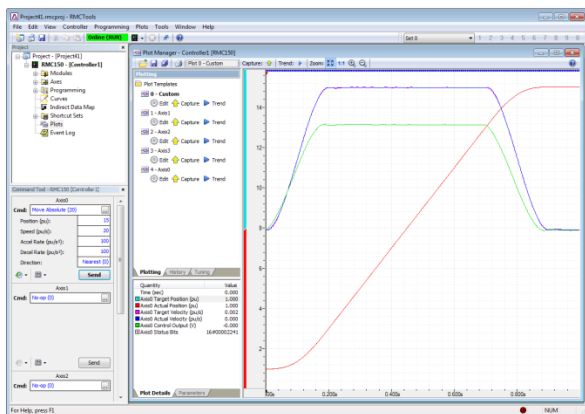# RMC150 MOTION CONTROLLER

STARTUP

GUIDE

With wiring diagrams

DELTA
COMPUTER SYSTEMS

Motion Control and More

Where to Get Help

Video Tutorials

In RMCTools, on the **Help** menu, click **Video Tutorials**.

RMCTools Help

In RMCTools, on the **Help** menu, click **Help Topics**.

Forum

forum.deltamotion.com

Delta Technical Support

Phone: +1-360-254-8688

Email: support@deltamotion.com

Contents

Step 1: Mounting

The RMC should be mounted upright on a vertical surface, such that the ventilation holes are on the top and bottom.

Mounting Options
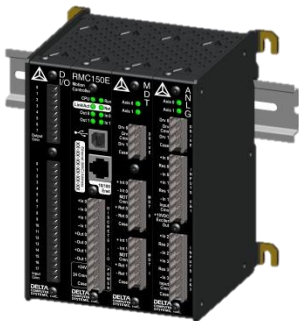
Symmetrical DIN 3   **Panel-mount**

- See **Discrete Input Wiring**

- **To** turn on a discrete input, apply a voltage of the correct level. The polarity is unimportant.

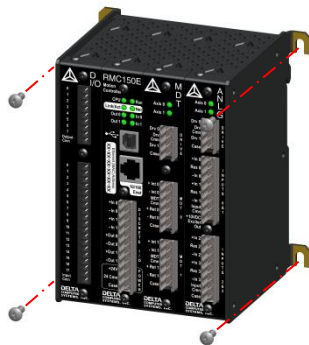|	RMC150E	DI/O	UI/O
Signal Levels	12-24 VDC	5-24 VDC	12-24 VDC
Max Current Draw	3 mA max	6 mA at 5V 10 mA at 24V	3 mA max

DI/O and UI/O Module

Because all the inputs share a common, all inputs on the same module must be wired the same.

Example

RMC150E Module

Each input has a "+" and "−" connection.

Example

Appendix B: Mounting Dimensions for dimensions.

Clearance

The amount of clearance above and below depends on the maximum ambient temperature:

Ambient Temperature	Clearance
122 - 140°F (50 - 60°C)	3 in. (7.6 cm)
86 - 122°F (30 - 50°C)	2 in. (5.1 cm)
Less than 86°F (30°C)	1 in. (2.5 cm)

Grounding

Make sure to properly ground the RMC. If mounted on a DIN rail, the RMC will conduct to the DIN rail. The RMC shell is electrically connected to its Case pins.

Step 2: Wiring

Wire the power, actuators and feedback devices to the RMC according to the instructions in **Appendix A: Wiring** on page 30.

Note: Remove power from the RMC before connecting any wires.

Wiring Topic		Page
General Wiring Information		31
Power		32
Control Output (Drive)		32
SSI Inputs		33
Start/Stop and PWM Inputs (Magnetostrictive)		35
Analog Inputs	Voltage Transducer	37
	Potentiometer	38
	Current Transducer	38
Resolver Inputs		40
Discrete Inputs/Outputs	Discrete Outputs	41
	Discrete Inputs	43

Step 3: Install RMCTools

Download

1. Go to http://www.deltamotion.com/dloads/

2. Choose the **RMC70** or **RMC150** category, then choose the **Software** category.

3. Choose the RMCTools 32-bit or 64-bit version as required for your computer.

4. Run the rmctoolsinstall32.exe or rmctoolsinstall64.exe file and follow the instructions.

Start RMCTools

On the Windows **Start** menu, choose **All Programs** and then **RMCTools**.

| PC Requirements for RMCTools	
Operating System	7/8.1/10

Step 4: Connect RMC to PC

USB Cable

Connect a standard A to B USB cable to the PC and to the RMC150E USB port .

This type of USB cable is used for PC peripherals such as printers, and is available at any store that sells electronics.
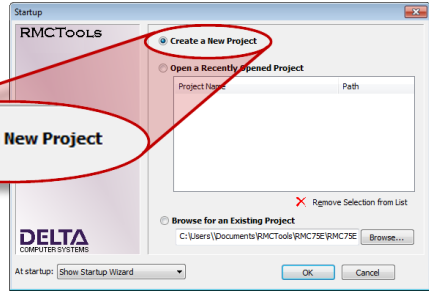
Or, use Ethernet Cable

Connect an Ethernet cable to the RMC150E and the PC or Ethernet switch. The RMC150E supports both straight through and crossover cables.
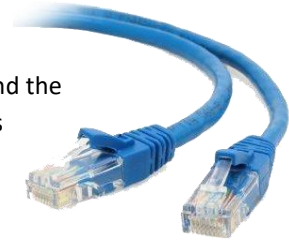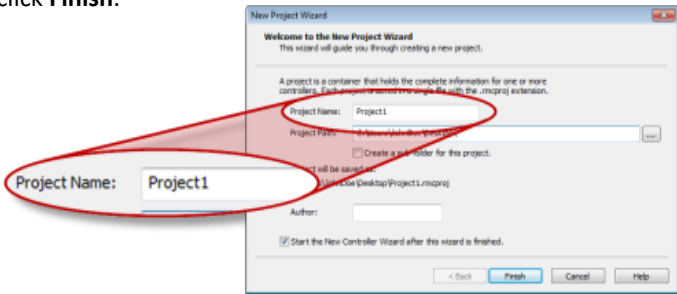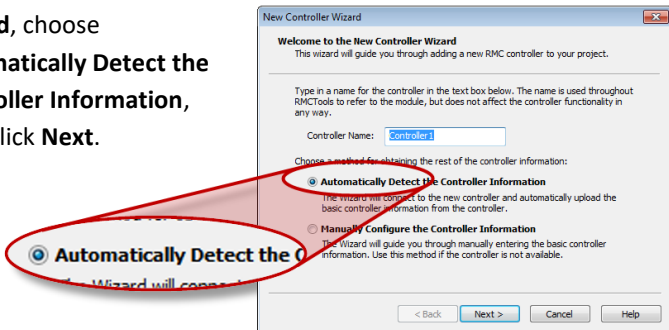
Step 5: Start a New Project

1. Start RMCTools.

2. In the **Startup** dialog,
   choose **Create a New
   Project** and click **OK**.

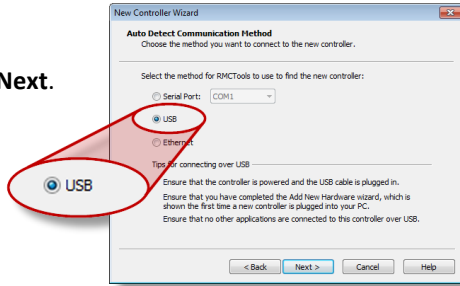3. Enter the **Project Name**,
   then click **Finish**.

4. In the **New Controller
   Wizard**, choose
   **Automatically Detect the
   Controller Information**,
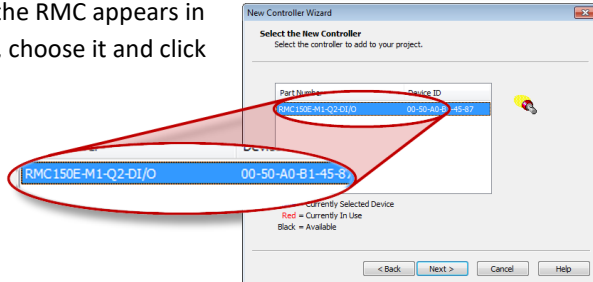   then click **Next**.

