A D Metro

One-Touch Resistive Controller User Guide

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Introduction

A D Metro's one-touch resistive sensor controller board provides a feature-rich, fully integrated resistive touch screen controller solution.

The A D Metro touch screen controller dynamically adapts to touch screen electrical characteristics such as sensitivity, contact resistance, and capacitance to provide optimal touch performance while minimizing integration effort. The standard controller supports both 5-wire and 4-wire resistive touch screens manufactured by A D Metro as well as other manufacturers.

This guide focusses on the two most popular variants of A D Metro's resistive controllers. One variant communicates to its host computer via USB only. The other variant can be configured (by moving jumpers) to communicate to its host computer either via USB or via full voltage RS-232 (+/-5.5V signalling). Both are compatible with 4-wire and 5-wire resistive sensors.

Variants of the A D Metro one-touch resistive controller are available with latching connectors for 5-wire sensors. Choose these variants for environments expected to experience significant vibration or shock (where cable restraint is limited)

For a list of the more common controller options and part numbers, see section **Controller Board Dimensions and Part Numbers**.

Resistive Sensor Types

A D Metro manufactures 4, 5 and 8-wire resistive touch sensors as well as sensors based on many other touch technologies. A D Metro can provide guidance as to which touch solution best matches your product needs.

Easily the most popular types of resistive sensors are known as 4-wire and 5-wire sensors. 5-wire sensors have the important advantage of substantially better durability (other design factors being equal). 4-wire sensors can be marginally more compact because they need slightly less bezel width around the touch sensing area.

A D Metro is well known for its patented ULTRA technology whereby a thin surface layer of microglass is used to make resistive sensors practically impervious to use and abuse. ULTRA sensor designs are refined to deliver excellent touch performance and are available for just about every touch screen size.

Preparing the Controller for a 4- or 5-Wire Sensor

The A D Metro resistive controller board uses a jumper as a switch to configure the board to work with either a 4-wire or 5-wire touch sensor. The jumper is either removed from, or connected across the 2-pin header that is identified as J5 on the board. The tiny (2-pin, 0.1” pitch) jumper creates an electrical connection between the two pins that it connects across.

Remove the two-pin jumper to configure the board to control a 4-wire resistive sensor. See the image on the left side of Figure 1.

Install the two-pin jumper on header J5 to configure the board to control a 5-wire resistive sensor. See the image on the right side of Figure 1.

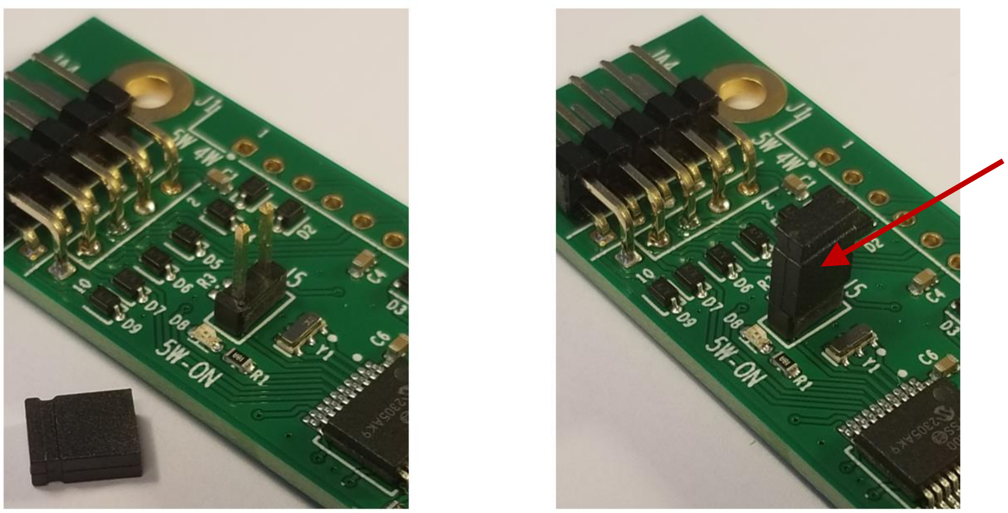

Figure 1: Controller Configured to Control 4-Wire Sensor (left image) or 5-Wire Sensor (right image)

Connecting a 5-Wire Resistive Touch Sensor

If you plan to use a 5-wire resistive touch sensor, this section describes how to connect the sensor to the A D Metro resistive controller.

Plug the sensor's 5-wire flex tail connector into the **bottom row** of the 10-pin (two by five pin) header identified as JA4 on the controller board (near one board edge), as shown in Figure 2. The flex tail connector may be connected in either orientation (upside-down or right-side-up) and the system will work fine. Bear in mind that inverting the flex tail connection changes the operating orientation of the touch sensor, so be sure to avoid inverting the connection again after calibration.

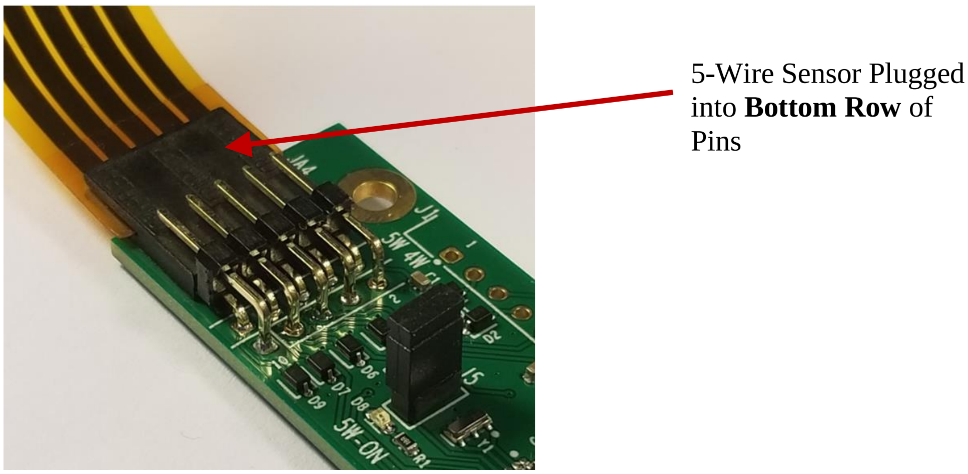

Figure 2 : Properly Connected 5-Wire Resistive Touch Sensor

All resistive touch systems need to be calibrated to achieve good registration of touches to locations on the associated display. Calibration teaches the controller how to align touch locations to match the display. Importantly, calibration also teaches the controller how to resolve the relative orientations of the touch sensor and display (including the effect of plugging in the flex tail inverted).

See section **Calibration**Error! Reference source not found. for details**.**

Connecting a 4-Wire Resistive Touch Sensor

If you plan to use a 4-wire resistive touch sensor, this section describes how to connect the sensor to the A D Metro resistive controller.

Plug the sensor's 4-wire flex tail connector into the 10-pin (two by five pin) header identified as JA4 on the controller board (near one board edge). Plug the four-pin flex tail into the left most four pins of the top row of JA4 as shown in Figure 3. The flex tail connector may be inserted in either orientation (upside-down or right-side-up) and the system will work fine. Bear in mind that inverting the flex tail connection changes the operating orientation of the touch sensor, so be sure to avoid inverting the connection again after calibration.

