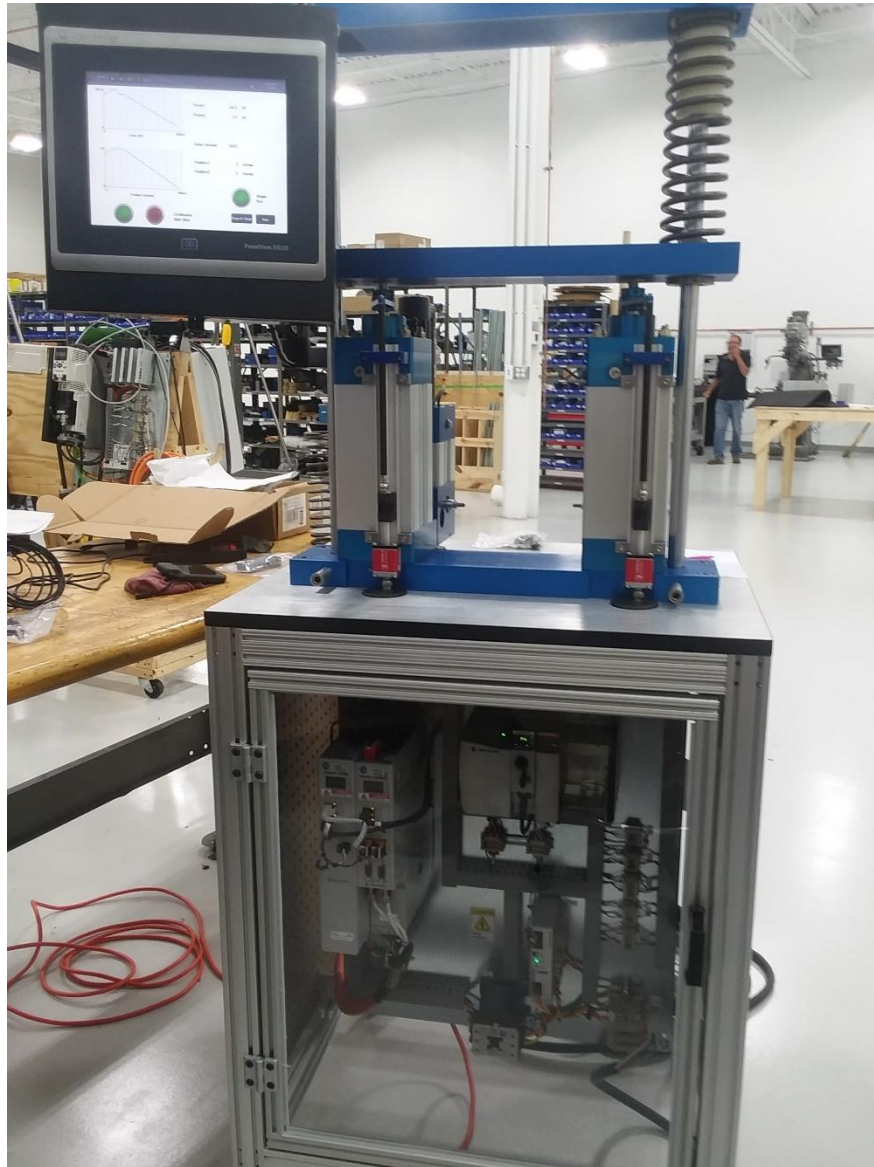


## TR-920 RA DUAL SYNCHRONIZED AXES



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### REVISION HISTORY

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## 1 PURPOSE

To provide guidelines and overview of using Gearing (MAG) to synchronize two Smart Hydraulic Actuator axes when using the Kyntronics AOI to control each actuator.

This document follows the PLC logic from the KyntronicsSHA\_AOI\_TestStandDualRAShow\_w3.ACD project file.

## 2 SYSTEM OVERVIEW

The system consists of two SHAs (Smart Hydraulic Actuators) coupled via rigid crossmembers and with a spring load on the righthand (master) side. The enclosure contains drives and controls, and with a PanelView operator console.

The right-hand actuator which has the spring load, is the master axis. It is called SHA\_Axis1 in the sample Studio project. The SHA\_Position1 virtual axis is used to command the (linear) positional moves for SHA\_Axis1, via the associated AOI (SHA\_PositionControl instance).

The left-hand actuator which does not have any direct load, is the slave axis. It is called SHA\_Axis2 in the sample Studio project. The SHA\_Position2 virtual axis is used to command the (linear) positional moves for SHA\_Axis2, via the AOI instance for this actuator.