5. **RMC150E via USB:**

   A. Click **USB** and click **Next**.

   B. When the RMC appears in the list, choose it and click **Next**.

   RMC150E via Ethernet:

   A. Click **Ethernet** and click **Next**.
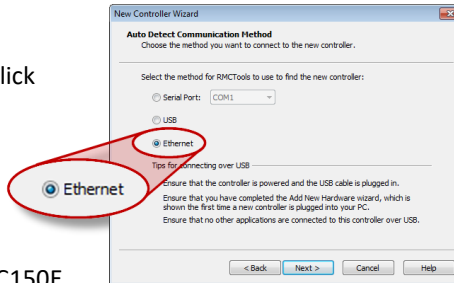
   B. Use the MAC address (on the RMC150E label) to identify the RMC in the list, then click the RMC.

   C. If the RMC does not have an IP address (0.0.0.0), click **Configure Device**, choose **Use the following IP address**, set the **IP Address** and **Subnet Mask**, then click **OK**.

   D. Click **Next**.

6. RMCTools will connect to the RMC and display it.
   Verify it is correct, then click **Finish**.

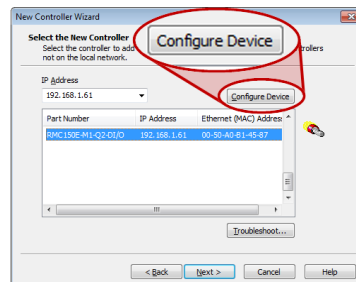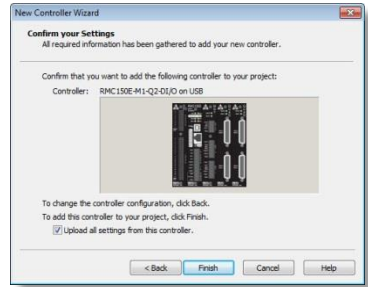7. The toolbar now displays Online (PROG) . This means RMCTools is communicating with the controller.

Project Pane

The project pane contains all the items in the project. Use the Project pane to navigate through the entire project.

Set Up Universal I/O Channels

If your RMC includes a **Universal I/O** module, you must first set up the high-speed channels before using them as part of an axis.
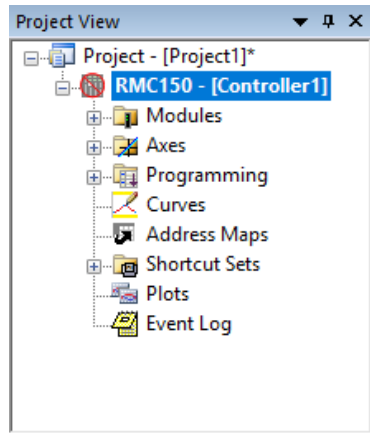
1. In the Project pane, expand the **Modules** folder and double-click the UI/O module.

2. On the **Quad/SSI** page, choose the desired **Mode** for each channel. Typically, this will be **Quadrature Input** or **SSI Axis Input**. For more details, refer to the **UI/O module** topic in the RMCTools help.

Saving Settings

Throughout the startup procedure, make sure to save the configuration changes you make or they may be lost!

1. Save RMCTools Project

On the **File** menu, click **Save**.

2. Update Flash

On the **Controller** menu, click **Update Flash**.

> **!** IF YOU DO NOT UPDATE FLASH, CHANGES TO THE RMC WILL BE LOST WHEN POWER IS REMOVED!

3. Repeat Often

Make sure to save often to prevent loss of data.

> **Tip:** On the **File** menu, click **Save and Update Flash** to perform both operations at once.

Step 6: Define the Axes

To use a physical input or output, it must be assigned to an internal software axis. The RMC starts with default axis assignments which you will likely need to change.

> **Note:** It is important to define the axes at the start of the project. Major changes to axes later may result in lost axis parameters.

Example Axis Definitions

Position Control Axis

One Control Output, one position input.
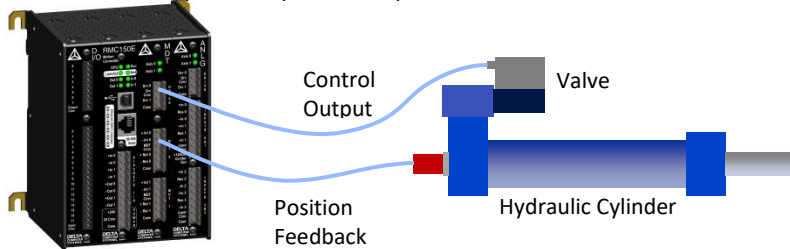
Position-Force Control Axis (all part of a single axis)

One Control Output, one position input, dual-input force

Reference Axis

One position input.

Delta Computer Systems, Inc.

View Axis Definitions

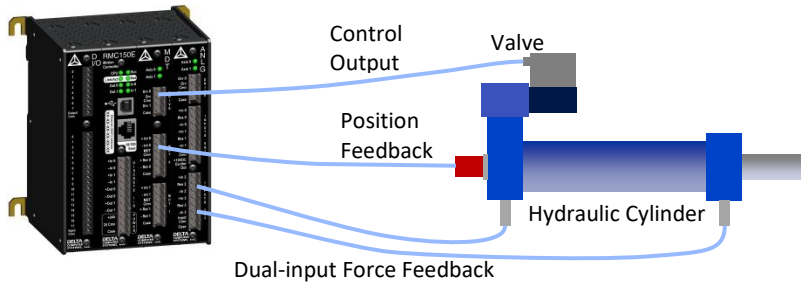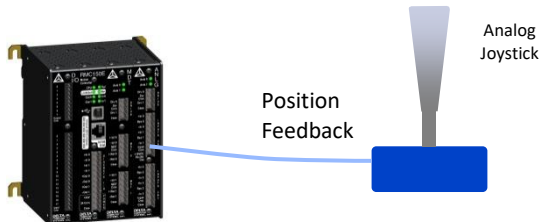1. In the Project tree, expand the **Axes** folder and double-click **Axis Definitions**.
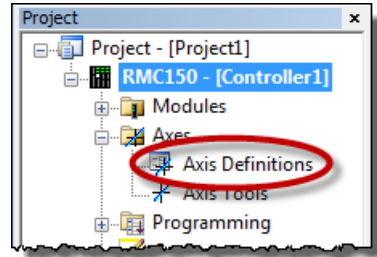
2. The **Axis Definitions** dialog opens:

   The list displays the software axes. To see the assigned hardware, click an axis in the list. The hardware assigned to that axis will be highlighted in the image.
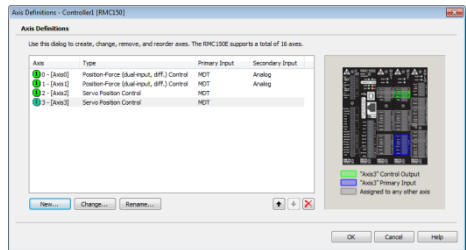
Edit Axis Definitions

Use the Axis Definitions dialog to change the axis definitions:

- Click **New** to add an axis**.**
- Click **Change** to edit the selected axis.
- Click ❌ to remove an axis.

If you need to make significant changes to the axis definitions, first delete all the axes, then create new ones.

For more details, click the **Help** button.

Step 7: Test an Actuator

You will now test an actuator such as a hydraulic valve or a motor. You will use the Direct Output command to send a voltage to the actuator. The actuator must already have been wired to the RMC.

> **!** USE THE DIRECT OUTPUT COMMAND WITH CAUTION! IT DISABLES THE SAFETY FEATURES OF THE RMC!

Fault Controller Button

If the motion causes problems, be prepared to quickly stop the axis by clicking the **Fault Controller** button on the toolbar, or pressing Ctrl + K on the keyboard.
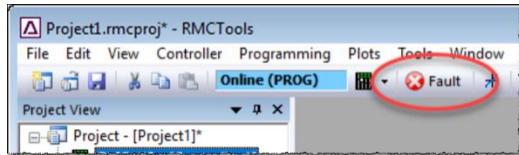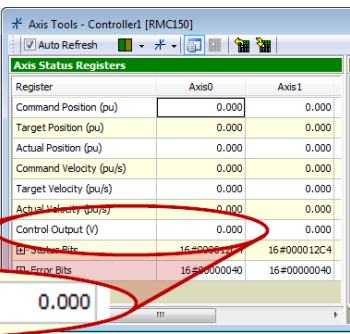
1. Check the machine and make sure that the axis may safely move in both directions.

