

Manual sign convention using XM systems

Overview

This document explains the process of defining the sign convention when there are fewer than three axes with controlled motion whilst performing an XM system measurement.

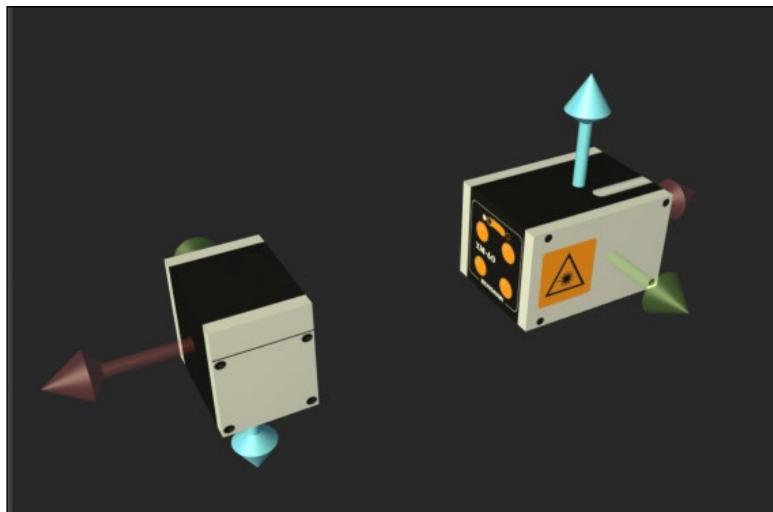
XM system sign convention

XM systems are capable of automatically setting their own sign conventions for linear, pitch angle, yaw angle, vertical straightness, horizontal straightness and roll by carrying out a sequence of moves prior to capturing data.

The sign convention sequence comprises of the following moves regardless of the axis which is being measured:

X + 150 µm	Y + 150 µm	Z + 150 µm
X - 150 µm	Y - 150 µm	Z - 150 µm

Automatic sign convention relies on all three axes being able to move to determine the sign convention for all degrees of freedom.



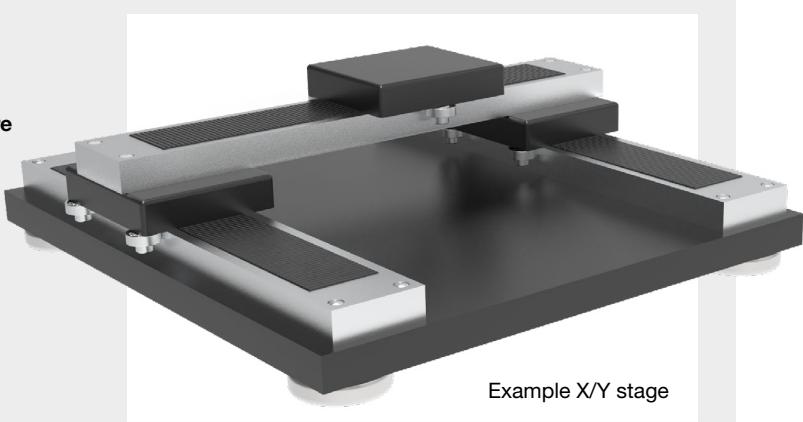
What if I do not have three axes?

If there are not three axes, then CARTO software allows the user to manually configure sign convention.

An example of this is an X/Y stage...

The X and Y axes can be precisely controlled. This achieves two of the three movements required.

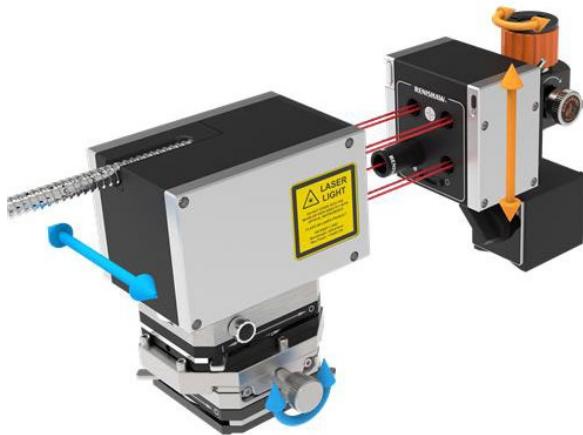
However, vertical translation is not possible.