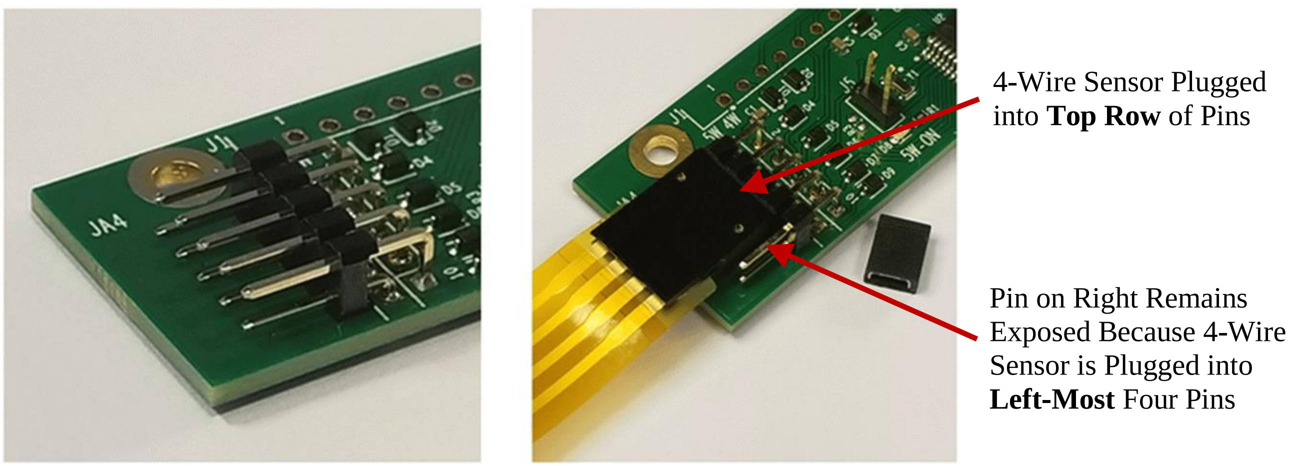

Figure 3: Use the Left-Most Pins of Header JA4 Top Row to Connect 4-Wire Sensor Flex Tail Connector

All resistive touch system needs to be calibrated to achieve good registration of touches to locations on the associated display. Calibration teaches the controller how to align touch locations to match the display. Importantly, calibration also teaches the controller how to resolve the relative orientations of the touch sensor and display (including the effect of plugging in the flex tail inverted).

See section **Calibration**Error! Reference source not found. for details**.**

Connecting to a Computer

All A D Metro resistive controllers have a USB-2 HID-compliant USB interface for plug-and-play operation with most computer operating systems. Some controller models also have a full-voltage RS-232 interface. With such configurable models, a pair of jumpers is used to select which interface gets used.

USB-Only Controller (CR1T-02-5WN-01)

To connect a USB-only model of controller (CR1T-02-5WN-01) to your computer USB port, use an A D Metro USB cable (10-CARU-EXT) plugged into the controller at connector J3.

Configurable USB/RS-232 Controller (CR1T-06-5WN-01)

For a configurable USB/RS-232 model of controller (CR1T-02-5WN-01), configure the controller and use the appropriate cable following these instructions:

For USB operation:

- Plug the two (dark-colored) jumpers onto header J2 as shown in Figure 5.
- Connect an A D Metro USB cable (part number: 10-CARU-EXT) between controller connector J3 and your computer USB port.

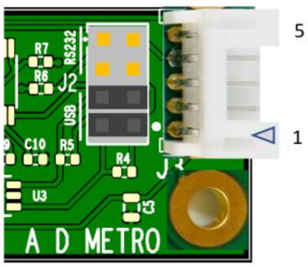

Figure 5: Jumper Positions For USB Operation

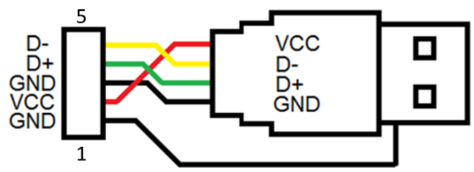

Figure 4: Electrical Schematic of USB Cable: 10-CARU-EXT)

For Full Voltage RS-232 operation:

- Plug the two (black-colored) jumpers onto header J2 as shown in Figure 7.
- Connect an A D Metro RS-232 cable (part number: 10-CARS-EXT) between controller connector J3 and your computer RS-232 port.
- Connect the power and ground wires that emerge from the A D Metro cable to a 3.3 to 5.0 Volt power source and ground (respectively).

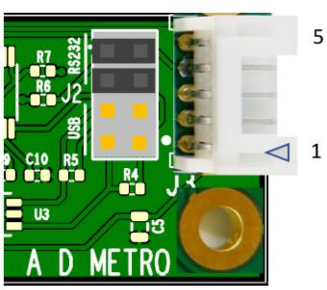

Figure 7: Jumper Positions For RS-232 Operation

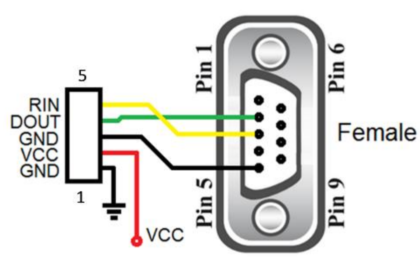

Figure 6: Electrical Schematic of RS-232 Cable: 10-CARS-EXT)

RS-232 Communication Protocol

When configured to communicate to the host using RS-232, the A D Metro controller sends messages using a baud rate of 9600 bits per second, no parity bit, 8 data bits and 1 stop bit. Each touch location is communicated by a set of five bytes with the content as detailed in **Error! Reference source not found.**. A touch location is normally sent when the touch begins, again when the touch location moves and again when the touch ends.

BYTE	BIT							
	7	**6**	**5**	**4**	**3**	**2**	**1**	**0**
1	1	R	R	R	R	R	R	T
2	0	X6	X5	X4	X3	X2	X1	X0
3	0	0	0	X11	X10	X9	X8	X7
4	0	Y6	Y5	Y4	Y3	Y2	Y1	Y0
5	0	0	0	Y11	Y10	Y9	Y8	Y7

T – Touch
R – Reserved
X – X ordinate of touch location (12 bits)
Y – Y ordinate of touch location (12 bits)

Figure 8: RS-232 Message Content

Calibration

Resistive touch sensors need an initial calibration to ensure that reported touch positions correspond to locations on the associated display.

There are several reasons why calibration is needed. Among these are inaccuracies in the physical sensor mounting position, how well the sensor size matches the display viewing area, variations in resistance of the sensor conductive layers and variations (and non-linearities) arising from how the sensor contacts are connected to its conductive layers. Calibration is also used to correct the operating orientation of a sensor to match display orientation if it is inconvenient or impossible to mount the sensor so that it operates naturally in the preferred orientation. The best resistive sensors can achieve uncalibrated accuracies of about 1.5 percent. Lower-quality sensors perform much worse.

A D Metro's Ultra Resistive 5-wire sensors are protected by a patented thin layer of armored microglass. These durable resistive sensors can be expected to perform so consistently over their lifetimes that one calibration is normally all that is needed.

A D Metro strongly recommends using 9-point or (better) 25-point calibration. 4-point calibration can only correct for offsets, scaling, and sensor orientation (rotation). 9- or 25-point calibration eliminates non-linearities such as "pin-cushion" or "hour-glass" distortions.

A D Metro strongly recommends use of the AR1100 Calibration Utility. This tool stores calibration information in non-volatile memory within the A D Metro controller. The AR1100 Calibration Utility is available as a free download from the Microchip Technologies website. Do not confuse Microchip's AR1100 Calibration Utility with the ARConfiguration Utility.

A D Metro does not recommend the Windows 10 and Windows 11 operating systems' built-in calibration tool. This tool struggles with calibration that involves correction of sensor operating orientation.

