10 V range)
Non-linearity	12 LSB typical (±10 V range)
Exciter output	10 Vdc ± 2%, 40 mA max total of all exciter outputs per terminal block
Common	
Max Power Dissipation	1.4 - 2.4 W, depending on use of Exciter Output
Max Power Consumption	1.2 W with no Exciter Output, 2.4 W with Exciter Output

A8 Pin-out

Terminal Block 1 (TB1)

Description		Pin			Description
Input 0 10V Exciter output	10V Exc	1	2	In0+V	Input 0+ Voltage
Input 0 Common	Cmn	3	4	In0+mA	Input 0+ Current
Input 0 Shield connection	Case	5	6	In0-	Input 0-
Input 1	10V Exc	7	8	In1+V	Input 1
	Cmn	9	10	In1+mA	
	Case	11	12	In1-	
Input 2	10V Exc	13	14	In2+V	Input 2
	Cmn	15	16	In2+mA	
	Case	17	18	In2-	
Input 3	10V Exc	19	20	In3+V	Input 3
	Cmn	21	22	In3+mA	
	Case	23	24	In3-	

Terminal Block 2 (TB2)

Description		Pin			Description
Input 4	10V Exc	1	2	In4+V	Input 4
	Cmn	3	4	In4+mA	
	Case	5	6	In4-	
Input 5	10V Exc	7	8	In5+V	Input 5
	Cmn	9	10	In5+mA	
	Case	11	12	In5-	
Input 6	10V Exc	13	14	In6+V	Input 6
	Cmn	15	16	In6+mA	
	Case	17	18	In6-	
Input 7	10V Exc	19	20	In7+V	Input 7
	Cmn	21	22	In7+mA	
	Case	23	24	In7-	

Connection Notes:

When connecting a voltage signal, use the In+V, In-, and Cmn pins. Do not connect In+mA.

When connecting a current signal, use the In+mA, In-, and Cmn pins. Do not connect In+V.

The Cmn pins must be connected to transducer commons. See wiring diagrams in RMCTools help.

Inputs 0-7 are isolated as a single group. There is no isolation between inputs.

Exciter outputs are +10 Vdc referenced to Cmn. Maximum current of 40 mA total of all exciter outputs per terminal block.

Terminal Blocks:

The unpluggable terminal blocks include spring-cage terminals. User-supplied ferrules provide for push-in connections.

Stranded Wire and Ferrule Size	
Conductor cross section	24 – 16 AWG 0.2 – 1.5 mm^2
Conductor cross section, ferrule no plastic sleeve	0.25 – 1.5 mm^2
Conductor cross section, ferrule with plastic sleeve	0.25 – 0.75 mm^2
Stripping Length	10 mm
Ferrule Length	10 – 12 mm

I/O Module: S8

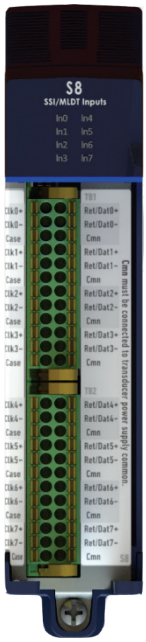
8 SSI or MDT Inputs, supports one quadrature input

The S8 module provides eight inputs, individually software selectable as SSI, or as magnetostrictive Start/Stop or PWM inputs.

When configured as SSI, an S8 input acts as a standard SSI input that can receive data from an SSI device, such as a position sensor. Optionally, one SSI monitor input can be configured in software, using inputs 6 and 7 on the S8 module. This SSI monitor input monitors data that is being transferred between a separate SSI input and an SSI device.

One RS-422 quadrature input (A+, A-, B+, B-) may be configured in software, using inputs 6 and 7 on the S8 module.

The S8 module interfaces with both linear sensors and rotary encoders. One LED per channel indicates the state of the respective input.



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S8 Specifications

See also General Specifications on page 5.

SSI Interface	
Data input	RS-422 differential
Clock output	RS-422 differential
Termination	Software selectable data input impedance: 110 Ω or >200 kΩ
Clock frequency	User-selectable, 100 kHz to 2500 kHz
Cable length maximum	Transducer dependent (approx. 3-2100 ft)
Resolution	Transducer dependent (up to 0.1 µm for magnetostrictive LDTs)
Count encoding	Binary or Gray Code
Data bits	8 to 32 bits
Bit masking	High or low bits may be masked
Additional Settings	Selectable overflow modes to conform to various SSI transducers Wire break detection
Start/Stop and PWM Interface	
Transducer interface types	MDT with Start/Stop or PWM (Pulse Width Modulated) feedback
Interrogation output	RS-422 differential (transducer must be configured for external interrogation)
Return input	RS-422 differential
Resolution	0.0005 in. with one recirculation
Count rate	240 MHz
Recirculations	Supports multiple recirculations only for PWM transducers with internal recirculations.
Maximum transducer length	440 in. at 4 ms (loop-time dependent)
Quadrature Interface	
Input	5V differential (RS-422) receiver for A+, A-, B+, B-.
Connection	Uses the following pins: A+: Input 6 Ret/Dat+ A-: Input 6 Ret/Dat- B+: Input 7 Ret/Dat+ B-: Input 7 Ret/Dat-
Termination	Software selectable data input impedance: 110 Ω or >200 kΩ
Max Encoder Frequency	8,000,000 quadrature counts/second
Power	
Max Power Dissipation	1.8 W

Continued on next page.

S8 Pin-out

Terminal Block 1 (TB1)

Description		Pin			Description
Input 0 Interrogate+ or Clock+	Int/Clk0+	1	2	Ret/Dat0+	Input 0 Return+ or Data+
Input 0 Interrogate- or Clock-	Int/Clk0-	3	4	Ret/Dat0-	Input 0 Return- or Data-
Input 0 Shield connection	Case	5	6	Cmn	Input 0 Common
Input 1	Int/Clk1+	7	8	Ret/Dat1+	Input 1
	Int/Clk1-	9	10	Ret/Dat1-	
	Case	11	12	Cmn	
Input 2	Int/Clk2+	13	14	Ret/Dat2+	Input 2
	Int/Clk2-	15	16	Ret/Dat2-	
	Case	17	18	Cmn	
Input 3	Int/Clk3+	19	20	Ret/Dat3+	Input 3
	Int/Clk3-	21	22	Ret/Dat3-	
	Case	23	24	Cmn	

Terminal Block 2 (TB2)

Description		Pin			Description
Input 4	Int/Clk4+	1	2	Ret/Dat4+	Input 4
	Int/Clk4-	3	4	Ret/Dat4-	
	Case	5	6	Cmn	
Input 5	Int/Clk5+	7	8	Ret/Dat5+	Input 5
	Int/Clk5-	9	10	Ret/Dat5-	
	Case	11	12	Cmn	
Input 6	Int/Clk6+	13	14	Ret/Dat6+	Input 6
	Int/Clk6-	15	16	Ret/Dat6-	
	Case	17	18	Cmn	
Input 7	Int/Clk7+	19	20	Ret/Dat7+	Input 7
	Int/Clk7-	21	22	Ret/Dat7-	
	Case	23	24	Cmn	