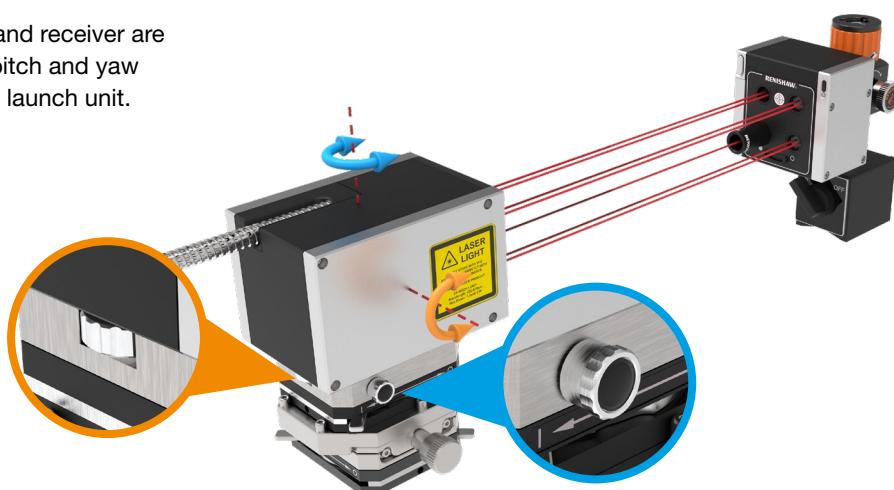
Renishaw translation stages

These stages are available to help the user in the initial alignment of the XM system.

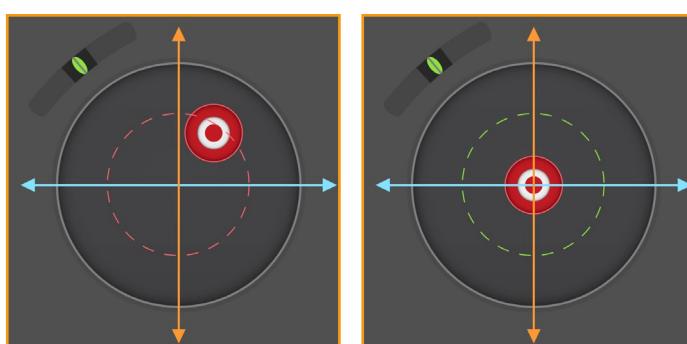
When the launch and receiver units are close, use the translation on the horizontal stage and / or vertical stage.



When the launch and receiver are far apart use the pitch and yaw adjustment on the launch unit.



Correct alignment in the Capture software application.



Full details of the alignment process can be found in the [XM multi-axis calibrator user guide](#).

Skip axis function

Once the system is aligned and start test is selected from the capture tab, the user will be prompted to datum and carry out auto sign detection moves.

Automatic sign detection

Move machine axes as prompted below:

Axis	Move direction	Complete
X	+	✓
X	-	✓
Y	+	✓
Y	-	✓
Z	+	✓

Complete sign detection moves for controlled axes.

For an axis which does not exist, select skip axis (circled).

After 'skip axis' has been selected the following screen is displayed, allowing sign convention to be manually defined..

Automatic sign detection

Select positive direction for skipped axes:

Camera orientation



Modify axes





Arrows point in the direction of positive measurement for translations.

Transparent arrows are axes which have already been defined by auto detection.

Bold arrows are axes which are not defined.

'Camera orientation' changes the view within the software for ease of understanding.

'Modify axes' switches the sign detection to suit user requirements.

By default, the XM system conforms to the right hand rule. This is the rule that the majority of machine tools, CMM's and stages use.

For interpreting test results, it is important to ensure the XM system is correctly configured.

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