Installing the AR1100 Calibration Utility

Due to manufacturing and sensor positioning variations in all 4-wire, 5-wire and 8-wire resistive sensors, every sensor-controller combination should be calibrated to eliminate offsets between touch locations and display locations.

The recommend software utility for calibration runs on Microsoft Windows and is available from the Microchip Technology website. To install and run the utility on Windows 10 or Windows 11, it is essential to follow the steps in this document in the order described.

Both the installer and installed tools were designed to run under a Windows 7 or older environment and it is essential for '.NET 2.0' features to be enabled. Once the tools are installed, it needs to run under Windows 7 compatibility mode.

1) Enable .NET 2.0 under Windows 10 or Windows 11

Before installing and running any of Microchip's Utilities, the Windows operating systems .NET 2.0 features must be enabled. These are typically not enabled by default on most Windows 10 and Windows 11 computers.

To enable .NET 2.0 under Windows 10 or Windows 11:

- Ensure all open applications are closed and desired files saved as procedure requires a reboot.
- In Windows search find and open 'Control Panel'.
- Select 'Programs and Features'.
- In left column select 'Turn Windows features on or off'.
- Click on NET Framework 3.5 (Includes NET 2.0 and 3.0) so the associated check box gets marked black as shown in Figure 9. (Usually top feature displayed).
- Select 'OK.'
- When asked, let 'Windows Update' download the files you need.
- Windows will then download all files, followed by 'Applying Changes'.
- When 'Done', exit Windows Control Panel.
- Reboot the computer.

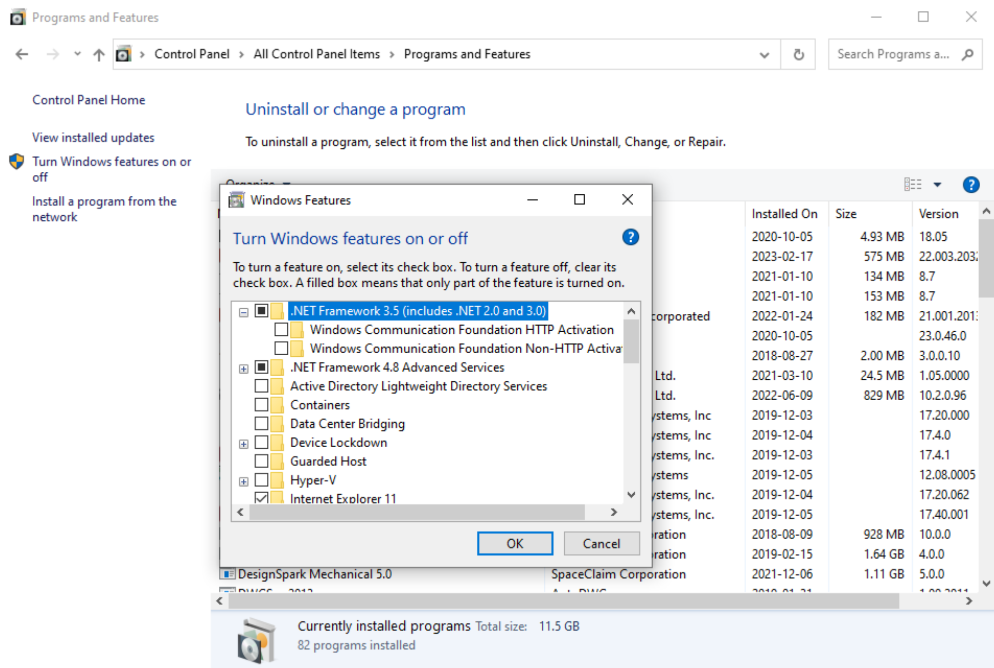

Figure 9: Enabling .NET 2.0

2) Download AR1100 Calibration Utility Templates and Guides

Go to the Microchip AR1100 webpage at http://www.microchip.com/wwwproducts/en/AR1100.

From the “Documentation” section, download the following into a folder on your computer desktop:

- “AR1100 Calibration Utility User's Guide DS41598A”.
- “AR1100 Calibration Templates for Development Kit DS41596A”.

From the “Embedded Software” section download the following into a folder on the computer desktop:

- “AR1100 Calibration Utility”.

You do **not** need to install the Firmware Download Utility. The A D Metro controller is factory programmed.

3) Install The AR1100 Calibration Utility

- Extract the AR1100 Calibration Utility Installer zip file contents to a desktop folder.
- Navigate to the folder into which the zip file contents were extracted and run setup.exe.
- If .NET 2.0 is enabled, you will see the splash page shown in Figure 10.
- Follow the installation instructions to install this software into the default folder.

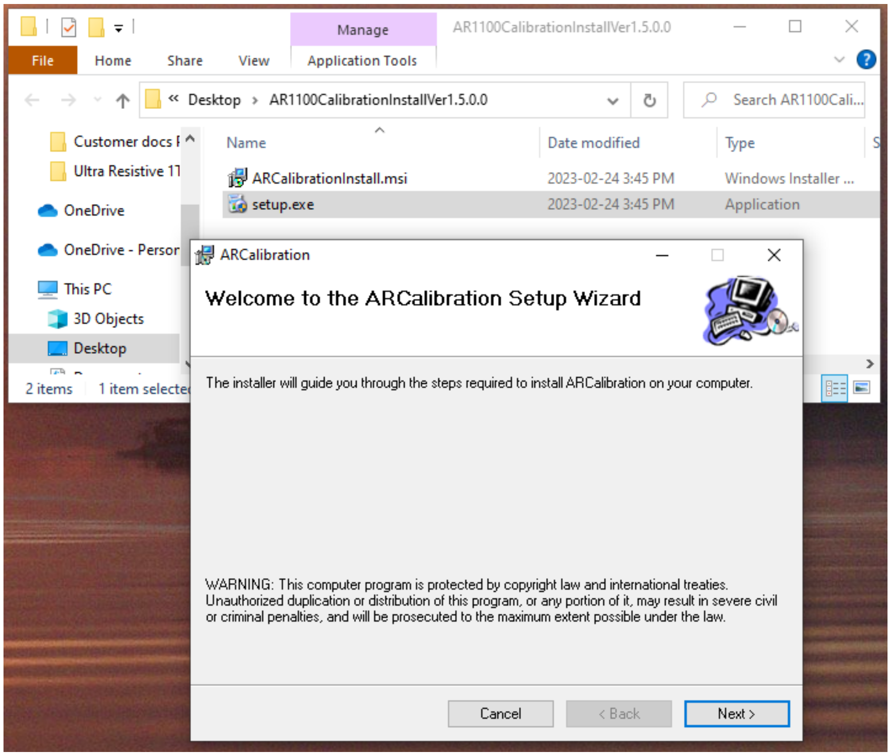

Figure 10: Opening page of ARCalibration Setup Wizard

- Two applications get installed and shortcuts to them are added to the desktop: "AR1100 Cal Config" & "AR1100Calibration".
- Configure **both** of these two applications to run in Windows 7 compatibility mode whenever they run.
  - Right click on the application (or shortcut) at location C:\Program Files (x86)\Microchip\Microchip AR Configuration Utility and:
  - Select the compatibility tab.
    - Select Compatibility tab.
    - Click on Change settings for all users.
      - Select Run this program in compatibility mode for Windows 7.
      - Click on "Apply" (if first time set) then "OK" in the "all-users" window.
    - Click on "Apply" (if first time set) then "OK" in main property window.

- Note once compatibility mode is set, after the first time the application is run, Windows will ask if the program ran OK. Click yes.

