MVC Feedforward
(Motion Vibration Control)

Application Note

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Revision History

Version	Description	Date
1.0	Initial Release	14 February 2022

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This product is warranted to be free of defects in material and workmanship and conforms to the specifications listed in this manual, for a period of 12 months from the shipment date from factory.

Contents

1 Introduction

1.1 Background

Base oscillations are prominent in systems with relatively high payload and accelerations and relatively low base stiffness. Stages with dual carriages or multiple machines working on the same base are also prone to such base oscillations.

This can affect performance such as settling time and jitter. Motion Vibration Control is a tool that can be used to detect and compensate for such vibrations.

1.2 Scope

This application note seeks to explain the steps to connect an MVC sensor to an Agito driver, and how to setup the driver to compensate for the vibrates using a feedforward.

2 Setup

2.1 Setup

Connect the stage to the Agito driver. Additionally, mount the MVC sensor onto the base and connect it to any of the analog inputs on the driver.

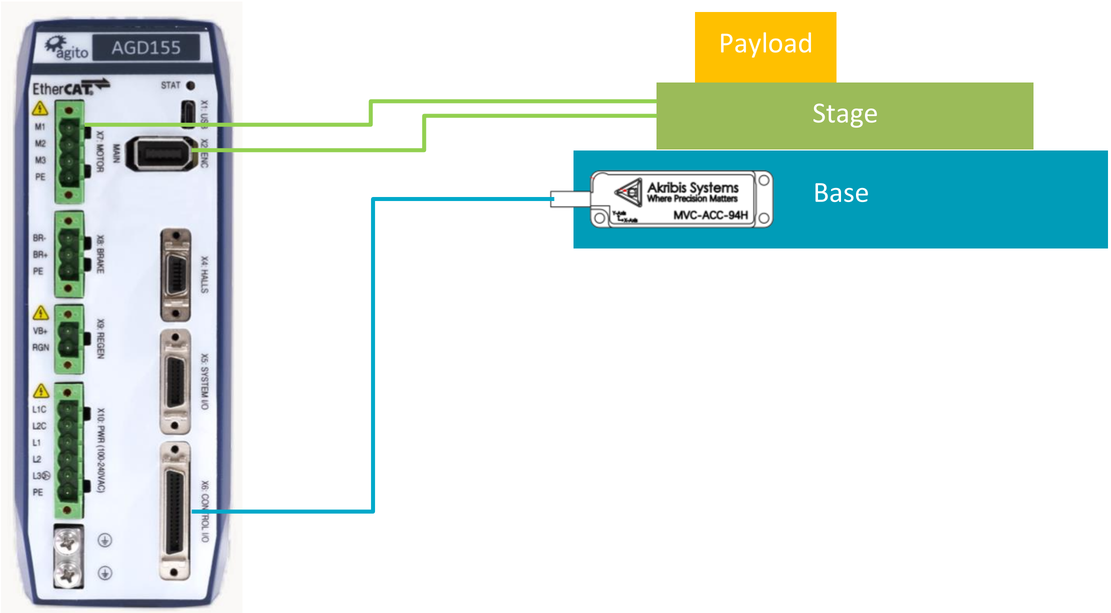

Figure 1. Stage Setup

2.2 AGD155 Wiring

Function	Pin Name	Pin #	AGD155 Connector
Analog Input +	Analog_Input_1	6	X6
Analog Input -	Analog_Input_Return_1	7	X6
5V	Supply Output 5V	36	X6
GND	Supply Output 0V	28	X6

2.3 MVC Wiring

Function	Pin Name	Pin #	MVC Connector
Analog Output +	Differential Analog Out +	14	D-Sub 15 Male
Analog Output -	Differential Analog Out -	15	D-Sub 15 Male
5V	Supply Input 5V	12	D-Sub 15 Male
GND	Supply Input 0V	13	D-Sub 15 Male

2.4 Ratio of MVC input to current output

Before the compensation feature can be used, the user will need to find the relationship between how much current to compensate for based on the reading from the MVC. The easiest method would be to do an experiment.

Firstly, tune the gains to a level which is able to reject the disturbance even without the feature. It is okay to have some noise at this stage, as we only want to measure the current needed to generate an opposite force on the base.

Next, make a motion to inject the disturbance, and do a recording of the following parameters,

Analog input
Current reference
Position Error

The controller will try to reject the disturbance via the PIV control and the current will increase to overcome the force applied by the base oscillation.