2. In the Project tree, double-click **Axis Tools.**
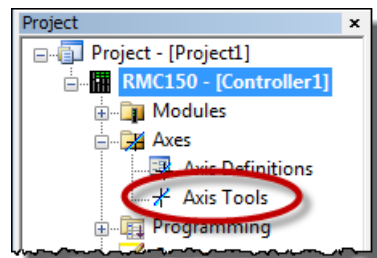
3. In the **Axis Status Registers**, on the **Basic** tab, look at the **Control Output**.

   It should be 0.

5. In the Command Tool, in the axis the actuator is connected to, click the [...] button.
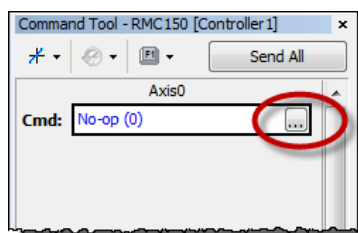
6. Browse to **Motion Commands**, then **Open Loop**.
Choose the **Direct Output** command and click **OK**.
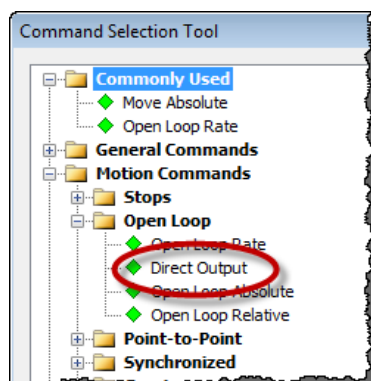
7. For the Direct Output command parameters, enter the following:

- **Output**: 0.1
- **Ramp Rate**: 100

When you send the command in the next step, the Control Output voltage will ramp to 0.1 V at a rate of 100 V/sec.
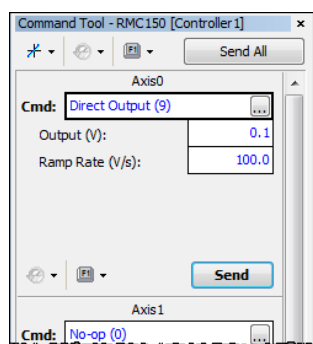
8. In the Command Tool, click **Send**.

   The axis should move, and the **Control Output** (in the **Axis Status Registers**) should be 0.100.
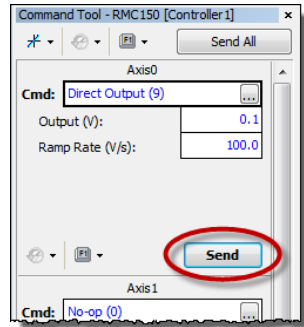
9. If the axis did not move, resend the command with a larger Output until the axis moves.

> **Note:** For the Quad module, if you are using the Enable Output for enabling the actuator, such as a motor drive, then you first need to set the Enable Output before trying to move the actuator. For details, see the **Set Enable Output (67) Command** topic in the RMCTools help.

10. Now stop the axis:
    In the Command tool, enter 0 in the **Output** box and click **Send**.
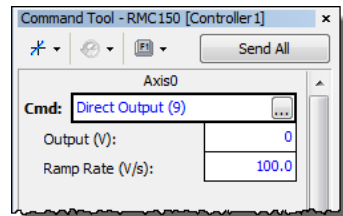
11. Repeat these steps to move the axis in the other direction. In the Direct Output command, use a negative **Output**.
    Move the axis back and forth through the entire travel range to make sure the machine is operating properly.

Step 8: Test Feedback Device

Now that you have connected and tested an actuator, you will connect and verify a feedback device. The device must already have been wired to the RMC.

Configure Feedback

In **Axis Tools**, in the **Axis Parameters** pane, on the **Setup** tab, you will configure certain parameters depending on the type of input you are using.

Refer to the procedure for your transducer type and module:

Transducer Type	Module	Page
Start/Stop or PWM (Magnetostrictive)	MDT (M)	19
SSI (linear or rotary)	SSI (S), Universal I/O (UI/O)	19
Analog (Voltage or Current)	ANLG (H), ANALOG INPUTS (A), ANLG2 (G), Universal I/O (UI/O)	20
Quadrature Encoder (A, B, Z)	QUAD (Q), Universal I/O (UI/O)	20
Resolver	RESOLVER (R)	20

Start/Stop or PWM (Magnetostrictive) Feedback

1. In the **Axis Parameters**, on the **Setup** tab, set the **MDT Type** register to the type of magnetostrictive transducer you have.
   This information is available from your transducer datasheet.
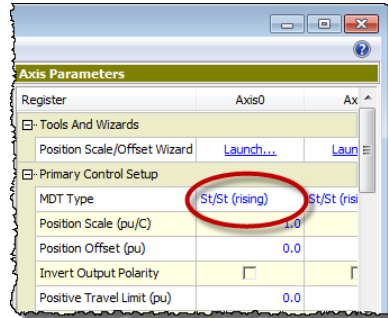
2. Click the **Download** button 🔧 to apply the changes to the RMC.

3. Continue to the **Verify Feedback** section on page 21.

SSI Feedback

1. In the **Axis Parameters** pane, on the **Setup** tab, set the following cells.

   - **SSI Format**
   - **SSI Data bits** (e.g. 24)
   - **Linear/Rotary**

   This information is available from your SSI device data sheet.

   Note: For help on a parameter, click the cell and press F1.

2. Click the **Download** button 🔧 to apply the changes to the RMC.

3. Continue to the **Verify Feedback** section on page 21.

Analog Feedback

1. In the **Axis Parameters**, on the
    Setup tab, set the **Input Type** to
    Voltage (±10V), **Voltage (±5V)** or
    Current (4-20mA).

    If the input is the primary input of
    the axis, the **Input Type** is under
    the **Primary Control Setup** section
    in the Axis Parameters.
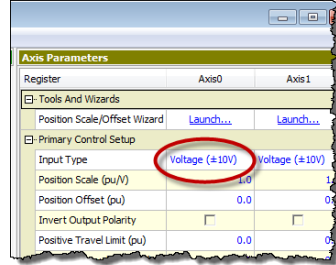
    For pressure or force inputs on a dual-loop axis, the **Input Type** is
    in the **Secondary Control Setup** section in the Axis Parameters.

2. Click the **Download** button 🔧 to apply the changes to the RMC.

3. Continue to the **Verify Feedback** section on page 21.

Quadrature Encoder Feedback

The QUAD module does not require any configuration. Continue to the
Verify Feedback section on page 21.

Resolver Feedback

1. In the **Axis Parameters** pane, on the **Setup** tab, under **Primary
    Control Setup**, set each register listed below, for each axis.

    -   **Resolver Resolution** – 14 bits or 16 bits

    -   **Reference Frequency**

    -   **Reference Amplitude**

    > **Note:** For help on these parameters, click the cell and press F1.
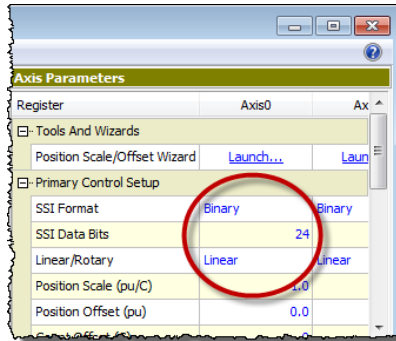
2. Click the **Download** button 🔧 to apply the changes to the RMC.

3. Continue to the **Verify Feedback** section on page 21.

Verify Feedback

1. In the **Axis Status Registers** pane, on the **All** tab, expand the **Feedback** section.

    For secondary inputs, expand the **Pressure/Force/Accel Feedback** section.
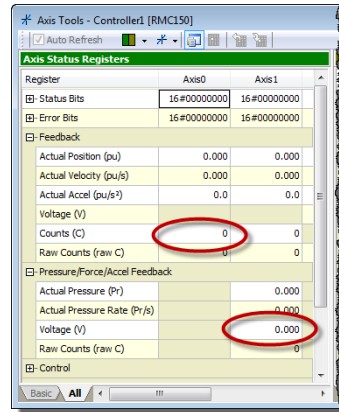
2. Depending on your feedback type, look at the **Counts**, **Volts** or **Current** register. It may be changing slightly.