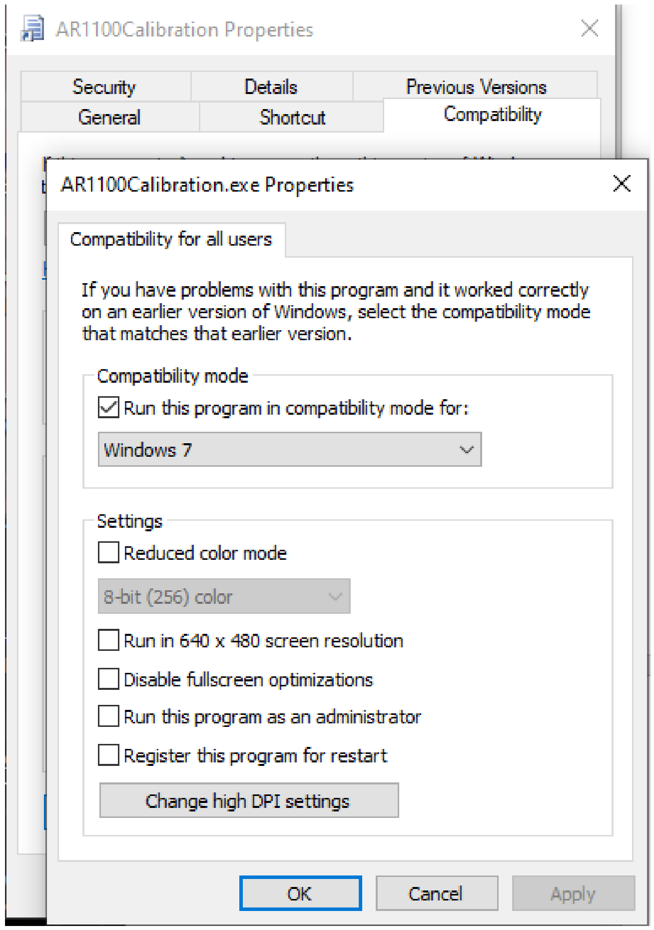

Figure 11: Setting Compatibility mode to be Windows 7

- Remember to repeat this process to configure the second application to also run in Windows 7 compatibility mode whenever it runs.

4) Run the AR1100 Cal Config Utility

This step is the start of a regular touch sensor calibration process.

- The AR1100 Cal Config Utility must be run before the Calibration Utility is run.
- Ensure you have a controller and sensor properly connected to your computer over USB. See section **Preparing the Controller for a 4- or 5-Wire Sensor** in this document.
- Ensure you run the "AR1100 Cal Config" application before running the Calibration Utility.
- Complete the preferences panel shown in Figure 12, changing "Num Wires" to match your sensor, and either 9-point or 25-point calibration, then save and close. Do not select Digitizer mode.

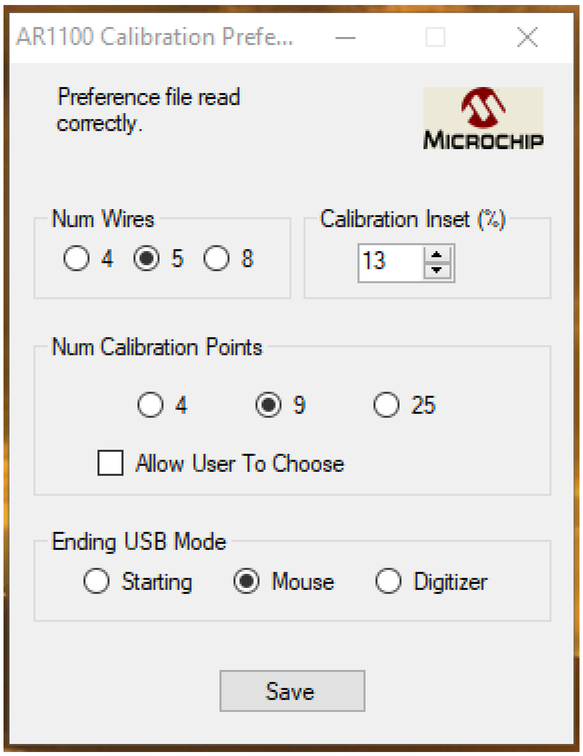

Figure 12: 9 point Calibration Configuration for 5-wire sensors

- If the sensor to be calibrated is not mounted on a display a paper calibration template can made based on the templates provided in "AR1100 Calibration Templates for Development Kit DS41596A.pdf" document and in Figure 13 or Figure 14. Use an application such as PowerPoint to scale template image X and Y independently so when printed the template borders exactly align with the displays active area. After calibrating the sensor orientation will be so point #1 is in the upper left of the display.

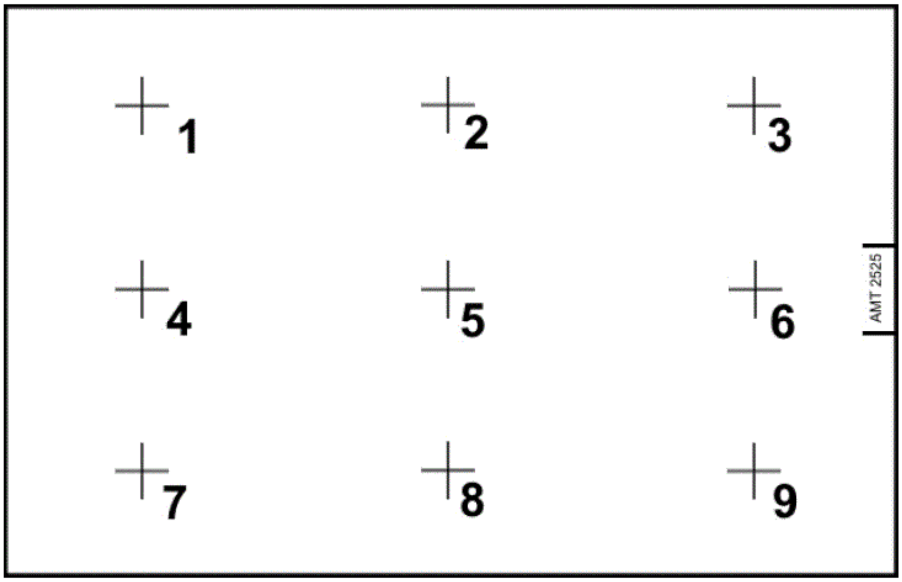

Figure 13: 9-point calibration template

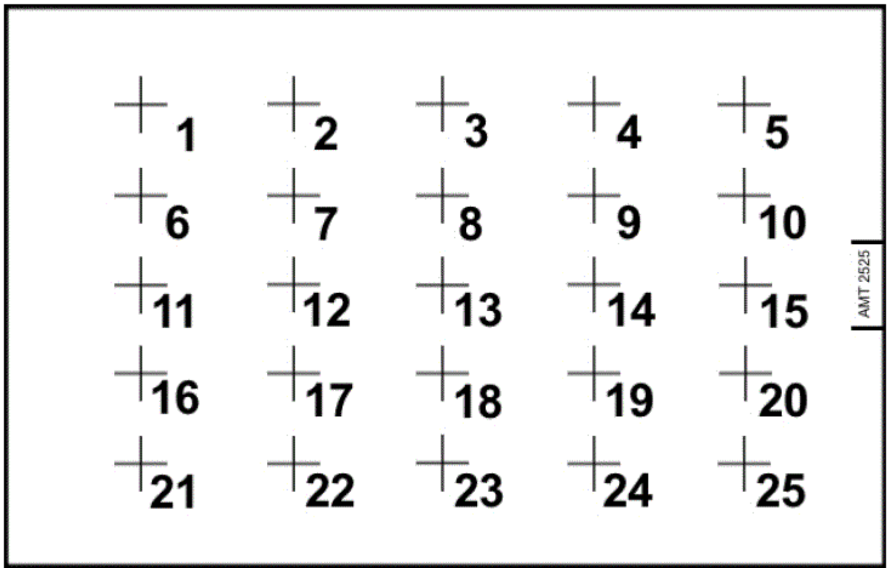

Figure 14: 25 point calibration template

- If the sensor is mounted on the display that the AR1100 Calibration Utility is running on there is no need for a paper template. The tool displays the selected template full screen as shown in Figure 16.