Stranded Wire and Ferrule Size	
Conductor cross section	24 – 16 AWG 0.2 – 1.5 mm^2
Conductor cross section, ferrule no plastic sleeve	0.25 – 1.5 mm^2
Conductor cross section, ferrule with plastic sleeve	0.25 – 0.75 mm^2
Stripping Length	10 mm
Ferrule Length	10 – 12 mm

Connection Notes:

For SSI:
- Int/Clk = Clock
- Ret/Dat = Data

For SSI Monitor Mode:
- Ret/Dat6± = Data In ±
- Int/Clk6± = unused
- Ret/Dat7± = Clock In ±
- Int/Clk7± = unused

For Magnetostrictive Start/Stop or PWM:
- Int/Clk = Interrogate
- Ret/Dat = Return

For Quadrature:
- Ret/Dat6± = A±
- Int/Clk6± = unused
- Ret/Dat7± = B±
- Int/Clk7± = unused

The Cmn pins must be connected to transducer commons.

Inputs 0-7 are isolated as a single group. There is no isolation between inputs.

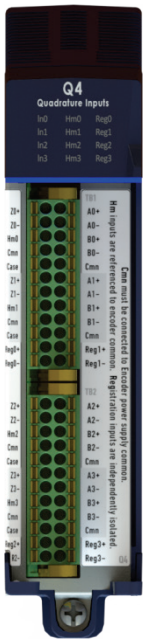
For best noise immunity, use shielded, twisted-pair wires and connect Cmn to transducer common with separate wire.

Terminal Blocks:

The unpluggable terminal blocks include spring-cage terminals. User-supplied ferrules provide for push-in connections.

I/O Module: Q4

4 Quadrature Encoder Inputs



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The Q4 module provides four quadrature (A, B, Z) inputs with one home input and one registration input per quadrature input. One LED per channel indicates the state of the respective input.

Each A quad B input is individually software-configurable as one of the following input types:

- RS-422 differential receiver
- Single-ended TTL-level input
- Differential HTL (High Threshold Logic), up to 24 Vdc signals
- Single-ended HTL (High Threshold Logic) , up to 24 Vdc signals

Each Z (index) input is individually software-configurable as one of the above input types, or a DI (discrete input) type, to support an index input that may be external to the encoder.

Termination is software-selectable for the A and B inputs, and separately for the Z inputs.

Delta recommends an RS-422 line driver output for quadrature encoders, as it provides the highest speed and very good noise immunity. The TTL and HTL input types are intended for retrofit applications where an existing encoder cannot easily be changed to RS-422. For new machine designs, Delta recommends RS-422.

Q4 Specifications

See also General Specifications on page 5.

Quadrature Inputs	
A and B Input Types, software selectable	RS-422 (5V differential receiver for A+, A-, B+, B-) HTL differential (A+, A-, B+, B-) HTL single-ended 12V (A, B) HTL single-ended 24V (A, B) TTL single-ended (A, B)
Z Input Types, software selectable	RS-422 (Z+, Z-) HTL differential (Z+, Z-) HTL single-ended 12V (Z) HTL single-ended 24V (Z) TTL single-ended (Z) DI (discrete input) (Z)
Termination	Software selectable for A and B or for Z. Input impedance: 115 Ω or >200 kΩ
Home Inputs	
Input Types, software selectable	TTL single-ended DI (discrete input)
RS-422 Input	
Max Count Rate	12,000,000 counts per second
Min Edge Alignment	45 ns time between A edge and B edge
Input Threshold	+/-200 mV max/min
Input Hysteresis	230 mV typical
HTL Differential Input	
Max Count Rate	2,000,000 counts per second
Min Edge Alignment	60 ns time between A edge and B edge
Input Threshold	+/-900 mV max/min
Input Hysteresis	1 V typical

Continued on next page.

Q4 Specifications (continued)

HTL Single-ended 12V Input	
Max Count Rate	1,000,000 counts per second
Min Edge Alignment	71 ns time between A edge and B edge
Input Threshold	6 V to 8 V
Input Hysteresis	270 mV typical
Max Input Current	460 µA
Max Propagation Delay	300 ns
HTL Single-ended 24V Input	
Max Count Rate	1,000,000 counts per second
Min Edge Alignment	71 ns time between A edge and B edge
Input Threshold	11 V to 13 V
Input Hysteresis	270 mV typical
Max Input Current	460 µA
Max Propagation Delay	300 ns
TTL Single-ended Input	
Max Count Rate	1,000,000 counts per second
Min Edge Alignment	95 ns time between A edge and B edge
Input Threshold	0.8 V to 2.0 V
Input Hysteresis	530 mV typical
DI Input	
Input Threshold	5.5 V to 8 V
Input Hysteresis	1.2 V typical
Max Input Current	3.3 mA
Max Propagation Delay	300 ns
Registration Inputs	
Input Characteristics	5 or 12-24 Vdc (software selectable)
Input “High” range	5 Vdc input: 3.5 to 5.5 Vdc, 7.5 mA max 12-24 Vdc input: 9 to 26.4 Vdc, 7 mA max
Input “Low” range	5 Vdc input: 0 to 1.7 Vdc, <1 mA 12-24 Vdc input: 0 to 5 Vdc, <1 mA
Maximum propagation delay	Off to On: 5 Vdc input: 0.3 µs 12-24 Vdc input: 0.3 µs On to Off: 5 Vdc input: 0.3 µs, (1.2 µs, open collector drive, 5V) 12-24 Vdc input: 0.5 µs, (11 µs, open collector drive, 24V)
Common	
Functional Isolation	500 Vac
Max Power Dissipation	1.4 W

Continued on next page.