3. Use the Direct Output command to move the axis back and forth (as described in the **Test an Actuator** section).

4. As the axis moves, look for a corresponding change in the **Counts**, **Volts** or **Current**. If it does not change smoothly, recheck the wiring, verify that the parameters on the **Setup** tab are correct, and check for smoothly changing **Counts**, **Volts** or **Current** again.

5. Save the project and update Flash.

Step 9: Scale and Offset

The Scale and Offset parameters convert the Counts, Volts or Current from the transducer into meaningful measurement units.

First, determine the approximate positions at either end of travel. This will help you verify later that you performed the procedure correctly.

To set the Scale and Offset:

1. Go to the **Axes Parameters** pane, **Setup** tab, **Tools and Wizards** section.
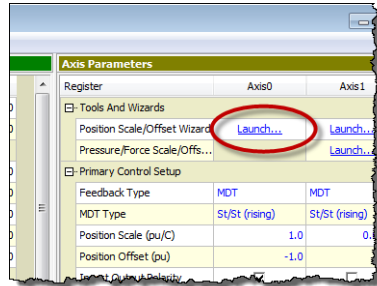
2. Click **Launch** in the desired axis.

3. In the wizard, follow the directions. For help, press the **Help** button.

> **Tip:** If the wizard does not work for your system, you can manually determine the Scale and Offset parameters. See the Scaling topic in the RMCTools help for details.

4. After completing the wizard, in the **Axis Parameters**, locate the **Display Units** parameter.

   Select the desired display units. If you wish to use units that are not listed, choose **Custom**, then type up to 4 characters in the **Custom Units** parameter.
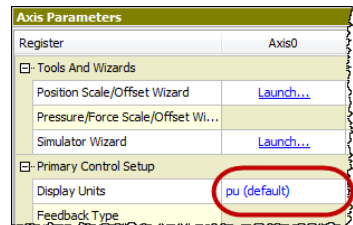
5. Click the **Download** button to apply the changes to the RMC. Remember to save your project and update Flash.

Step 10: Set the Output Polarity

The Actual Position, Pressure, Force or Velocity *must increase* when the RMC applies a *positive* output voltage. If this condition is not met, you will not be able to perform closed-loop control.

1. Send the Direct Output command with a positive **Output** value that is large enough to move the axis.

2. On the **Basic** tab of the **Axis Status Registers** pane, observe the **Actual Position** and note whether it is increasing or decreasing:

    Increasing
    The Output Polarity is correct. Go to **Enable the Axes** below.

    Decreasing
    You must invert the Output Polarity:

    A. In the **Axis Parameters** pane, on the **Setup** tab, double-click the **Invert Output Polarity** parameter to set it.

    B. Click the **Download** button 🏗 to apply the change to the RMC.

Enable the Axes

In order to send motion commands other than Direct Output, the axes must be enabled after the RMC starts up.

1. In the Command Tool, in the **Cmd** box, type **Enable**, and choose **Enable Controller (7)** from the list.

2. Click **Send**. All axes will be enabled.

Entering RUN Mode will also enable the axes.
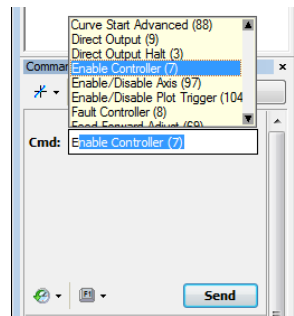
Step 11: Tuning

In order to control an axis in closed-loop, it must first be tuned. You can use autotuning or manually tune the axis.

Autotuning – Position Axes Only

Autotuning can be used for most position control axes.

1. **Open Tuning Tools**
   On the **Tools** menu, click **Tuning Tools**.

2. **Set Up Tuning Tools**
   Set up the buttons that you will use to move the axis back and forth after autotuning is complete.

   - Click the first button labeled **[Click to set up]**.

   - Enter a **Move Absolute** command with position, speeds, and acceleration values that will work for your system.

   - Repeat for the other button, with a different position.
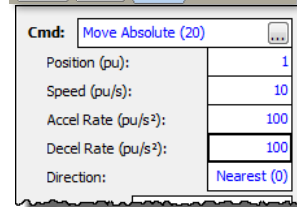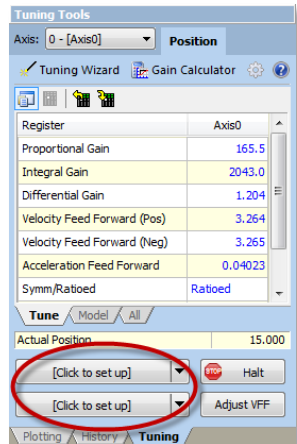
3. **Start the Tuning Wizard**
   In the Tuning Tools, click **Tuning Wizard**.

4. **Complete the Tuning Wizard**
   During the autotuning, the wizard will move the axis a short distance when you prompt it to.
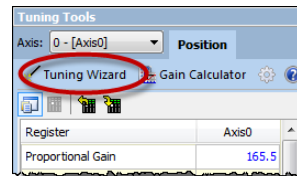
5. When the wizard is complete, the **Gain Calculator** will open. Use the slider bar to choose gains. Begin by pulling the slider close to the bottom, then click **Apply Gains**.
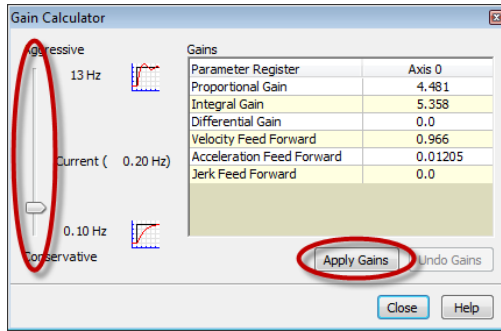
6. Use the buttons you previously set up to move the axis back and forth. The plot will automatically be displayed.

> **Tip:** To halt the axis, click the **Fault Controller** ❌ button on the toolbar, or press Ctrl+K.

7. If the Actual Position is not following the Target Position very well, pull the slider bar up, apply gains, and move the axis again. Repeat until the Actual Position tracks the Target Position very well.

Tuning With an Existing Plot

If the autotuning does not work for your system, you can use the Tuning Wizard with an existing plot.

1. In the Tuning Tools, use the move buttons to make moves and adjust the Proportional Gain until the axis has some control.
2. Start the Tuning Wizard and choose **Use Existing Plot**. The Wizard will prompt you to choose one of the plots of the moves you made.
3. When the wizard completes, use the Gain Calculator as described above.

Manual Tuning–Position, Pressure, or Force Axes

You can manually tune systems for which autotuning does not work.
For instructions:

4. On the help menu, choose **Help Topics**.
5. On the **Index** tab, type **tuning** and double-click **about**.
6. The **Tuning Overview** topic describes tuning.
   In the **Manual Tuning** section, choose a procedure. For most
   position control applications, choose **Tuning a Hydraulic Position
   Axis or Motor in Velocity Mode**. For pressure or force, choose the
   procedure that applies to your axis.

After tuning, save the project and update Flash.

Continuing the Motion Application

After setting up and tuning the RMC, it is ready to perform motion and be integrated into the rest of your application. The RMC has numerous features to assist you. The major components are listed here to guide you when continuing your motion application.

Commands

The RMC has a rich set of pre-programmed commands that perform anything from simple moves to complex motion to system control. For a list of all the commands, see the **Command List** topic in the RMCTools help.

User Programs

A User Program carries out simple or advanced sequences of commands on the RMC. This allows the RMC to respond to events within its control-loop time rather than the scan rate of a PLC or other host controller. It also reduces the PLC programming required.

A User Program consists of multiple steps linked together in sequences. Each step can issue any RMC command to one or several axes. The link types allow branching and looping, waiting for conditions and many other features. Simple and complex mathematical operations are also possible in the user program.

A User Program runs on a *task*. Each task can run one user program at a time. The RMC150 has ten tasks. Therefore, an RMC150 controller may run up to ten User Programs simultaneously.

For details on creating and running User Programs, see the **User Programs** topic in the help.

Communications

Most PLCs or other host controllers can communicate with the RMC, which includes reading status, writing values, and sending commands to the RMC. The RMC150E supports Ethernet and PROFIBUS-DP.

See the **Communications** section of the RMCTools help for more detailed information.

Discrete I/O

Discrete I/O augments the communications of the RMC. Discrete I/O is often faster than the communications, and is therefore well-suited for starting a sequence in the RMC at a specific time. See the **Discrete I/O** topic in the RMCTools help for details.