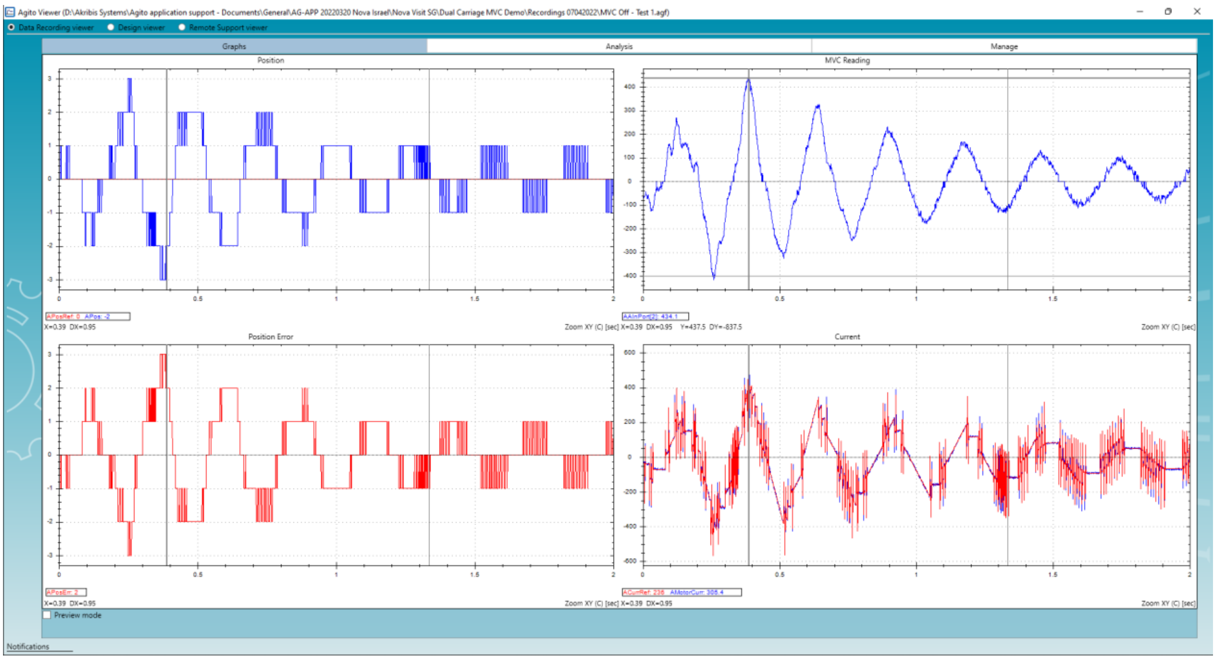

Figure 2. Controller Setup

In the example above, the current profile matches the MVC profile with a lag. Taking a simple peak-peak ratio, we get 437.5mV to 600mA. The gain is 1.37mA/mV.

2.5 Controller setup

Navigate to 

then 

. In this page you will be able to configure the analog input to do torque compensation using the MVC sensor. Set the Input Mode to 6 – Torque Compensation. Adjust the signal conditioning parameters accordingly.

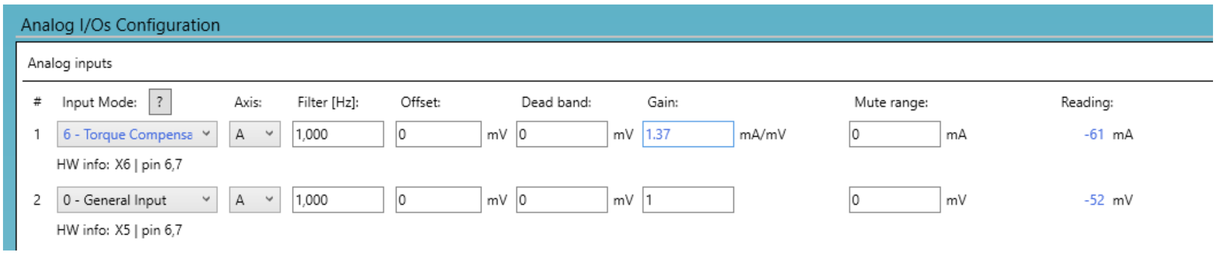

Figure 3. Controller Setup – Analog Input

Navigate to 

then 

. Set the TorqCompMode to 0 – Use analog input.

Figure 4. Controller Setup - More

After applying the settings, the torque compensation will take effect.

2.6 Verification

Adjust the PIV gains to a desired level. Repeat the same experiment to create the disturbances and check if the performance has improved. Continue adjusting the gains of the torque compensation feature.