Q4 Pin-out

Terminal Block 1 (TB1)

Description		Pin			Description
Input 0 Z+	Z0+	1	2	A0+	Input 0 A+
Input 0 Z-	Z0-	3	4	A0-	Input 0 A-
Input 0 Home	Hm0	5	6	B0+	Input 0 B+
Encoder and Home Common	Cmn	7	8	B0-	Input 0 B-
Shield connection	Case	9	10	Cmn	Encoder and Home Common
Input 1 Z+	Z1+	11	12	A1+	Input 1 A+
Input 1 Z-	Z1-	13	14	A1-	Input 1 A-
Input 1 Home	Hm1	15	16	B1+	Input 1 B+
Encoder and Home Common	Cmn	17	18	B1-	Input 1 B-
Shield connection	Case	19	20	Cmn	Encoder and Home Common
Registration 0 Input	Reg0+	21	22	Reg1+	Registration 1 Input
	Reg0-	23	24	Reg1-	

Terminal Block 2 (TB2)

Description		Pin			Description
Input 2 Z+	Z2+	1	2	A2+	Input 2 A+
Input 2 Z-	Z2-	3	4	A2-	Input 2 A-
Input 2 Home	Hm2	5	6	B2+	Input 2 B+
Encoder and Home Common	Cmn	7	8	B2-	Input 2 B-
Shield connection	Case	9	10	Cmn	Encoder and Home Common
Input 3 Z+	Z3+	11	12	A3+	Input 3 A+
Input 3 Z-	Z3-	13	14	A3-	Input 3 A-
Input 3 Home	Hm3	15	16	B3+	Input 3 B+
Encoder and Home Common	Cmn	17	18	B3-	Input 3 B-
Shield connection	Case	19	20	Cmn	Encoder and Home Common
Registration 2 Input	Reg2+	21	22	Reg3+	Registration 3 Input
	Reg2-	23	24	Reg3-	

Stranded Wire and Ferrule Size	
Conductor cross section	24 – 16 AWG 0.2 – 1.5 mm^2
Conductor cross section, ferrule no plastic sleeve	0.25 – 1.5 mm^2
Conductor cross section, ferrule with plastic sleeve	0.25 – 0.75 mm^2
Stripping Length	10 mm
Ferrule Length	10 – 12 mm

Connection Notes:

The Cmn pins must be connected to the encoder commons.

Inputs 0-3 are isolated as a single group. There is no isolation between inputs.

The Home input uses the same common as the A and B inputs. Therefore, the Home input will not support an active low home signal such as an NPN open collector. The Home input will support a PNP open collector.

For best noise immunity, use shielded, twisted-pair wires and connect Cmn to transducer common with separate wire.

Terminal Blocks:

The unpluggable terminal blocks include spring-cage terminals. User-suppled ferrules provide for push-in connections.

I/O Module: LC8

8 Load Cell Inputs, ±5 mV/V, with Sense Input

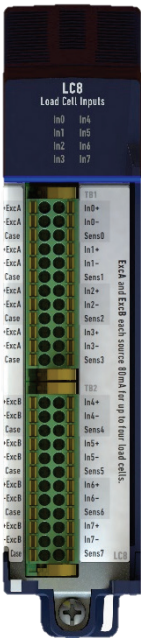
The LC8 module provides eight load cell inputs with two unpluggable terminal blocks of four inputs each. The LC8 supports sensitivities up to 5 mV/V with full Wheatstone bridge configurations. Quarter and half bridges are supported with a customer-supplied bridge completion circuit.

The 6.75 V excitation is intended to work with 350 ohm load cells. Load cells with lower resistance are supported, as long as the total excitation current per terminal block does not exceed 80 mA.

External customer-supplied excitation voltage may be used as long as the Max Differential Input (±34.25 mV) is not exceeded and the input voltage at In+ or In- relative to -Exc is within the Input Voltage Range (0.6 V to 6.15 V typical).

The LC8 supports 4 wire and 6 wire load cells. Each LC8 load cell input includes a single sense input for wire voltage drop compensation. Therefore, only the negative sense wire on a 6 wire load cell will be connected to the LC8 input. For accurate compensation with a single sense input, the excitation wires should be of the same length and gauge.

One LED per input indicates the state of the respective input.



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LC8 Specifications

See also General Specifications on page 5.

Inputs	
Inputs	Eight 24-bit load cell inputs
Overvoltage protection	±24 V, momentary
Input range	±33.75 mV (5 mV/V with 6.75 V excitation)
Max differential input	±34.25 mV (5.075 mV/V with 6.75 V excitation)
Input voltage range	In+ or In- relative to -Exc: 0.6 V to 6.15 V typical
Input impedance	5 MΩ
Input step response	70% in 2 samples times, 100% in 3 samples times
Sampling frequency	8 kHz max
Sampling filter	150 Hz to 2.4 kHz, based on sampling frequency
Offset drift with temperature	±40 nV/V/°C typical
Gain drift with temperature	-0.005%/°C (-50 ppm/°C) typical
Non-linearity	±15 ppm of Full Scale Range typical
Exciter output	6.75 Vdc ± 2 mV typical. 80 mA max total of all exciter outputs per terminal block.
Common	
Max Power Dissipation	1.4 - 2.4 W, depending on use of Exciter Output
Max Power Consumption	1.3 W with no Exciter Output, 3.2 W with Exciter Output

LC8 Pin-out

Terminal Block 1 (TB1)

Description		Pin			Description
6.75 V Exciter output	+ExcA	1	2	In0+	Input 0 +
Input 0 Exciter -	-ExcA	3	4	In0-	Input 0 -
Input 0 Shield connection	Case	5	6	S0	Sense -
Input 1	+ExcA	7	8	In1+	Input 1
	-ExcA	9	10	In1-	
	Case	11	12	S1	
Input 2	+ExcA	13	14	In2+	Input 2
	-ExcA	15	16	In2-	
	Case	17	18	S2	
Input 3	+ExcA	19	20	In3+	Input 3
	-ExcA	21	22	In3-	
	Case	23	24	S3	

Terminal Block 2 (TB2)

Description		Pin			Description
Input 4	+ExcB	1	2	In4+	Input 4
	-ExcB	3	4	In4-	
	Case	5	6	S4	
Input 5	+ExcB	7	8	In5+	Input 5
	-ExcB	9	10	In5-	
	Case	11	12	S5	
Input 6	+ExcB	13	14	In6+	Input 6
	-ExcB	15	16	In6-	
	Case	17	18	S6	
Input 7	+ExcB	19	20	In7+	Input 7
	-ExcB	21	22	In7-	
	Case	23	24	S7	

Connection Notes:

Load cell Exciter:

Inputs 0-7 are isolated as a single group. There is no isolation between inputs.

The pins must be wired according to wiring diagrams in the Startup Guide and RMCTools. The Sense - input is optional.

Exciter outputs (+Exc) are 6.75 Vdc referenced to -Exc. Maximum current is 80 mA total of all exciter outputs per terminal block.

Terminal Blocks:

The unpluggable terminal blocks include spring-cage terminals. User-supplied ferrules provide for push-in connections.