5) Run the AR1100 Calibration Utility

The AR1100 Calibration Utility saves the calibration results into the controller's non-volatile memory. The calibration does not get erased when power to the controller is turned off.

- Ensure you have a controller and sensor properly connected to your computer via USB.
- Ensure the AR1100 Cal Config Utility has just been run.
- Double click on the desktop "AR1100Calibration" shortcut.
- You should see an initial Window as shown in Figure 15. This also confirms that .NET is working properly.

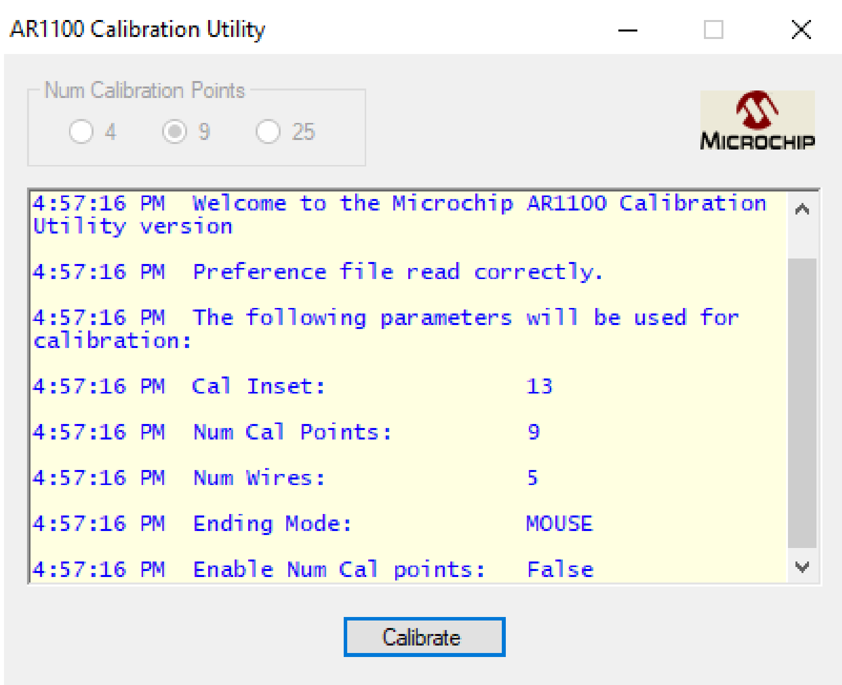

Figure 15: First windows when Calibration Utility runs

- When ready to start calibration touches, click on Calibrate. After about 15 seconds, the calibration template is displayed.

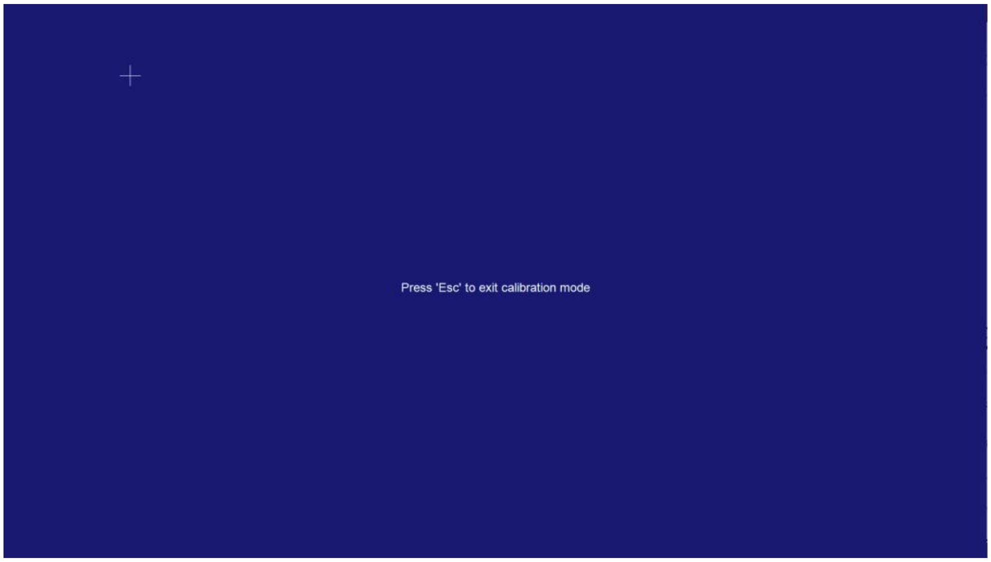

Figure 16: Full-screen calibration template – first point

- Precisely and briefly press the fiducial mark (plus sign). A non-scratching point may be used.
- Press again when the fiducial mark moves to the next location. Repeat until all calibration points have been entered and the finishing window shown in Figure 17 appears.

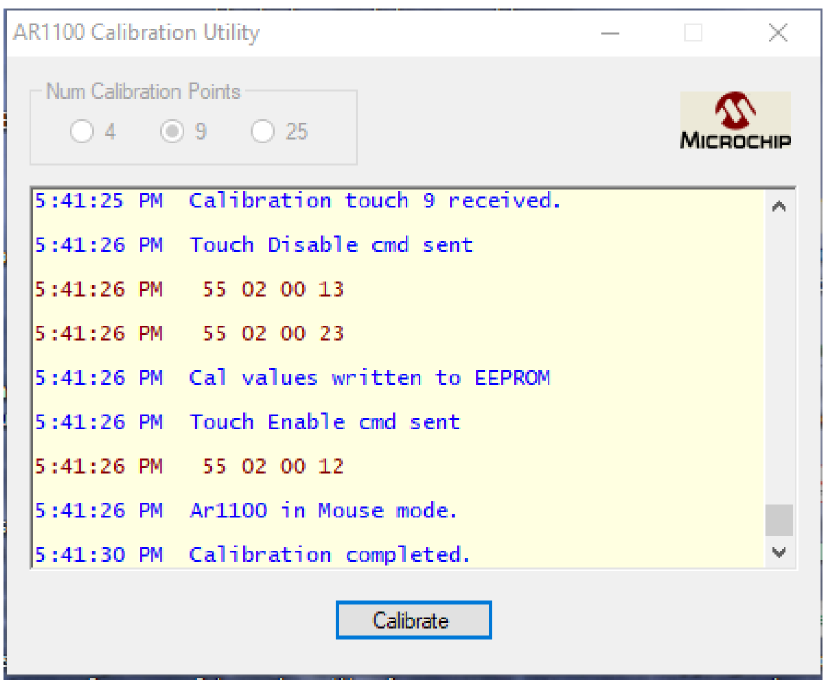

Figure 17: Calibration Completed Window

- The Calibration is complete. Exit the Calibration tool.
- Confirm that the controller and sensor function properly.