The AOIs for the actuators are in the SHA\_Routine, in the SHA\_MotionTask\_Program of the MotionTask.

On the Dual Demo unit, the two actuators' linear positions have been calibrated and offset such that they will report the same position when the fixture is properly aligned. However, this matching of actual positions is not a requirement when Gearing axes; a fixed offset could be established during setup of the alignment of the actuators to then track the positional difference during operation.

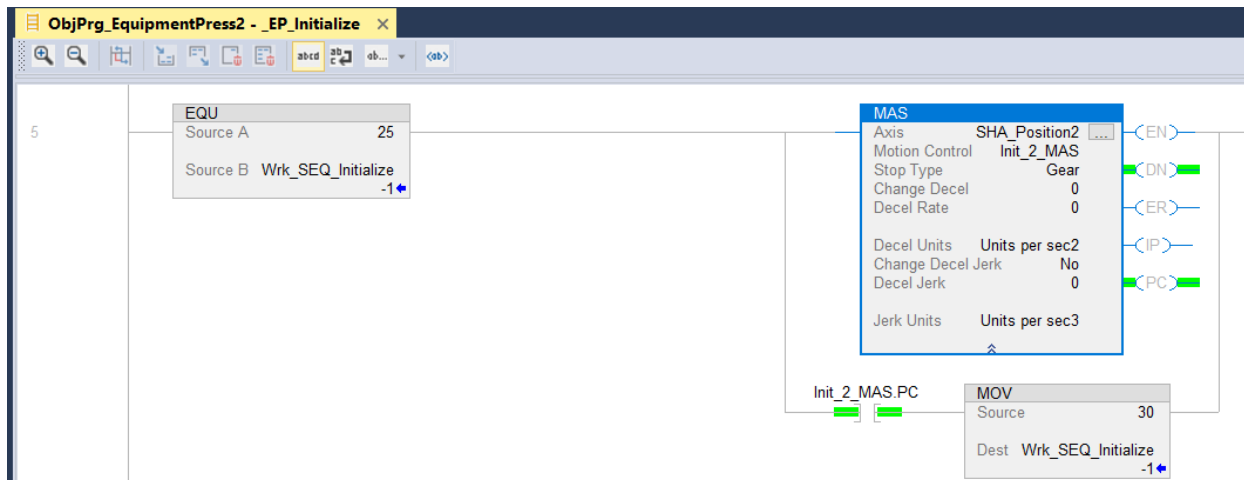
## 3 STARTUP SEQUENCE

At startup, each SHA\_Position virtual axis has its absolute position MRP'd to the actual position of the respective SHA\_Axis, so that no motion will occur when the AOIs are enabled.

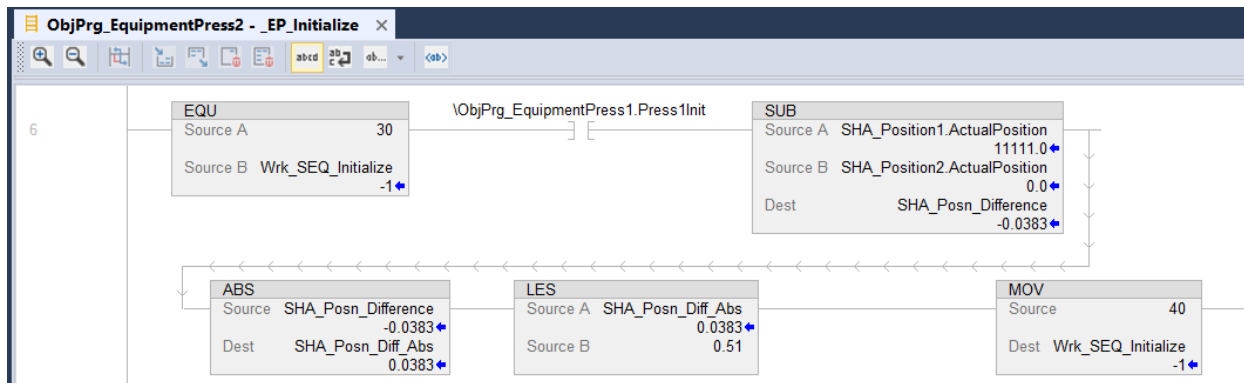
The dual demo actuators do not have any lock valve, so when the system is unpowered and relaxed, the spring load will typically push down the (Master) SHA\_Axis1 slightly, as compared to the (Slave) SHA\_Axis2. The rigid platform and guides have some give, and so the two axes will therefore be at slightly different positions when the unit powers up. The misalignment is typically in the range of 0.038" to 0.2" depending on how long the unit was left off and where it was parked.