Stranded Wire and Ferrule Size	
Conductor cross section	24 – 16 AWG 0.2 – 1.5 mm^2
Conductor cross section, ferrule no plastic sleeve	0.25 – 1.5 mm^2
Conductor cross section, ferrule with plastic sleeve	0.25 – 0.75 mm^2
Stripping Length	10 mm
Ferrule Length	10 – 12 mm

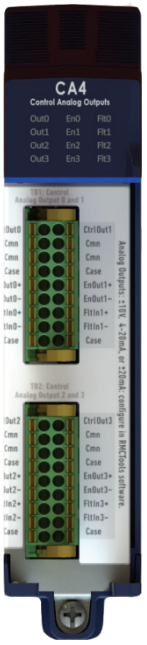
I/O Module: CA4

4 Analog Outputs, ±10 V, 4-20 mA, or ±20 mA, with Fault Inputs and Enable Outputs

The CA4 module provides four analog outputs specifically designed for control outputs to valves, amplifiers, or drives. The outputs are individually software selectable as ±10 V, 4-20 mA, or ±20 mA for connection to a wide variety of actuators. The CA4 also supports custom ranges within the ±10 V and ±20 mA ranges, such as 0-10 V, 0-5 V, 1-5 V, etc.

Each analog output has an associated 12-24 Vdc Fault Input and a solid state relay Enable Output. The Fault Inputs and Enable Outputs may be dedicated to the respective output, or may be used as general-purpose discrete I/O.

Three LEDs per channel indicate the state of the respective analog output, Enable Output, and Fault Input.



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CA4 Specifications

See also General Specifications on page 5.

Analog Outputs	
Range	Voltage mode: ± 10 V @ 15 mA (670 Ω or greater load) Current mode: ± 20 mA @ 10 V (500 Ω or lower load)
Tolerance at full output	Voltage mode: ± 5 mV at 10 V Current mode: ± 10 μA at 20 mA
Resolution	18 bits
Hardware Output Filter	First-order filter, time constant 100 μsec
Overload protection	Continuous short to common
Overvoltage protection	Outputs are protected by clamp diodes
Enable Output	
Output type	Solid State Relay
Load types	DC general use, DC resistance, DC Pilot Duty
Logic polarity	User selectable to Active Open or Active Closed
Rated voltage	max ±30 Vdc
Maximum current	±75 mA
Maximum propagation delay	2 ms turn-on, 0.5 ms turn-off
Closed	Low impedance (15 Ω maximum)
Open	High impedance (<1 μA leakage current at 30 V)
Fault Input	
Input characteristics	12-24 Vdc; polarity independent, sinking or sourcing load
Logic polarity	User selectable to Active Input “High” or Active Input “Low” (Open when module not powered)
Input “High” range	9 to 26.4 Vdc (polarity independent), 3 mA maximum
Input “Low” range	0 to 5 Vdc (polarity independent), <1 mA
Maximum propagation delay	100 μs Off to On 750 μs On to Off (open collector drive)
Common	
Max Power Dissipation	1.4 W, all analog outputs in voltage mode 2.8 W, all analog outputs in current mode

Continued on next page.

CA4 Pin-out

Terminal Block 1 (TB1)

Description		Pin			Description
Voltage or current output 0	CtrlOut0	1	2	CtrlOut1	
Output common	Cmn	3	4	Cmn	
Output common	Cmn	5	6	Cmn	
Shield connection	Case	7	8	Case	
Enable Output 0+	EnOut0+	9	10	EnOut1+	Output 1
Enable Output 0-	EnOut0-	11	12	EnOut1-	
Fault Input 0+	FltIn0+	13	14	FltIn1+	
Fault Input 0-	FltIn0-	15	16	FltIn1-	
Shield connection	Case	17	18	Case	

Terminal Block 2 (TB2)

Description		Pin			Description
	CtrlOut2	1	2	CtrlOut3	
	Cmn	3	4	Cmn	
	Cmn	5	6	Cmn	
	Case	7	8	Case	
Output 2	EnOut2+	9	10	EnOut3+	Output 3
	EnOut2-	11	12	EnOut3-	
	FltIn2+	13	14	FltIn3+	
	FltIn2-	15	16	FltIn3-	
	Case	17	18	Case	

Stranded Wire and Ferrule Size	
Conductor cross section	24 – 16 AWG 0.2 – 1.5 mm^2
Conductor cross section, ferrule no plastic sleeve	0.25 – 1.5 mm^2
Conductor cross section, ferrule with plastic sleeve	0.25 – 0.75 mm^2
Stripping Length	10 mm
Ferrule Length	10 – 12 mm

Connection Notes:

The CtrlOut pin is normally ±10V. May be configured to ±20 mA or 4-20 mA in RMCTools.

Analog outputs 0-3 are isolated as a single group. There is no isolation between outputs.

For best noise immunity, use shielded, twisted-pair wires. When connecting to a differential input, connect CtrlOut and Cmn as a twisted pair to the receiver differential inputs, and also run a separate wire from Cmn to the differential input common.

Terminal Blocks:

The unpluggable terminal blocks include spring-cage terminals. User-supplied ferrules provide for push-in connections.

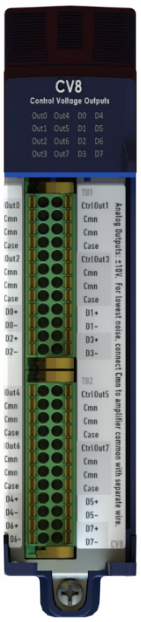
I/O Module: CV8

8 Analog Outputs, ±10 V only, with eight individually-configurable discrete I/O

The CV8 module provides eight analog outputs specifically designed for control outputs to valves, amplifiers, or drives. The ±10 V outputs support custom ranges within the ±10 V range, such as 0-10 V, 0-5 V, 1-5 V, etc.

The CV8 provides eight discrete I/O points, individually configurable as inputs or outputs. These discrete I/O may be used for general purpose I/O, Fault Inputs, or Enable Outputs.

Each analog output has an associated LED, and each discrete I/O point has an associated LED.



Shown without door

CV8 Specifications

See also General Specifications on page 5.

Analog Outputs	
Range	± 10 V @ 5 mA (2000 Ω or greater load)
Tolerance at full output	± 5 mV at 10 V
Resolution	18 bits
Hardware Output Filter	First-order filter, time constant 75 µsec
Overload protection	Continuous short to common
Overvoltage protection	Outputs are protected by clamp diodes
Discrete Outputs (up to 8 per module)	
Output type	Solid State Relay, individually isolated
Load types	DC general use, DC resistance, DC Pilot Duty
Logic polarity	User selectable to Active Open or Active Closed
Rated voltage	max ±30 Vdc
Maximum current	±75 mA
Maximum propagation delay	2 ms turn-on, 0.5 ms turn-off
Closed	Low impedance (15 Ω maximum)
Open	High impedance (<1 µA leakage current at 30 V)
Discrete Inputs (up to 8 per module)	
Input characteristics	12-24 Vdc; polarity independent, individually isolated
Logic polarity	User selectable to Active Input “High” or Active Input “Low” (Open when module not powered)
Input “High” range	9 to 26.4 Vdc (polarity independent), 3 mA maximum
Input “Low” range	0 to 5 Vdc (polarity independent), <1 mA
Maximum propagation delay	100 µs Off to On 750 µs On to Off (open collector drive)
Common	
Max Power Dissipation	2.0 W

Continued on next page.