Variables

Variables help make the User Programs very flexible and easy to maintain. Variables can be used to effortlessly change programs and easily modify User Program parameters via a PLC. Variables can also be used to store data.

For details on using variables, see the **Variables** topic in the help.

Program Triggers

Use the Program Triggers to start User Programs based on conditions defined by the user. For example,

- Start a User Program by writing to an RMC variable from a PLC.
- Start a User Program when a discrete input turns on.
- Automatically start a User Program when the RMC starts up.
- When an error condition occurs, automatically start a User Program to handle it.

See the **Program Triggers** topic in the RMCTools help for details.

Diagnostic Tools

This section describes the main diagnostic tools of RMCTools that will aid you in monitoring and troubleshooting your system.

Plots

The RMC provides very flexible plotting capabilities. Virtually any register in the RMC can be plotted, and multiple registers may be plotted simultaneously. You can easily capture events with the plot trigger. For details on using plots, see the **Plots** topics in the help.

Event Log

The Event Log Monitor displays all events that have occurred in the controller, such as issued commands, changed parameters and errors. The Event Log Monitor is an important aid in troubleshooting.

The Event Log can help you:

- Determine if a command was successfully issued. The entire command, with parameters, is displayed.
- Find out which, if any, error occurred.
- See where a command was issued from, for example, from a PLC, from a User Program or from the Command Tool.

To open the Event Log:

- In the Project Pane, expand the controller, and double-click **Event Log** .

> **Note:** The Event Log is very useful! When you don't know what happened, or why something did not happen, look at the Event Log.

Appendix A: Wiring

This appendix describes how to wire the RMC. Use the table below to find the wiring diagram you need. For communications wiring, consult the RMCTools help.

> **Note:** Remove power from the RMC before connecting any wires.

Wiring Topic		Page
General Wiring Information		31
Power		32
Control Output (Drive)		32
SSI Inputs		33
Start/Stop and PWM Inputs (Magnetostrictive)		35
Analog Inputs	Voltage Transducer	37
	Potentiometer	38
	Current Transducer	38
Quadrature Inputs		39
Resolver Inputs		40
Discrete Inputs/Outputs	Discrete Outputs	41
	Discrete Inputs	43

General Wiring Information

To minimize electrical interference:

- Use twisted pairs for all wiring where possible.
- Use shielded cables for all wiring.
- Keep RMC wiring separate from AC mains or conductors carrying high currents, especially high frequency switching power such as conductors between servo drives and motors or amplifiers and proportional valves.

For UL and CUL compliance:

- Power supply must be Class 2.
- All RMC inputs and outputs must be connected to Class 2 circuits only.

For products labeled Class I, Division 2:

- Conductors must be copper only. Follow wire gauge and clamp screw torque as listed below.

Wire Gauge and Clamp Screw Torque

Use the table below to determine proper wire gauge and torque for the clamp screws on the terminal blocks.

Module	Gauge	Torque
RMC150E, MDT (M), SSI (S), Analog (H, A, G), RES (R)	26-12 AWG (0.13 - 3.3 mm^2)	4.5 lb-in (0.51 Nm)
DI/O, UI/O	28-16 AWG (0.08 - 1.3 mm^2)	2.2 lb-in (0.25 Nm)

Wiring Power

Voltage: +24VDC (20.4 – 27.6VDC)

Current rating:

Backplane Slots	3	4	5	6
Max Current (mA)	375	500	625	750

UL and CUL Requirements

For UL and C-UL compliance, the power supply must be Class 2. Class 2 power supplies are limited to 100W output. No additional fusing is required if a class 2 power supply is used.

Power Wiring Diagram
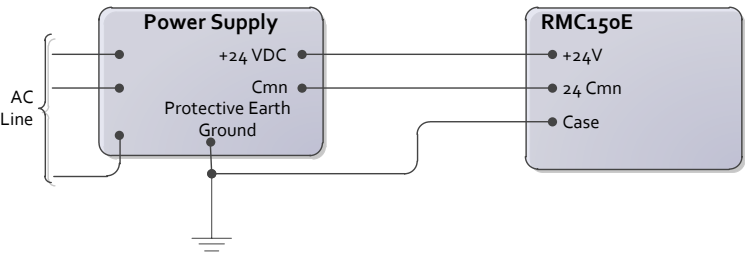
Note: For optimum power stability, do not power high-current-draw devices with the same 24V power supply used for the RMC. The RMC may restart if it experiences a momentary power drop.

Control Output for all Axis Modules
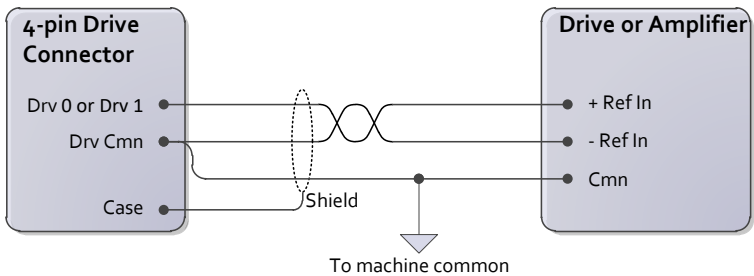
SSI Transducer Wiring

For Synchronous Serial Interface (SSI) transducers and encoders.
If the SSI transducer is linear, make sure to choose the synchronized type.
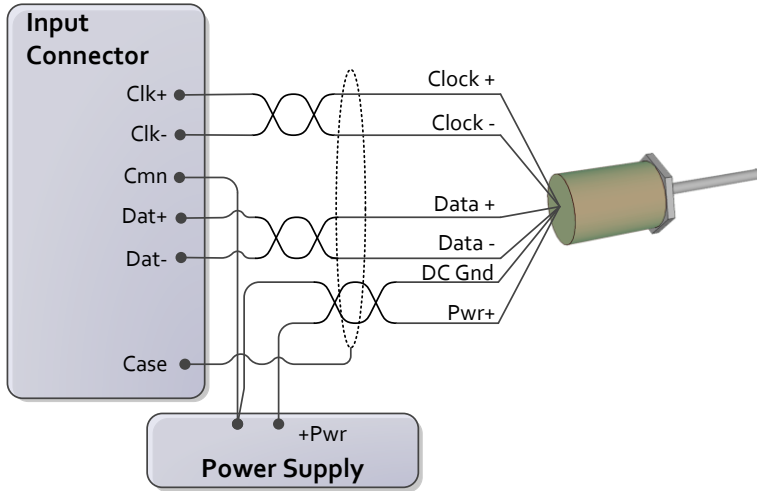
Tip: See next page for manufacturer-specific wiring diagrams.

Universal I/O Module:
The Universal I/O SSI input wiring is identical to the diagram shown above, with the exception of the pin order. For details, see the **UI/O Module Wiring** topic in the RMCTools help.

Notes:
- The user must supply power to the transducer.
- Do NOT connect the transducer ground or common to the shield, case, or protective earth ground

SSI Manufacturer-Specific Wiring Labels and Colors

These diagrams provide transducer manufacturer labels and colors.
Follow all SSI wiring instructions on page 33.

Balluff Micropulse BTL-5 with SSI output
Styles: Z, W, K, P

MTS Temposonics with SSI output
Models: R, RP, RH

MDT Module Start/Stop or PWM Transducer Wiring

For magnetostrictive transducers with Start/Stop or PWM outputs.
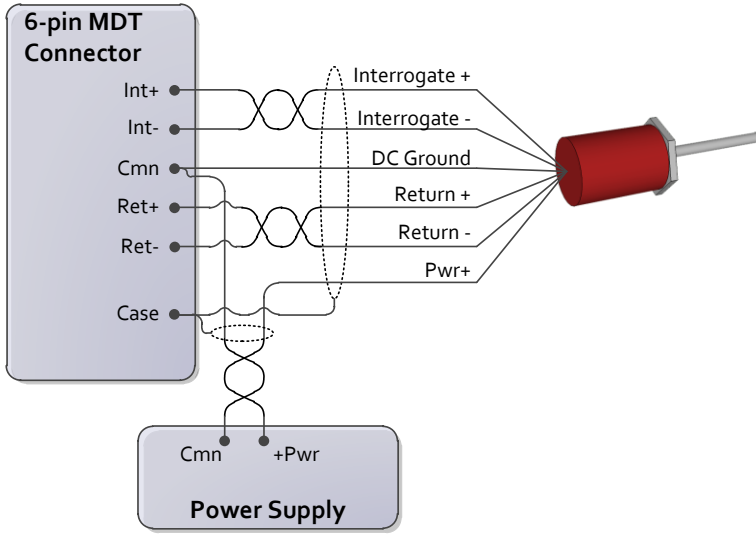
Tip: See next page for manufacturer-specific wiring diagrams.