Important note about the calibration utility: If you choose to experiment with any sensor settings using the software utilities, be sure to **avoid** ever configuring the controller as an HID-DIGITIZER. This fixes the touch controller into HID_DIGITIZER operation. A D Metro has a (lengthy) guide available which describes the many steps needed to revert touch controller operation.

Non-Standard Sensor Connections

Does Your 5-Wire Sensor Require A 'Cross-Over' Cable?

Some 5-wire resistive sensors need a crossover cable to allow them to work with the A D Metro controller board. Connecting a crossover cable between the sensor flex tail and the controller board is a simple and complete solution to achieve compatibility.

A close look at which corners of the sensor are connected to pins 1, 2, 4 and 5 reveals whether the sensor is directly compatible or whether a crossover cable is needed to work with the A D Metro controller.

Technical information for any of 5-wire resistive touch sensor normally includes a description of how the five flex tail pins are connected inside the sensor. This description is often called a connector 'pinout.' Every 5-wire sensor connector has one wire that connects to the 'sensing' front sheet of the sensor (usually pin 3). The remaining wires (1, 2, 4 and 5) each connect to one of the four electrodes near the corners of the sensor's rear sheet.

Manufacturers use a range of terminology to name the sensor corner connections. The abbreviations UL, UR, LL and LR mean upper-left, upper-right, lower-left, and lower-right respectively. The abbreviations RT, RL, LT, and LL mean right-top, right-lower, left-top, and left-lower respectively. Sense and SG refer to the sense layer electrode connection. Other manufacturers use numbers or letters to label their sensor corners, then refer to these numbers or letters in their pinout tables.

Figure 18 shows three example 5-wire connector pinout tables copied from various sensor datasheets.

PIN	DESC
1	UL
2	UR
3	SENSE
4	LL
5	LR

CONNECTOR PINOUT	
PIN NO.	DESIGNATION
1	RT
2	RL
3	SG
4	LT
5	LL

CONNECTOR PINOUT	
PIN NO.	DESIGNATION
1	RL
2	RT
3	SG
4	LT
5	LL

Figure 18: Connector Pinout Tables for Example 5-Wire Resistive Touch Sensors

Make a sketch or mental image of the geometrical pattern formed by the four connections (1, 2, 4 and 5) in that order. It does not matter what sensor orientation you use for this exercise. The orientation does not have to match the intended use orientation. Orientation variations will be corrected for as part of the calibration process.

Any 5-pin sensor with pin connection lines forming a "zig-zag" pattern is directly compatible with the A D Metro controller.

Figure 19 illustrates this process for each of the three example sensors and pinout tables from Figure 18.

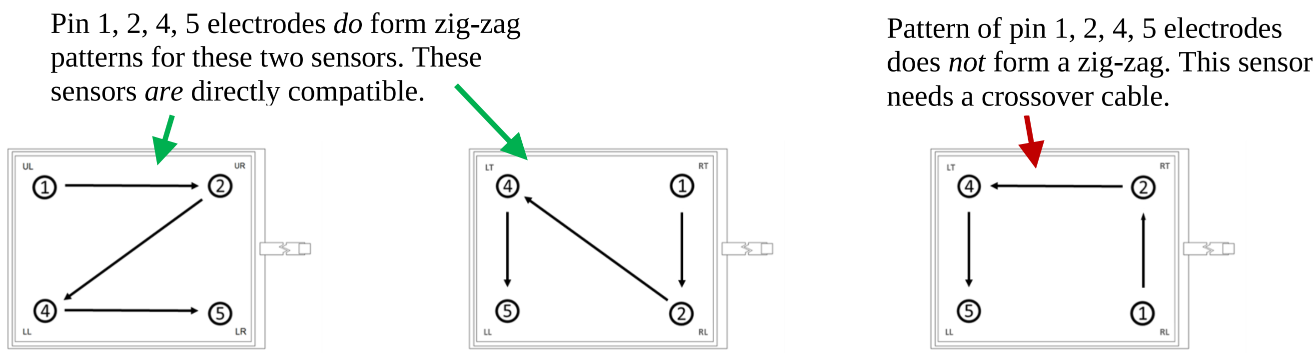

Figure 19: Pinout Patterns of Example 5-Wire Resistive Touch Sensors

In more detail, a 5-wire sensor is compatible with the A D Metro controller if the corner electrodes connections assigned to pins 1, 2, 4 & 5, in that order, form a zig-zag pattern when the four sensor corners to which they are connected are illustrated. The zig-zag pattern may be in any direction (an 'N' or 'Z' shape or backward or upside-down 'N' or 'Z').

Sensors that need a crossover cable (to become compatible) all have electrode (1, 2, 4, 5) pinout patterns that form a 'C' or 'U' shape (or backward or upside-down 'C' or 'U').

Figure 20 illustrates the construction of a 5-Wire crossover cable.

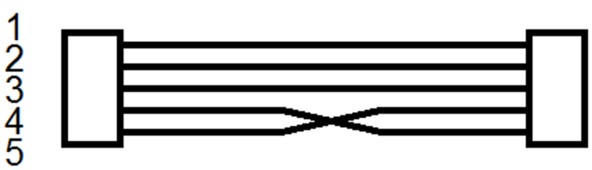

Figure 20: Electrical Schematic of 5-Wire Crossover Cable

There also exist rare sensors that do not use pin 3 as their sense line. In these exceptional cases, a custom adaptor cable is needed.

Does Your 4-Wire Sensor Require A 'Cross-Over' Cable?

Some 4-wire resistive sensors need a crossover cable to allow them to work with the A D Metro controller board. Connecting a crossover cable between the sensor flex tail and the controller board is a simple and complete solution to achieve compatibility with these non-standard sensors.

Every 4-wire resistive sensor flex tail connector has two wires connected to the sensor electrodes that control X axis (or direction) touch measurements and two wires connected to the electrodes that control Y axis touch measurements.

Technical information for any 4-wire resistive touch sensor normally includes a description of how the four flex tail wires are connected inside the sensor. This description is often called a connector 'pinout.'

Manufacturers use a range of terminology. The abbreviations X-, X+, Y- and Y+ mean left edge, right edge, bottom edge, and top edge electrodes respectively. "Left", "Right", "Bottom", and "Top" may also be used.

Figure 21 shows four example 4-wire connector pinout tables copied from various sensor datasheets. Notation on the figure explains why the three left-most example sensors ARE directly compatible with the A D Metro resistive controller and why the right-most sensor requires a crossover cable.

A 4-wire sensor is directly compatible when pins 1 & 3 both relate to the same axis (or direction) of touch measurements.

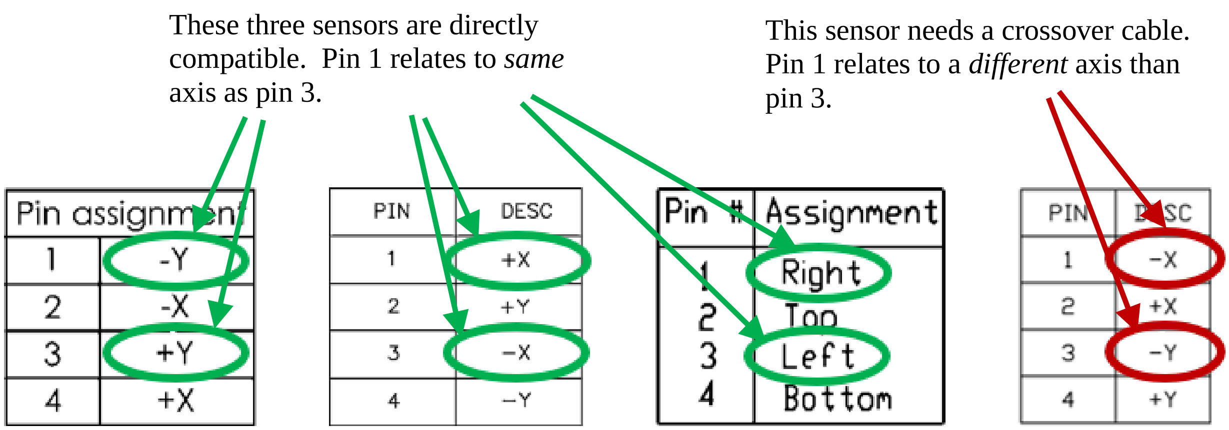

Figure 21: Connector Pinout Tables for Example 4-Wire Resistive Touch Sensors

Controller compatibility is not affected by which pins have positive (+) or negative (-) connections. Compatibility is not affected if both X connections are swapped with both Y connections.