CV8 Pin-out

Terminal Block 1 (TB1)

Description		Pin			Description
Voltage output 0	CtrlOut0	1	2	CtrlOut1	Output 1
Output common	Cmn	3	4	Cmn	
Output common	Cmn	5	6	Cmn	
Connection to case	Case	7	8	Case	
Output 2	CtrlOut2	9	10	CtrlOut3	Output 3
	Cmn	11	12	Cmn	
	Cmn	13	14	Cmn	
	Case	15	16	Case	
Discrete I/O 0+	D0+	17	18	D1+	Discrete I/O 1
Discrete I/O 0-	D0-	19	20	D1-	
Discrete Input 2	D2+	21	22	D3+	Discrete I/O 3
	D2-	23	24	D3-	

Terminal Block 2 (TB2)

Description		Pin			Description
Output 4	CtrlOut4	1	2	CtrlOut5	Output 5
	Cmn	3	4	Cmn	
	Cmn	5	6	Cmn	
	Case	7	8	Case	
Output 6	CtrlOut6	9	10	CtrlOut7	Output 7
	Cmn	11	12	Cmn	
	Cmn	13	14	Cmn	
	Case	15	16	Case	
Discrete I/O 4	D4+	17	18	D5+	Discrete I/O 5
	D4-	19	20	D5-	
Discrete I/O 6	D6+	21	22	D7+	Discrete I/O 7
	D6-	23	24	D7-	

Stranded Wire and Ferrule Size	
Conductor cross section	24 – 16 AWG 0.2 – 1.5 mm^2
Conductor cross section, ferrule no plastic sleeve	0.25 – 1.5 mm^2
Conductor cross section, ferrule with plastic sleeve	0.25 – 0.75 mm^2
Stripping Length	10 mm
Ferrule Length	10 – 12 mm

Connection Notes:

Analog outputs 0-7 are isolated as a single group. There is no isolation between outputs.

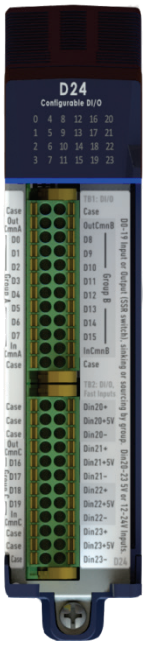
For best noise immunity, use shielded, twisted-pair wires. When connecting to a differential input, connect CtrlOut and Cmn as a twisted pair to the receiver differential inputs, and also run a separate wire from Cmn to the differential input common.

Terminal Blocks:

The unpluggable terminal blocks include spring-cage terminals. User-supplied ferrules provide for push-in connections.

I/O Module: D24

24 Discrete I/O



Shown without door

The D24 discrete I/O module contains 20 configurable discrete I/O points for 24 Vdc and 4 high-speed discrete inputs for either 5 or 24 Vdc signals.

The four high-speed inputs of the D24 module are software configurable as general-purpose inputs, or quadrature or pulse counter inputs. The D24 quadrature input supports single-ended encoders and encoders with complements, and up to 24 V signals. The D24 quadrature input is not designed for RS-422 drivers, but will function at a reduced input frequency.

Delta always recommends an RS-422 line driver output for quadrature encoders, as it provides high speed and very good noise immunity. RS-422 quadrature signals are best supported by the Q4 module and on the S8 and U14 module (only one input on the S8). The D24 quadrature is intended for retrofit applications where an existing encoder cannot easily be changed to RS-422. For new machine designs, use RS-422.

20 general-purpose discrete I/O points:

- 24 Vdc signals
- Individually software-configurable as an input or output (solid state relay).
- Arranged in 3 isolated groups of 8, 8, and 4 I/O points.

4 high-speed inputs:

- 5 or 24 Vdc signals (separate pin for 5 or 12-24 Vdc connection)
- Software configurable as general-purpose or specific high-speed functionality
- Quadrature encoder, software-configurable as one of the following options:
  - 1 single-ended quadrature input with A, B, and Z, using inputs 20-22.
  - 1 quadrature input with complements (A+, A-, B+, B-) and wire break detection, using inputs 20-23.
  - 2 single-ended quadrature inputs with A and B, using inputs 20-23.
- Pulse counter, using inputs 20 and 22, software configurable as rising edge, falling edge, or rising and falling edge counter.
- Supports Event Timers – high-speed timing between input events

D24 Specifications

See also General Specifications on page 5.

General Purpose Inputs	
Input Characteristics	12-24 Vdc; polarity independent, sinking or sourcing load
Logic polarity	True High
Input “High” range	9 to 26.4 Vdc (polarity independent), 3 mA maximum
Input “Low” range	0 to 5 Vdc (polarity independent), <1 mA
Maximum propagation delay	100 µsec, (750 µsec, open collector “Off”)
General Purpose Outputs	
Outputs	Solid State Relay
Load types	DC general use, DC resistance, DC Pilot Duty
Maximum voltage	max ±30 Vdc
Maximum current	±75 mA
Maximum propagation delay	2 ms turn-on, 0.5 ms turn-off
Logic 1 (True, On)	Low impedance (15 Ω maximum)
Logic 0 (False, Off)	High impedance (<1 µA leakage current at 30 V)

Continued on next page.

D24 Specifications (continued)

See also General Specifications on page 5.

High-Speed Inputs	
Input Characteristics	5 or 12-24 Vdc (separate pins for 5 or 12-24 Vdc)
Logic polarity	True High
Input “High” range	5 Vdc input: 3.5 to 5.5 Vdc, 7.5 mA max 12-24 Vdc input: 9 to 26.4 Vdc, 7 mA max
Input “Low” range	5 Vdc input: 0 to 1.7 Vdc, <1 mA 12-24 Vdc input: 0 to 5 Vdc, <1 mA
Maximum propagation delay	Off to On: 5 Vdc input: 0.3 µs 12-24 Vdc input: 0.3 µs On to Off: 5 Vdc input: 0.3 µs, (1.2 µs, open collector drive, 5V) 12-24 Vdc input: 0.5 µs, (11 µs, open collector drive, 24V)
Maximum input frequency	5 Vdc input: 1,000 kHz, (400 kHz, open collector drive, 5V) 12-24 Vdc input: 500 kHz, (25 kHz, open collector drive, 24V)
Common	
Max Power Dissipation	1.0 W, plus 50 mW per I/O point used

D24 Pin-out

Terminal Block 1 (TB1)

Description		Pin			Description
Shield connection	Case	1	2	Case	Shield connection
Common for Group A outputs	OutCmnA	3	4	OutCmnB	Common for Group B outputs
Group A, DI/O point 0	D0	5	6	D8	Group B, DI/O point 8
Group A, DI/O point 1	D1	7	8	D9	Group B, DI/O point 9
Group A, DI/O point 2	D2	9	10	D10	Group B, DI/O point 10
Group A, DI/O point 3	D3	11	12	D11	Group B, DI/O point 11
Group A, DI/O point 4	D4	13	14	D12	Group B, DI/O point 12
Group A, DI/O point 5	D5	15	16	D13	Group B, DI/O point 13
Group A, DI/O point 6	D6	17	18	D14	Group B, DI/O point 14
Group A, DI/O point 7	D7	19	20	D15	Group B, DI/O point 15
Common for Group A inputs	InCmnA	21	22	InCmnB	Common for Group B inputs
Shield connection	Case	23	24	Case	Shield connection

Terminal Blocks:

The unpluggable terminal blocks include spring-cage terminals. User-supplied ferrules provide for push-in connections.