Notes:
- The MDT module interfaces to 5V differential (RS-422) signals. Single-ended (TTL) signals are strongly discouraged. See the RMCTools help for single-ended wiring diagrams.
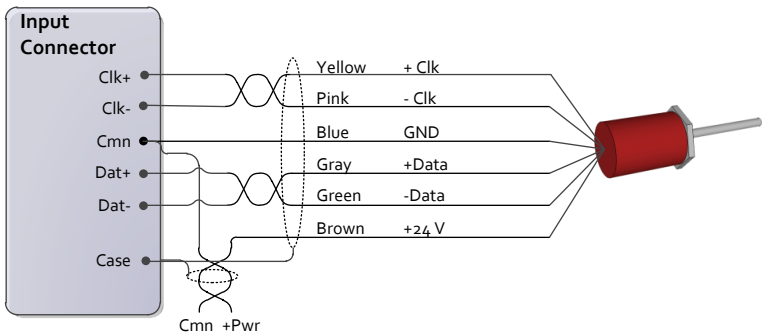- The user must supply power to the transducer.
- Do NOT connect the transducer ground or common to the shield, case, or protective earth ground.

MDT Manufacturer-Specific Wiring Labels and Colors

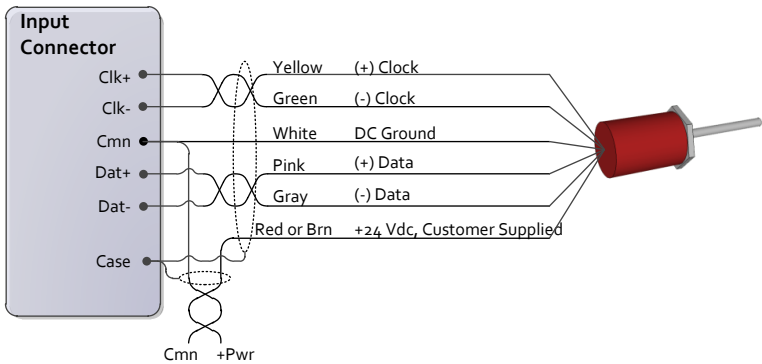These diagrams provide transducer manufacturer labels and colors. Follow all MDT wiring instructions on page 35.

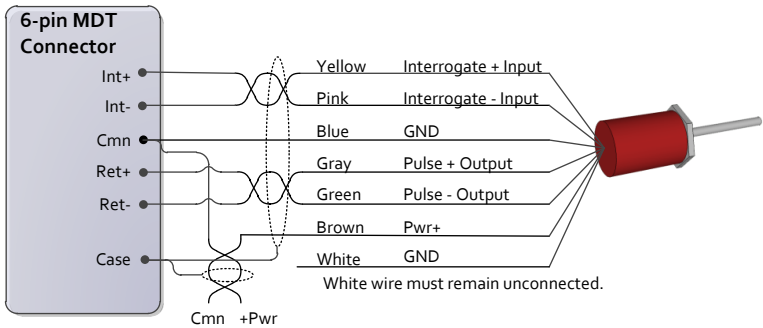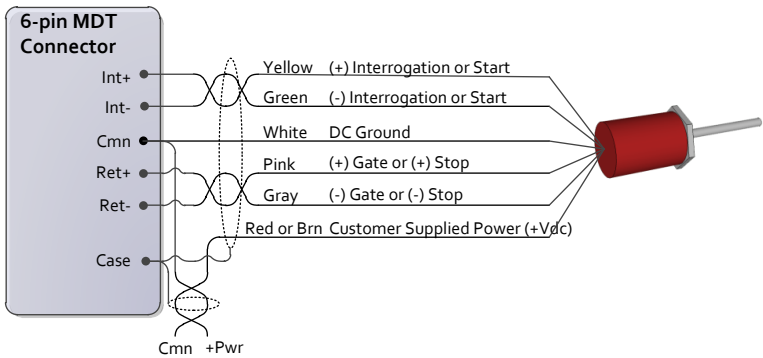**Balluff Micropulse BTL-5, digital RS-485 output**
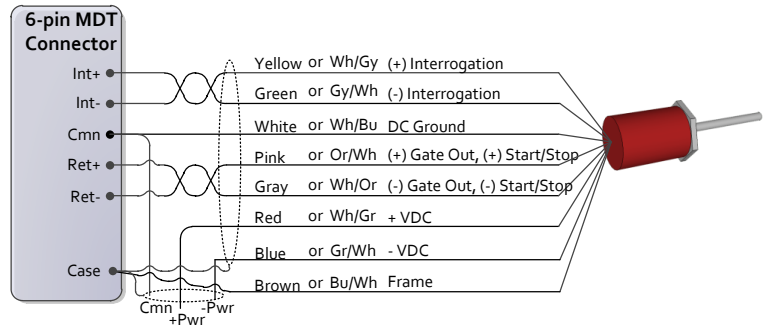
Styles: Z, W, K, E, P, R, AT

6-pin MDT Connector		
Int+	Yellow	Interrogate + Input
Int-	Pink	Interrogate - Input
Cmn	Blue	GND
Ret+	Gray	Pulse + Output
Ret-	Green	Pulse - Output
	Brown	Pwr+
Case	White	GND

White wire must remain unconnected.

Cmn   +Pwr

MTS Temposonics with digital output (Start/Stop or PWM)

Models: LH, LS, LD, LF, LPS, LPR, G, EP2, ER

6-pin MDT Connector		
Int+	Yellow	(+) Interrogation or Start
Int-	Green	(-) Interrogation or Start
Cmn	White	DC Ground
Ret+	Pink	(+) Gate or (+) Stop
Ret-	Gray	(-) Gate or (-) Stop
Case	Red or Brn	Customer Supplied Power (+Vdc)

Cmn   +Pwr

MTS Temposonics II with DPM or RPM personality module

6-pin MDT Connector			
Int+	Yellow	or Wh/Gy	(+) Interrogation
Int-	Green	or Gy/Wh	(-) Interrogation
Cmn	White	or Wh/Bu	DC Ground
Ret+	Pink	or Or/Wh	(+) Gate Out, (+) Start/Stop
Ret-	Gray	or Wh/Or	(-) Gate Out, (-) Start/Stop
	Red	or Wh/Gr	+ VDC
	Blue	or Gr/Wh	- VDC
Case	Brown	or Bu/Wh	Frame

Cmn   +Pwr

Analog Voltage Transducer Wiring

Voltage Transducer, 4- or 5-Wire
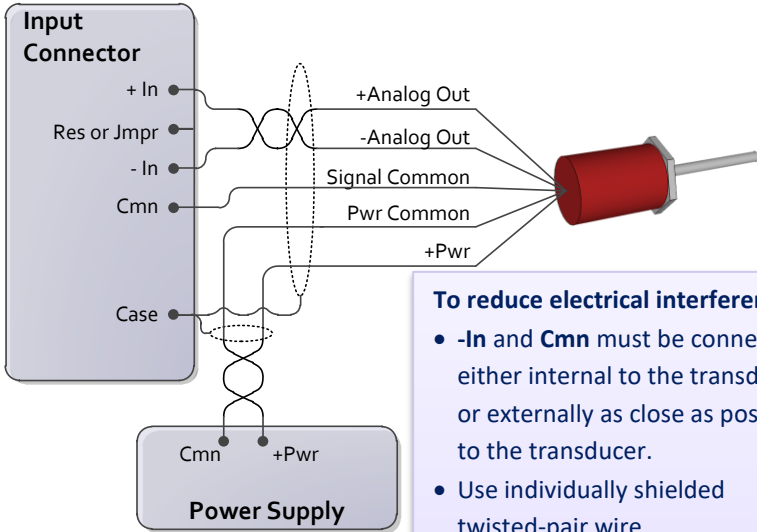
To reduce electrical interference:

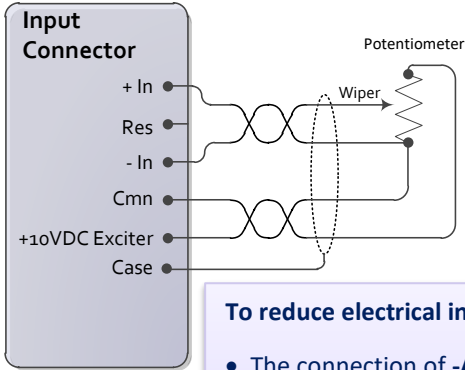- **-In** and **Cmn** must be connected, either internal to the transducer or externally as close as possible to the transducer.
- Use individually shielded twisted-pair wire.
- Connect cable shield to earth ground on one end only.
- If transducer has only one common, connect Pwr Supply Common and RMC Cmn to it. For best results, make this connection at the transducer.