Polarity reversals and orientation variations will be corrected by the calibration process.

Figure 22 illustrates the construction of a 4-Wire crossover cable.

Figure 22: Electrical Schematic of 4-Wire Crossover Cable

How Resistive Sensors Work

4-Wire Sensor Operation

In summary, a 4-wire resistive touch sensor is made from two sheets (or layers) of transparent material, separated from each other only by (nonconductive) micro dots. The facing surfaces of these two sheets have coatings of transparent, conductive material (normally indium tin oxide or ITO). When the sensor gets touched, the front sheet bends so that the ITO at the point of contact makes electrical contact with the ITO of the rear sheet. Touch location is determined by rapidly alternating between measuring horizontal (X) and vertical (Y) touch positions. One of the two sheets has electrodes along its top and bottom edges to facilitate Y measurements. Voltage is applied across these two electrodes to create a smooth voltage gradient from sensor top to bottom. Wherever the sensor is touched, that point in the voltage gradient touches the opposite sheet, the voltage gets sampled (through the ITO and electrodes on that sheet) and a Y location is calculated. The second sheet has electrodes along its left and right edges to facilitate X measurements. Voltage is applied across these two electrodes to create a smooth voltage gradient from sensor side to side. Wherever the sensor is touched, that point in the voltage gradient touches the opposite sheet, the voltage gets sampled (through the ITO and electrodes on that sheet) and an X location is calculated.

In any resistive touch sensor, the front surface sheet gets deformed during normal use and may be abused. The ITO layer on this front sheet may develop micro cracks. In a 4-wire sensor, these micro cracks can degrade the ability to create a smooth voltage gradient when this surface sheet is used for measurement of touch location.

8-Wire Sensor Operation

8-wire resistive sensors are identical to 4-wire sensors except that each electrode connection has a duplicate wire. By using a pair of wires to each electrode, the controller can correct touch locations for any electrical resistance in the wires and connections. With modern electrical connectors and sensor calibration, there are few situations where a touch performance benefit is achieved by an 8-wire sensor over a 4-wire sensor.

5-Wire Sensor Operation

In summary, a 5-wire resistive touch sensor is made from two sheets (or layers) of transparent material, separated from each other only by (nonconductive) micro dots. The facing surfaces of these two sheets have coatings of transparent, conductive material (normally indium tin oxide or ITO). When the sensor gets touched, the front sheet bends so that the ITO at the point of contact makes electrical contact with ITO of the rear sheet. Touch location is determined by rapidly alternating between measurements of horizontal (X) and vertical (Y) touch locations. Where 5-wire sensor construction differs from 4-wire is in the electrodes used to create smooth voltage gradients. On 5-wire sensors, only the rear sheet is used to create voltage gradients (alternating) between both X and Y directions. The rear sheet has electrodes around its corners and 'linearizing patterns' around its edges that create smooth voltage gradients in (alternately) the X or Y direction. Whether the gradient is in the X or Y direction, the front layer is used to sample the voltage at the contact point when a touch occurs then X or Y location is calculated.

In any resistive touch sensor, the front surface sheet gets deformed during normal use and may be abused. The ITO layer on this front sheet may develop micro cracks. In a 5-wire sensor, the front sheet is never used to form a voltage gradient. Voltage gradients are only created using the rear sheet - which is isolated from deformation and abuse. Possible cracking on the front sheet ITO has no effect on the integrity of voltage (and location) measurements by 5-wire sensors because the entire front sheet ITO reaches effectively the same voltage during a sample. Therefore, other things being equal, 5-wire resistive sensors have considerably better endurance (and less need for recalibration) than 4-wire or 8-wire sensors.

Controller Board Dimensions and Part Numbers

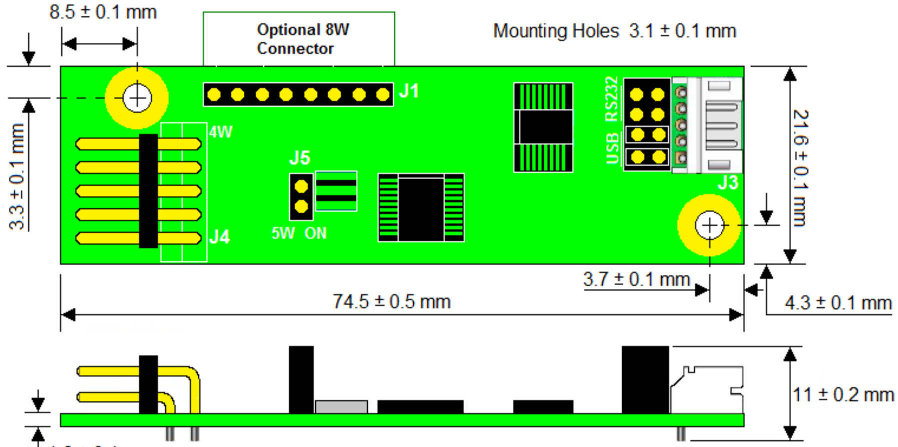

Figure 23 : Controller Dimensions

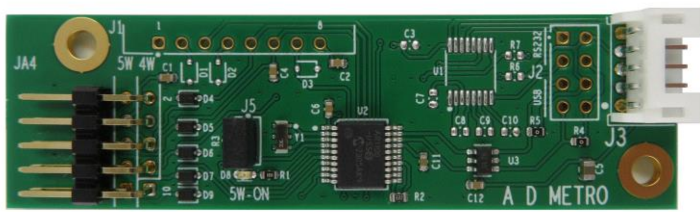

Figure 24 Part Number: CR1T-02-5WN-01

Figure 25 Part Number: CR1T-06-5WN-01

Part Number	Controller Description
CR1T-02-5WN-01	USB-Only Controller with Non-Latching Universal Sensor Connector
CR1T-06-5WN-01	USB/RS-232 Controller with Non-Latching Universal Sensor Connector
CR1T-02-5WL-01	USB-Only Controller with Latching 5-pin Sensor Connector
CR1T-02-4WL-01	USB-Only Controller with Latching 4-pin Sensor Connector
CR1T-06-8WL-01	USB/RS-232 Controller with Latching 8-pin Sensor Connector

Contact A D Metro (www.admetro.com) for availability and further guidance, or if you need other options such as a controller that communicates via 3.3V or 5V RS-232.

Appendix A: 8-Wire Resistive Sensors

A D Metro's standard resistive controllers do not ship with the 8-wire connector or associated protection circuitry installed. If 8-wire sensing is required, contact A D Metro to request a suitable controller.

8-wire resistive sensors operate identically to 4-wire sensors. The only difference is that the four sensor electrodes each have two wires leading back to the controller. The controller makes slight compensations for resistance in the wiring and connections.