Stranded Wire and Ferrule Size	
Conductor cross section	24 – 16 AWG 0.2 – 1.5 mm^2
Conductor cross section, ferrule no plastic sleeve	0.25 – 1.5 mm^2
Conductor cross section, ferrule with plastic sleeve	0.25 – 0.75 mm^2
Stripping Length	10 mm
Ferrule Length	10 – 12 mm

Terminal Block 2 (TB2)

Description		Pin			Description
Shield connection	Case	1	2	Din20+	Input 20+ for 12-24 Vdc
Shield connection	Case	3	4	Din20+5V	Input 20+ for 5 Vdc
Shield connection	Case	5	6	Din20-	Input 20- for all signals
Common for Group C outputs	OutCmnC	7	8	Din21+	
Group C, DI/O point 16	D16	9	10	Din21+5V	Input 21
Group C, DI/O point 17	D17	11	12	Din21-	
Group C, DI/O point 18	D18	13	14	Din22+	
Group C, DI/O point 19	D19	15	16	Din22+5V	Input 22
Common for Group C inputs	InCmnC	17	18	Din22-	
Shield connection	Case	19	20	Din23+	
Shield connection	Case	21	22	Din23+5V	Input 23
Shield connection	Case	23	24	Din23-	

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D24 Configurability and Connection Notes

I/O Points 0-19:

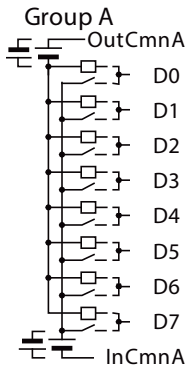
Divided into groups A, B, and C. Each group contains I/O points with a shared output common and input common. Each individual point is configured in the RMCTools software to be an input or an output.

All inputs in a group share the same common, and all outputs in a group share the same common.

Within each group, all inputs must be the same polarity, and all outputs must be the same polarity, but inputs need not be the same polarity as outputs, that is, outputs can switch high side or low side, and inputs can be active high or low.

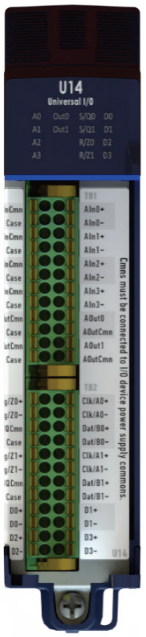
Inputs 20-23:

Inputs only, individually isolated. For 12-24 Vdc inputs, wire to Din+ and Din-. For 5 Vdc inputs, wire to Din+5V and Din-. Do not wire both Din+ and Din+5V on the same input.



I/O Module: U14

4 Analog Inputs (±10 V or 4-20 mA), 2 Analog Outputs (±10 V, 4-20 mA, or ±20 mA), 4 Discrete I/O, 2 High-Speed Channels for SSI, MDT or Quadrature Encoder Inputs, each with an additional high-speed discrete input



Shown without door

The U14 module provides multiple types of I/O to complement the RMC200's other high-density modules. For example, use the U14 together with an 8-input module and 8-output module to obtain a controller with 10 axes of motion without purchasing extra modules with many unused inputs.

The U14 provides:

- **Four analog inputs**
  For ±10 V or 4-20 mA signals. 18 bits resolution ADCs with oversampling for increased effective resolution and noise reduction. One LED per channel indicates the state of the respective input.
- **Two analog outputs**
  18-bit analog outputs designed for control outputs to valves, amplifiers, or drives. The outputs are individually software selectable as ±10 V, 4-20 mA, or ±20 mA for connection to a wide variety of actuators. The U14 also supports custom ranges within the ±10 V and ±20 mA ranges, such as 0-10 V, 0-5 V, 1-5 V, etc. One LED per channel indicates the state of the respective analog output.
- **4 configurable discrete I/O points**
  For 24 Vdc. Each I/O point is configurable as an input or output and individually isolated. One LED per I/O point indicates the status of the input or output.
- **Two channels of high-speed I/O**
  Individually software selectable as SSI inputs, magnetostrictive Start/Stop or PWM inputs, or as quadrature encoder inputs. Each channel has an associated registration/Z (index) input. One LED per channel indicates the state of the respective high-speed channel, and another LED indicates the state of each Reg/Z input.
  - **SSI:** A U14 high-speed channel can be configured as:
    - **SSI input**: receives data from an SSI device, such as a position sensor.
    - **SSI monitor input**: monitors data that is being transferred between a separate SSI input and an SSI device.
    - **Echo mode**: Channel 1 outputs as an SSI device the data received by channel 0 configured as an SSI input.
  - **Magnetostrictive Start/Stop or PWM inputs (MDT):**
    Requires RS-422 signals and supports multiple recirculations.
  - **Quadrature encoder input:**
    Each A quad B input is individually software-configurable as one of the following input types:
    - RS-422 differential receiver
    - Single-ended TTL-level input
    - Differential HTL (High Threshold Logic), up to 24 Vdc signals
    - Single-ended HTL (High Threshold Logic) , up to 24 Vdc signals

    Delta recommends an RS-422 line driver output for quadrature encoders, as it provides the highest speed and very good noise immunity. TTL and HTL are intended for retrofit applications where an existing encoder cannot easily be changed to RS-422. For new machine designs, Delta recommends RS-422.
  - **Two Registration/Z (Index) inputs**
    Each Z (index) input is individually software-configurable as one of the above input types, or a DI (discrete input) type, to support an index input that may be external to the encoder.

See U14 specifications on the next page.

U14 Specifications

See also General Specifications on page 5.