Voltage Transducer, 3-Wire
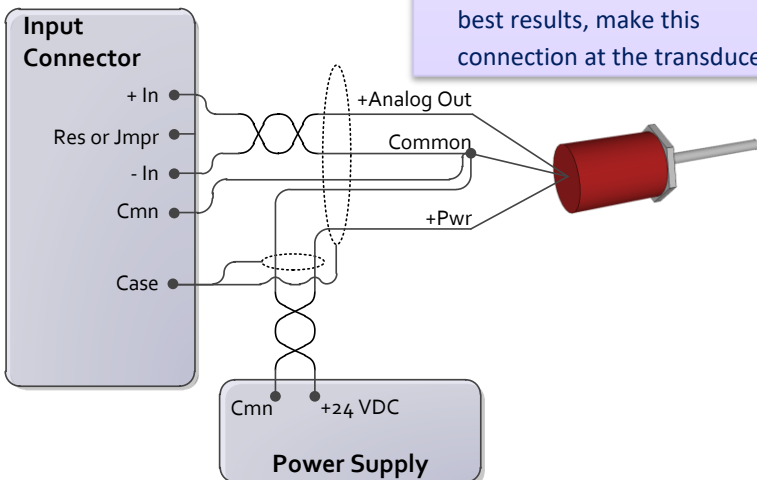
Potentiometer with Exciter Pin

Note: Use the **Exciter** pin to increase the measurement accuracy of the potentiometer. Not available on the UI/O module.

Input Connector

Potentiometer

+ In

Res

Wiper

- In

Cmn

+10VDC Exciter

Case

To reduce electrical interference:

- The connection of **-Analog In** to **Cmn** should be made as close as possible to the transducer.
- Use individually shielded twisted-pair wire.
- Connect cable shield to ground on one end only.

Analog 4-20 mA

Note: The Analog (G) module does not support 4-20 mA.

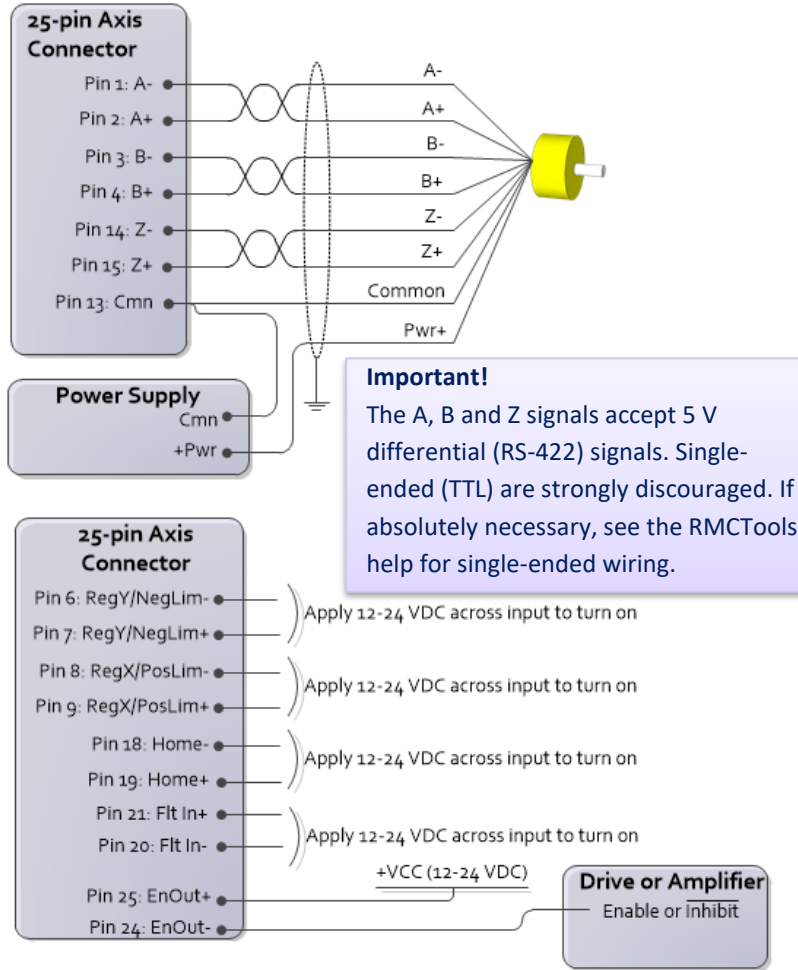**Input Connector**

+ In

Res or Jmpr

+Analog Out

- In

+Pwr

Cmn

Case
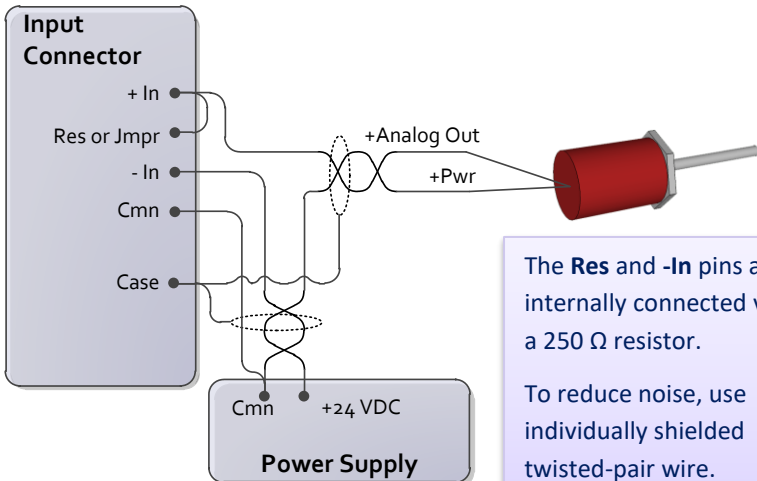
The **Res** and **-In** pins are internally connected via a 250 Ω resistor.

To reduce noise, use individually shielded twisted-pair wire.

Cmn   +24 VDC

Power Supply

Delta Computer Systems, Inc.

Quadrature Encoder Wiring

Pin-out table is available in the RMCTools help.

Important!
The A, B and Z signals accept 5 V differential (RS-422) signals. Single-ended (TTL) are strongly discouraged. If absolutely necessary, see the RMCTools help for single-ended wiring.


Universal I/O Module
The Universal I/O encoder wiring is identical to the diagram shown above, with the exception of the pin order. For details, see the **UI/O Module Wiring** topic in the RMCTools help.

Reg/Lim and Home Inputs
Compatible with 5-24 VDC. They draw 3.5 mA min, 10 mA max.