8-wire sensors are gradually diminishing in popularity, as the inherently greater durability of 5-wire sensors and lack of life cycle variations in cables and connectors largely eliminated the need for separate sensing wires.

Preparing the Controller for 8-Wire Sensor Use

The A D Metro resistive controller board uses a 'jumper' as a switch to configure the board to work with either a 4-wire and 8-wire or just a 5-wire sensor. The jumper is either removed from, or connected across, the 2-pin header that is identified as J5 on the board. The tiny (2-pin, 0.1" pitch) jumper creates an electrical connection between the two pins that it connects across.

Remove the two-pin jumper from header J5 to configure the controller to use an 8-wire resistive sensor (as shown in Figure 26).

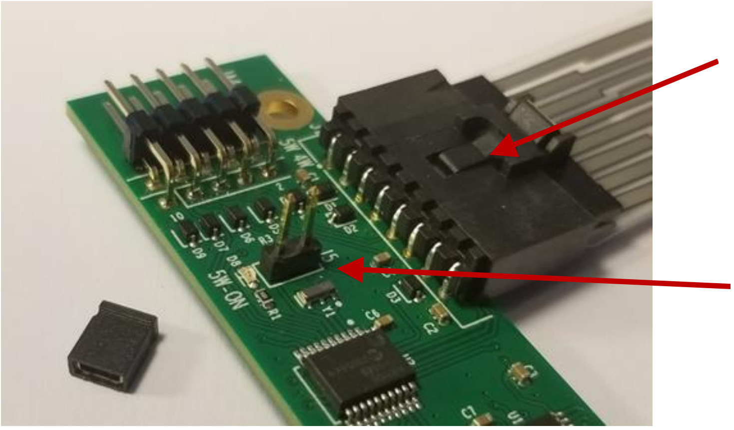

Figure 26: Remove Jumper from Header J5 to Use an 8-Wire Sensor

Connecting an 8-Wire Resistive Touch Sensor

If you plan to use an 8-wire resistive touch sensor, plug the sensor's 8-wire flex tail connector into the 8-pin (single row) header identified as J1 on the controller board (along a long board edge). If the board does not use a latching connector, it is possible to insert the sensor flex tail in either orientation (upside-down or upside-right). The system will work fine in either case. Bear in mind that inverting the flex tail connection changes the operating orientation of the touch sensor, so be sure to avoid inverting the connection again after calibration.

Does Your 8-Wire Sensor Require A 'Cross-Over' Cable?

Some 8-wire resistive sensors may need a 'crossover cable' to allow them to work with the A D Metro controller board. Connecting a crossover cable between the sensor flex tail and the controller board is a simple and complete solution to achieve compatibility with these non-standard sensors.

Every 8-wire resistive sensor flex tail connector has two pairs of wires that connect to the sensor electrodes controlling touch measurements in the X direction and (the remaining) two pairs of wires connected to electrodes that control measurements in the Y direction.

Technical information for any 8-wire resistive touch sensor normally includes a description of how the eight flex tail wires are connected inside the sensor. This description is often called a connector 'pinout.'

Figure 27 contains four example pinout tables copied from datasheets of 8-wire resistive touch sensors. Notation on the figure explains why the two left-most example sensors ARE directly compatible with the A D Metro resistive controller and why the two right-most sensors require a crossover cable to achieve compatibility.

An 8-wire sensor is directly compatible when pins 1, 2, 5 & 6 all relate to the same axis (or direction) touch measurements.

These two sensors are directly compatible. Pins 1, 2, 5 & 6 all relate to the *same* axis.

These sensors both need a crossover cable. Pins 1, 2, 5 & 6 relate to a *mix* of axes.

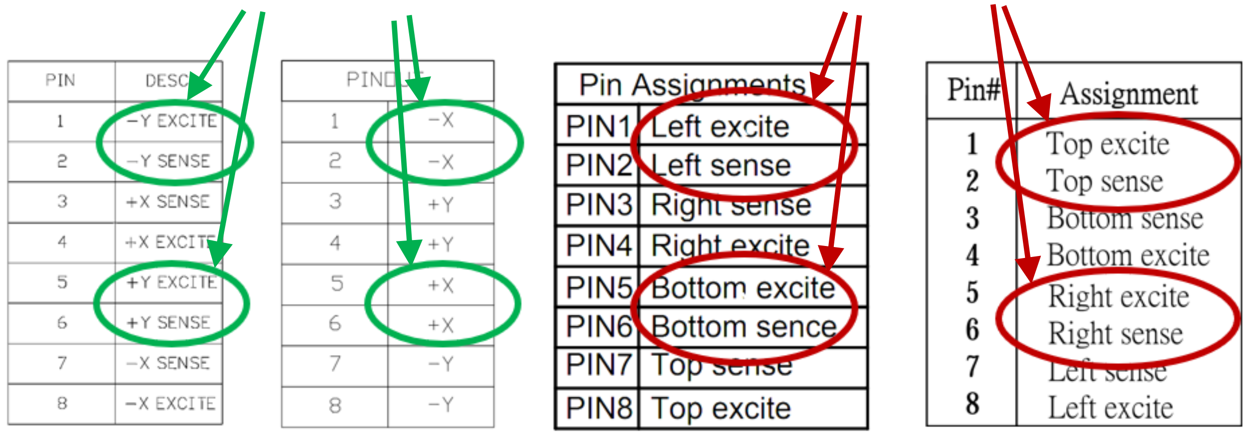

Figure 27: Connector Pinout Tables for Four Example 8-Wire Resistive Touch Sensors

In more detail, an 8-wire sensor IS compatible with the A D Metro controller if the pairs of electrodes assigned to connector pins 1, 2, 5 & 6 all relate to one axis (or direction) of touch measurement and pins 3, 4, 7 & 8 all relate to the other axis of touch measurements.

Sensor compatibility is not affected by which line is identified as ‘excite’ or ‘sense.’ Controller compatibility is not affected by the locations of positive (+) and negative (-) ends of sensor electrodes. Compatibility is not affected if all four X connections are swapped with all four Y connections. These kinds of polarity reversals only affect sensor operating orientation which gets corrected as part of the calibration process.

Figure 28 illustrates the construction of an 8-Wire crossover cable.

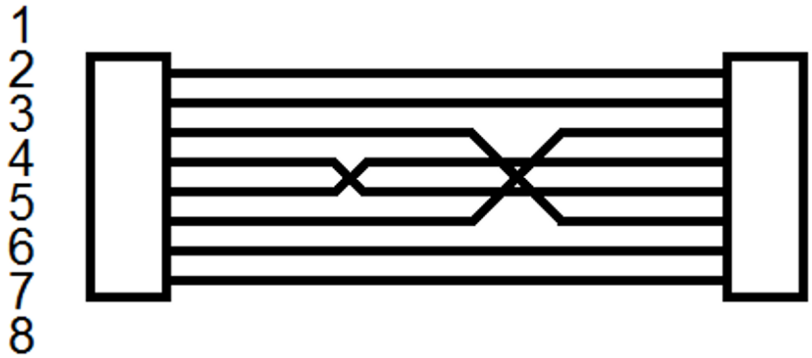

Figure 28: Electrical Schematic of 8-Wire Crossover Cable

References

1. A D Metro One-Touch Resistive Controller Datasheet
   https://www.admetro.com/CR1T-0x-5WN-01-Resistive-one-touch-controller-datasheet-v3.1.pdf
2. A D Metro Ultra Integration and Installation Guide

3. AR1100 Chip Documentation http://www.microchip.com/wwwproducts/en/AR1100