The startup logic for each actuator resides in the ObjPrg\_EquipmentPress1 and ObjPrg\_EquipmentPress2 EP\_Initialize routines.

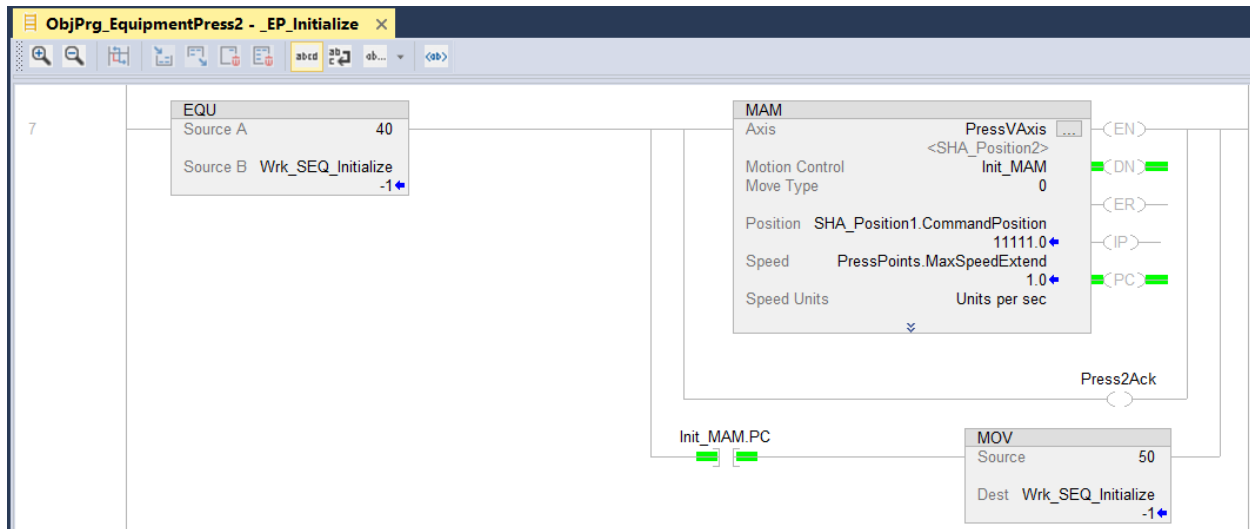
Each Press MRP's its virtual axis to the actual position. The Press2 slave then turns off any gearing via the MAS on rung 5:



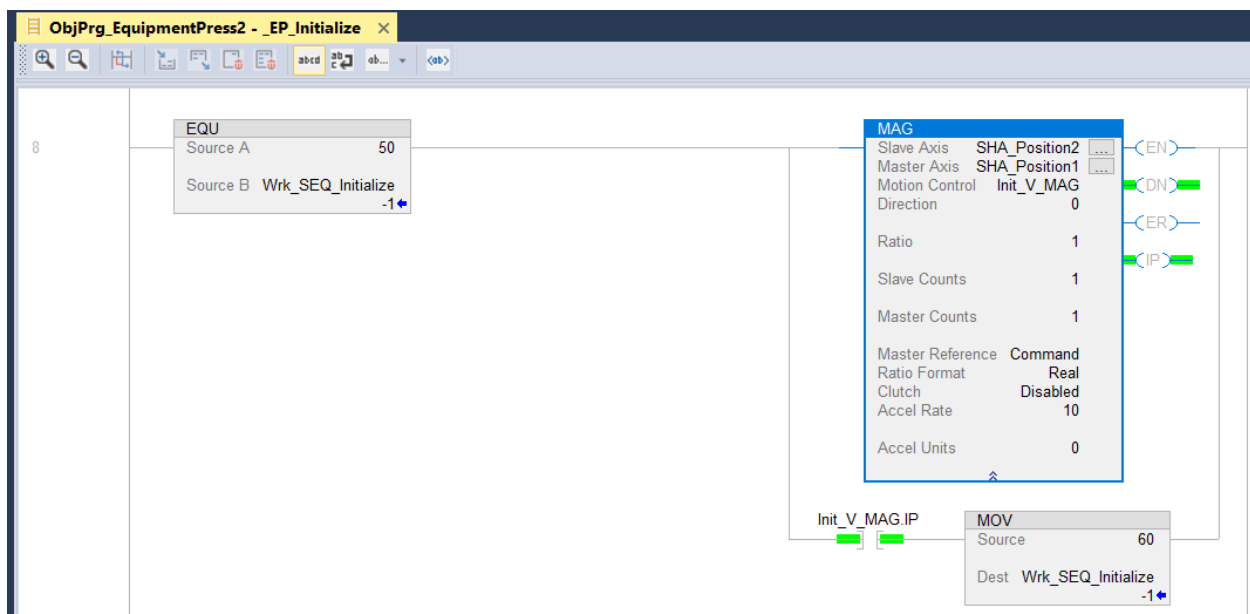
The Press2 startup logic must wait for the Press1/SHA\_Axis1 startup sequence to finish, prior to performing the positional check between the master and slave positions (rung 6). Axis2 must be within a position tolerance window in order to continue and finish the Gearing/synchronization. The absolute positional difference must be less than 0.51" on the dual demo (use a value appropriate to the system) in order for the alignment and syncing to occur.