Resolver Module Transducer Wiring

The wiring diagram below is for resolvers that fall within the Resolver module's signal specifications (800 Hz to 5 kHz and 1.41 to 4.8 VRMS). The Ref In input is only used for reference signals outside of these specifications, and requires contacting Delta for assistance.
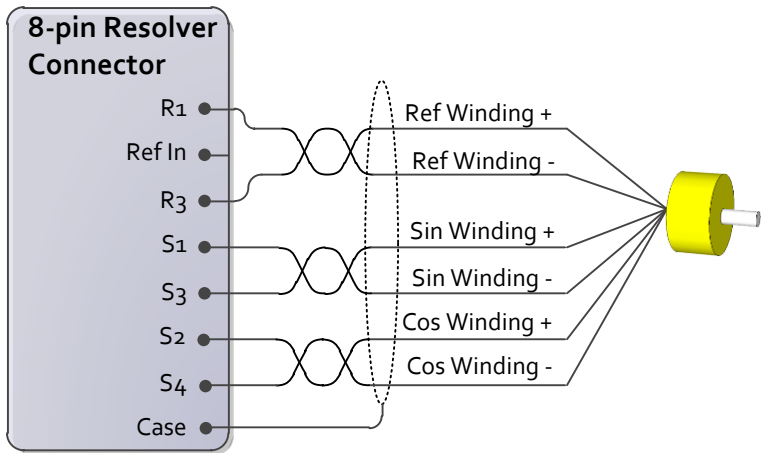
| Pin	Function
R1	Reference Output +
Ref In	Reference In (normally not used)
R3	Reference Output -
S1	Sine Input +
S3	Sine Input -
S2	Cosine Input +
S4	Cosine Input -
Case	Controller Chassis Ground (shield)

Discrete Output Wiring

The RMC150E, DI/O and UI/O outputs are solid state relays. When off, they have high impedance, and when on, they have low impedance.

	RMC150E	DI/O	UI/O
On Impedance	50Ω max, 25Ω typical		
Max Current	75 mA (50 mA for Class I Div 2)		75 mA (Class I Div 2 not available)
Max Voltage	30 V		

When switching *inductive* loads, place a diode or tranzorb across the load to protect the switch when it turns off. Otherwise, a voltage spike in excess of the 30 V rating of the SSR may occur. See the **RMC150E Discrete I/O Wiring** topic in the RMCTools help for more details.
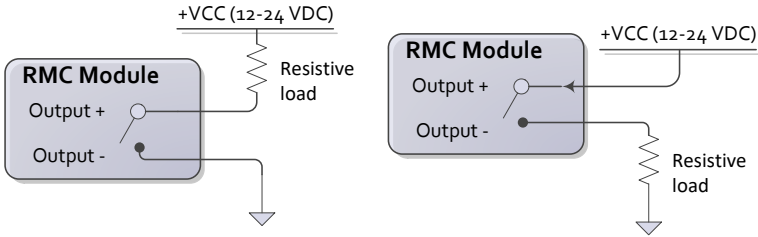
DI/O and UI/O Module

Outputs can be wired in either a high-side or low-side configuration. Because all the outputs share a common, all outputs on the same module must be wired the same.
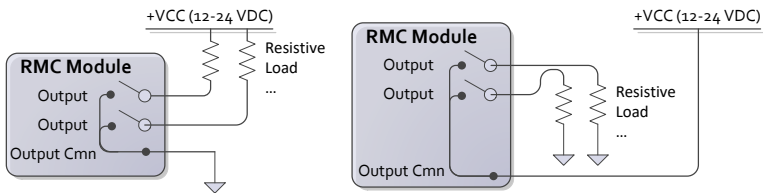
RMC150E Module

Each output has a "+" and "–" connection. Outputs can be wired in either a high-side or low-side configuration.
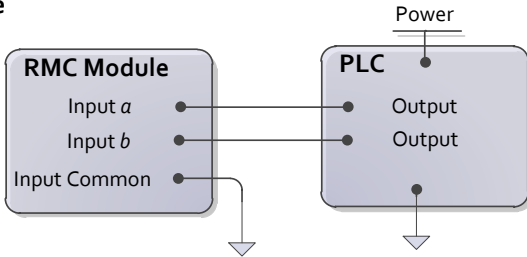
Discrete Input Wiring

To turn on a discrete input, apply a voltage of the correct level. The polarity is unimportant.

	RMC150E	DI/O	UI/O
Signal Levels	12-24 VDC	5-24 VDC	12-24 VDC
Max Current Draw	3 mA max	6 mA at 5V 10 mA at 24V	3 mA max

DI/O and UI/O Module
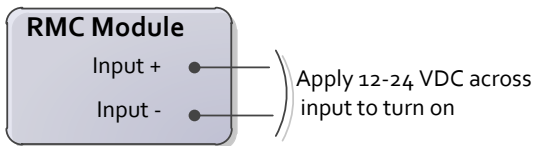
Because all the inputs share a common, all inputs on the same module must be wired the same.
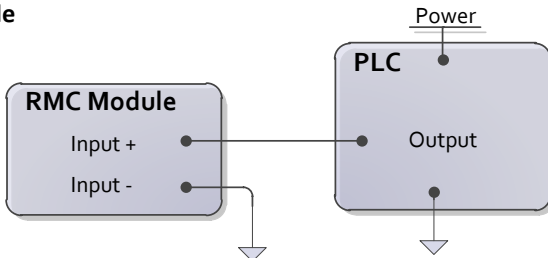
Example

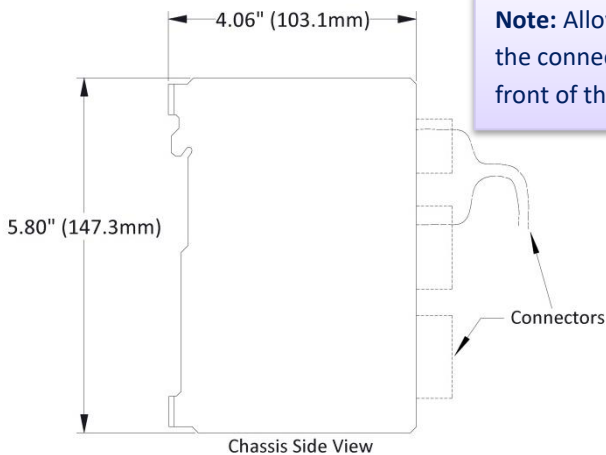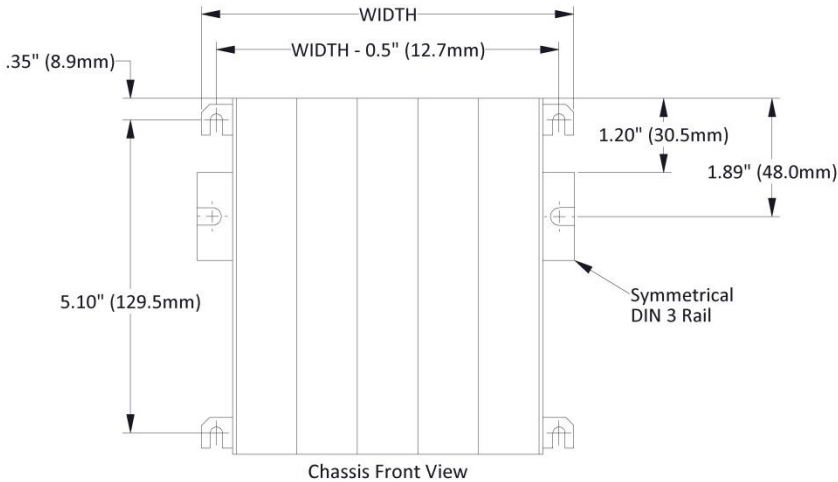### RMC150E Module

Each input has a "+" and "–" connection.

Example

Appendix B: Mounting Dimensions

Backplane Slots	3	4	5	6
Total Width	4.10 in. (104.1 mm)	5.10 in. (129.5 mm)	6.10 in. (154.9 mm)	7.10 in. (180.3 mm)

Chassis Front View

Chassis Side View

Note: Allow space for the connectors on the front of the RMC.

Appendix C: Agency Compliance

- .

UL and CUL

For UL and CUL compliance:

- Power supply must be Class 2.
- All RMC inputs and outputs must be connected to Class 2 circuits only.

Class I Div 2

Products marked "Class I Division 2, Group A, B, C, D" are suitable for use in Class I Division 2, Groups A, B, C, and D hazardous locations and nonhazardous locations only.

WARNING – EXPLOSION HAZARD – DO NOT DISCONNECT EQUIPMENT WHILE THE CIRCUIT IS LIVE OR UNLESS THE AREA IS KNOWN TO BE FREE OF IGNITABLE CONCENTRATIONS.

WARNING – EXPLOSION HAZARD – SUBSTITUTION OF ANY COMPONENT MAY IMPAIR SUITABILITY FOR CLASS I, DIVISION 2.

Surrounding air temperature of 60° C.

The RMC150E USB port is intended for configuration, programming, and troubleshooting purposes only. It should not be connected during normal operation.

See page 31 for wire gauge, screw clamp torque and wire type requirements.

The RMC Family of Motion Control

Connect. Control. Optimize.