Analog Inputs	
Inputs	Four 18-bit differential (higher resolution obtained by oversampling)
Overvoltage protection	±24 V, momentary
Input ranges	±10 V, 4-20 mA, ±20 mA (each input independently configurable)
Max differential ranges	Voltage: -10.2 V to +10.2 V Current: -20 mA to +20 mA (continuous), -25 mA to +25 mA (peak)
Max input voltage ranges	In+ or In- relative to Cmn: -14 V to +14 V typical
Input impedance	Voltage input: 1 MΩ Current input: 165Ω
Input filter slew rate	25 V/ms
Sampling frequency	200 kHz internal sampling. Provides one filtered sample per control loop (e.g. 1 msec) to CPU.
Sampling filter	250 Hz – 4 kHz, user-selectable internal low-pass sampling filter.
Offset drift with temperature	0.2 LSB/°C typical (±10 V range)
Gain drift with temperature	20 ppm/°C typical (±10 V range)
Non-linearity	12 LSB (counts) typical (±10 V range)
Analog Outputs	
Range	Voltage mode: ± 10 V @ 15 mA (670 Ω or greater load) Current mode: ± 20 mA @ 10 V (500 Ω or lower load)
Tolerance at full output	Voltage mode: ± 5 mV at 10 V Current mode: ± 10 µA at 20 mA
Resolution	18 bits
Hardware Output Filter	First-order filter, time constant 100 µsec
Overload protection	Continuous short to common
Overvoltage protection	Outputs are protected by clamp diodes
SSI Interface	
Data input	RS-422 differential
Clock output	RS-422 differential
Termination	Software selectable data input impedance: 110 Ω or >200 kΩ
Clock frequency	User-selectable, 100 kHz to 2500 kHz
Cable length maximum	Transducer dependent (approx. 3-2100 ft)
Resolution	Transducer dependent (up to 0.1 µm for magnetostrictive LDTs)
Count encoding	Binary or Gray Code
Data bits	8 to 32 bits
Bit masking	A selectable number of high or low bits may be masked
Additional Settings	Selectable overflow modes to conform to various SSI transducers. Wire break detection
Start/Stop and PWM Interface	
Transducer interface types	MDT with Start/Stop or PWM (Pulse Width Modulated) feedback
Interrogation output	RS-422 differential (transducer must be configured for external interrogation)
Return input	RS-422 differential
Resolution	0.0005 in. with one recirculation
Count rate	240 MHz
Recirculations	Supports multiple recirculations only for PWM transducers with internal recirculations.
Maximum transducer length	440 in. at 4 ms (loop-time dependent)

Continued on next page.

U14 Specifications (continued)

Quadrature Inputs	
A and B Input Types, software selectable	RS-422 (5V differential receiver for A+, A-, B+, B-) HTL differential (A+, A-, B+, B-) HTL single-ended 12V (A, B) HTL single-ended 24V (A, B) TTL single-ended (A, B)
Reg/Z Input Types, software selectable	RS-422 (Reg/Z+, Reg/Z-) HTL differential (Reg/Z+, Reg/Z-) HTL single-ended 12V (Reg/Z) HTL single-ended 24V (Reg/Z) TTL single-ended (Reg/Z) DI (discrete input) (Reg/Z)
Termination	Software selectable in RS-422 and TTL modes for A and B and for Reg/Z. Input impedance: 115 Ω or >200 kΩ
Absolute Max Input Voltage	26.2 V
Absolute Min Input Voltage	-26.2 V
Fault Voltage	TTL, RS-422: Input voltage < -16V or > 16V (typical) HTL, DI: Input voltage < -16V (typical)
RS-422 Input	
Max Count Rate	8,000,000 counts per second
Min Edge Alignment	55 ns time between A edge and B edge
Input Threshold	+/-460 mV max/min
Input Hysteresis	230 mV typical
Maximum Propagation Delay	RS-422: 25 ns
HTL Differential Input	
Max Count Rate	2,000,000 counts per second
Min Edge Alignment	70 ns time between A edge and B edge
Input Threshold	+/-2 V max/min
Input Hysteresis	1 V typical
HTL Single-ended 12V Input	
Max Count Rate	1,000,000 counts per second
Min Edge Alignment	80 ns time between A edge and B edge
Input Threshold	6 V to 8 V
Input Hysteresis	270 mV typical
Max Input Current	460 µA
Max Propagation Delay	300 ns
HTL Single-ended 24V Input	
Max Count Rate	1,000,000 counts per second
Min Edge Alignment	80 ns time between A edge and B edge
Input Threshold	11 V to 13 V
Input Hysteresis	270 mV typical
Max Input Current	460 µA
Max Propagation Delay	300 ns
TTL Single-ended Input	
Max Count Rate	1,000,000 counts per second
Min Edge Alignment	105 ns time between A edge and B edge
Input Threshold	0.8 V to 2.0 V
Input Hysteresis	530 mV typical
DI Input	
Input Threshold	5.5 V to 8 V
Input Hysteresis	1.2 V typical
Max Input Current	3.3 mA
Max Propagation Delay	300 ns

Continued on next page.

Power	
Max Power Dissipation	2.6 W, both analog outputs in voltage mode 3.2 W, both analog outputs in current output
General Purpose Discrete Inputs	
Input Characteristics	12-24 Vdc; polarity independent, sinking or sourcing load
Logic polarity	True High
Input “High” range	9 to 26.4 Vdc (polarity independent), 3 mA maximum
Input “Low” range	0 to 5 Vdc (polarity independent), <1 mA
Maximum propagation delay	100 µsec, (750 µsec, open collector “Off”)
General Purpose Discrete Outputs	
Outputs	Solid State Relay
Load types	DC general use, DC resistance, DC Pilot Duty
Maximum voltage	max ±30 Vdc
Maximum current	±75 mA
Maximum propagation delay	2 ms turn-on, 0.5 ms turn-off
Logic 1 (True, On)	Low impedance (15 Ω maximum)
Logic 0 (False, Off)	High impedance (<1 µA leakage current at 30 V)

U14 Pin-out

Terminal Block 1 (TB1)

Description		Pin			Description
Analog Input Common	A In Cmn	1	2	A In0+	Analog Input 0+
Shield connection	Case	3	4	A In0-	Analog Input 0-
Analog Input 1	A In Cmn	5	6	A In1+	Analog Input 1
	Case	7	8	A In1-	
Analog Input 2	A In Cmn	9	10	A In2+	Analog Input 2
	Case	11	12	A In2-	
Analog Input 3	A In Cmn	13	14	A In3+	Analog Input 3
	Case	15	16	A In3-	
Analog Output Common	A Out Cmn	17	18	A Out0	Analog Output 0
Shield connection	Case	19	20	A Out Cmn	Analog Output Common
Analog Output 1	A Out Cmn	21	22	A Out1	Analog Output 1
	Case	23	24	A Out Cmn	

The AInCmn pins are internally connected. The AOutCmn pins are internally connected.