If this positional check is valid, then the slave is moved to the Master's position (rung 7):

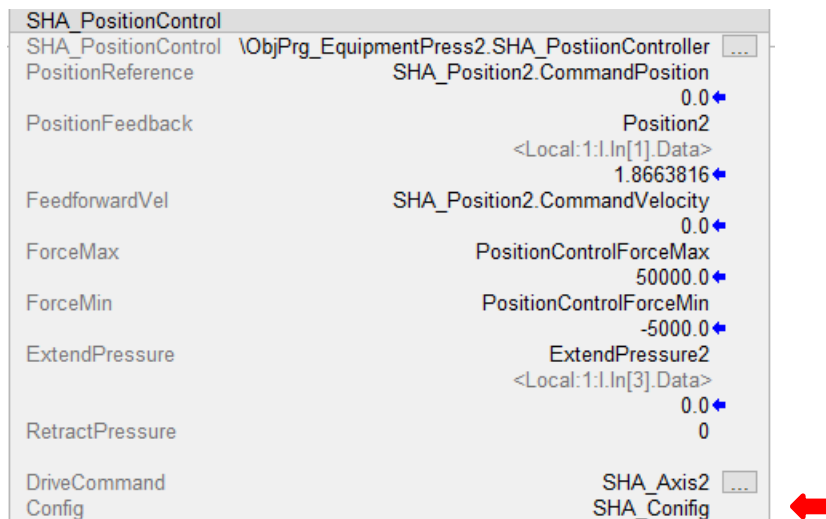
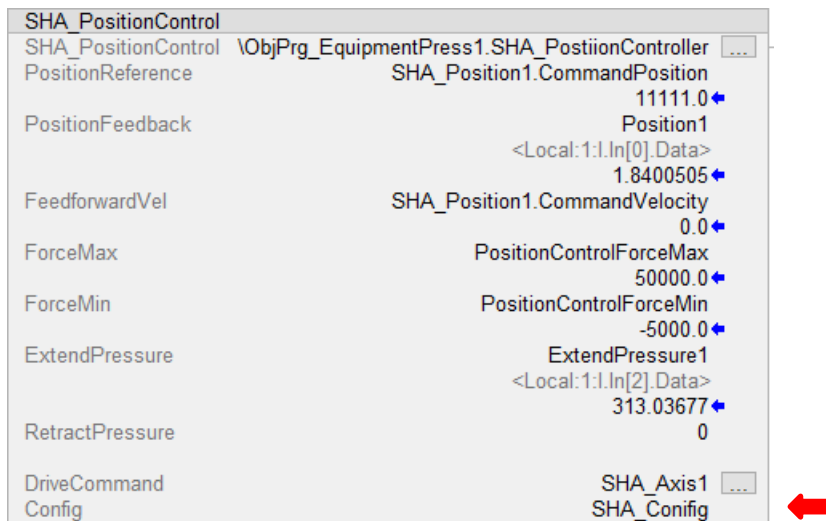


The synchronization is accomplished by Gearing the SHA\_Positon2 virtual axis to the SHA\_Position1 virtual axis—via the MAG function block on rung 8 of the ObjPrg\_EquipmentPress2 EP\_Initialize routine:



## 4 AOI SYNCHRONIZATION DETAILS

The Dual Demo uses identical actuators. Because of this, the same SHA\_Config can be used in both AOIs, as the Force gains and tuning are identical. Likewise, the same ForceMax and ForceMin tags can be used for both:



It is possible to Gear two non-identical actuators; however, in this case the Master's virtual axis should use velocities and accelerations that are within the range of both actuators.