Terminal Block 2 (TB2)

Description		Pin			Description
Registration/Quad Z 0+	Reg/Z0+	1	2	Clk/A0+	SSI Clk/MDT Int/Quad A 0+
Registration/Quad Z 0-	Reg/Z0-	3	4	Clk/A0-	SSI Clk/MDT Int/Quad A 0-
SSI/MDT/Quad Common	S/Q Cmn	5	6	Dat/B0+	SSI Data/MDT Ret/Quad B 0+
Shield connection	Case	7	8	Dat/B0-	SSI Data/MDT Ret/Quad B 0-
High-speed Channel 1	Reg/Z1+	9	10	Clk/A1+	High-speed Channel 1
	Reg/Z1-	11	12	Clk/A1-	
	S/Q Cmn	13	14	Dat/B1+	
	Case	15	16	Dat/B1-	
Discrete I/O 0+	D0+	17	18	D1+	Discrete I/O 1+
Discrete I/O 0-	D0-	19	20	D1-	Discrete I/O 1-
Discrete I/O 2+	D2+	21	22	D3+	Discrete I/O 3+
Discrete I/O 2-	D2-	23	24	D3-	Discrete I/O 3-

The S/Q Cmn pins are internally connected.

Connection Notes:

Analog inputs 0-3 are isolated as a single group. Analog output 0-1 are isolated as a single group. There is no isolation between individual inputs in these groups.

The Reg/Z input uses the same common as the A and B encoder. Therefore, the Reg/Z input will not support an active low home signal such as an NPN open collector. The Reg/Z input will support a PNP open collector.

For best noise immunity, use shielded, twisted-pair wires and connect Cmn to transducer common with separate wire.

Discrete I/O points D0-D3 are individually isolated.

Terminal Blocks:

The unpluggable terminal blocks include spring-cage terminals. User-supplied ferrules provide for push-in connections.

Stranded Wire and Ferrule Size	
Conductor cross section	24 – 16 AWG 0.2 – 1.5 mm^2
Conductor cross section, ferrule no plastic sleeve	0.25 – 1.5 mm^2
Conductor cross section, ferrule with plastic sleeve	0.25 – 0.75 mm^2
Stripping Length	10 mm
Ferrule Length	10 – 12 mm

Blank Slot Covers

The blank slot covers protect the base connector from foreign particles. The covers hinge on the top hooks of the base and magnetically attach to the base. In addition, a hole allows the user to supply and install a screw for firm attachment to the base. Recommended screw size is #6-32 x 1/2" or #6-32 x 5/8".



Part number: R2-SC

SD Card

Delta recommends using industrial-grade SD (SDSC) or SDHC cards with the CPU20L and CPU40. Industrial grade cards provide many benefits over commercial grade, including a wide temperature range and long data retention life. Customers may purchase a card from Delta or supply their own standard form factor SDSC or SDHC card up to 32 GB with a FAT32 or FAT16 file system. Delta offers an industrial rated, SDSC, 1 GB card:



R2-MEM-SD-1G	
Card family	SDSC
File system	FAT16
Form factor	Standard
Capacity	1 GB
Memory type	SLC
Temperature range	-40 to +85°C

Part number: R2-MEM-SD-1G

Cables

Pigtail cables provide a compact, convenient option for RMC200 modules. These cables are for short distances between the RMC200 and terminal blocks within the same cabinet. For long cable runs, use cables with lower resistance and better shielding.





Part Number	For Module	For Terminal Block	Number Required per Module	Lengths*
R2-CB-A8-*nn*A	A8	TB 1 or TB 2	2	
R2-CB-S8-*nn*A	S8	TB 1 or TB 2	2	
R2-CB-Q4-*nn*A	Q4	TB 1 or TB 2	2	
R2-CB-LC8-*nn*A	LC8	TB 1 or TB 2	2	*nn* = 06 6 ft. (1.83 m)
R2-CB-CA4-*nn*A	CA4	TB 1 or TB 2	2	
R2-CB-CV8-*nn*A	CV8	TB 1 or TB 2	2	
R2-CB-D24TB1-*nn*A	D24	TB1	1 of each cable assembly (2 total)	*nn* = 12 12 ft. (3.66 m)
R2-CB-D24TB2-*nn*A		TB2		
R2-CB-U14TB1-*nn*A	U14	TB1	1 of each cable assembly (2 total)	
R2-CB-U14TB2-*nn*A		TB2		

*Contact Delta for other lengths.

Voltage-to-Current Converters

Delta's voltage-to-current converters are designed for converting a voltage control output to current for current-controlled servo valves. Delta offers several voltage-to-current converters to fit your needs. The maximum output current is adjustable in increments of 10 mA up to the maximum output current range.

Notice that the CA4 and U14 analog outputs supports up to ±20 mA and do not need a converter for valves rated for ±20 mA or less. Valves rated for ±40 mA can typically be operated with ±20 mA if the coils are wired in series rather than in parallel. The user must determine whether series connection is acceptable.

Part Number	Description	Output Current Range*	Power Supply
VC2124	2-channel voltage-to-current converter	±100 mA per channel	24 Vdc
VC2100	2-channel voltage-to-current converter	±100 mA per channel	±15 Vdc
VC2100-HS	2-channel voltage-to-current converter – high speed**	±100 mA per channel	±15 Vdc



VC2124



VC2100



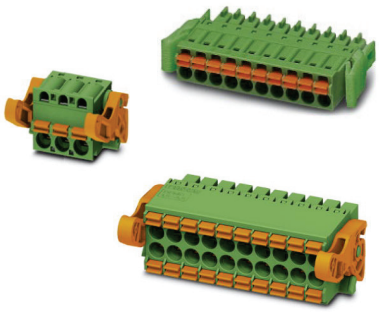
VC2100-HS

* Channels can be connected in parallel to provide higher current. For example, two ±100 mA channels connected in parallel will provide ±200 mA.

** Most hydraulic control applications do not require the high-speed converter.

Terminal Blocks

All RMCs ship with connectors. Connectors are also available for order individually from Delta. The table below lists the available connectors. These parts are also available from connector manufacturer Phoenix using these part numbers.



Phoenix Connector Part No	Delta Part No	Connector Description	For Modules
FKC 2,5/ 3-ST-5,08-LR - 1792520	EPA0078	3-pin Terminal Block	PS4D, PS6D
FMC 1,5/ 3-ST-3,5-RF - 1952034	EPA0166	3-pin Terminal Block	CPU20L
FMC 1,5/ 8-ST-3,5-RF – 1952089	EPA0081	8-pin Terminal Block	CPU40, CPU20L
DFMC 1,5/ 9-ST-3,5-LR – 1790551	EPA0079	18-pin Terminal Block	CA4
DFMC 1,5/12-ST-3,5-LR – 1790580	EPA0080	24-pin Terminal Block	A8, S8, Q4, CV8, D24, U14

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