Shutter control circuit instructions

This project is an interface system between the Syndyne system and the shutter drive mechanism mounted on the doors. It accepts shutter control signals from Syndyne and drives the shutter motors as needed to open/close the shutters as requested.

It is designed to drive two shutter assemblies independently and simultaneously.

The limits for each shutter are stored in the Arduino’s semi-permanent memory. It uses this information to know what position “value” indicates that the shutter is fully open, fully closed, or somewhere between.

If the mechanism were to be disassembled, it will be necessary to recalibrate the limits in the Arduino so that the actual shutter position will be correctly understood by the Arduino.

Feedback systems

Systems relying on a feedback loop tend to drive uncontrolled (ie: try to drive past fully open or fully closed) if the feedback loop were to fail. The firmware has some ability to detect such a state and will report an error if it determines that this has probably occurred.

Hardware

The hardware is powered by 12VDC (for the Arduino) and 24VDC for the motors. The hardware uses a potentiometer to determine the current position of the shutters.

It has two circuit boards:

* The Arduino “Uno” (the larger board)
* The motor driver board (out 1 & 2 are for room 1; out 3 & 4 are for room 2)

The feedback potentiometer is a multiturn pot. It’s important to note that this pot does have an endstop at the maximum CW and CCW positions. It’s very important to understand that the shutter open/close range of pot positions must lie within the working range of the pot.

**Good scenarios:**

(pot limit) (pot limit)

|---------------------------------------------------------------------------|

|-------------------------| 🡨 shutter position

Closed Open

(pot limit) (pot limit)

|---------------------------------------------------------------------------|

|-------------------------| 🡨 shutter position

Closed Open

(pot limit) (pot limit)

|---------------------------------------------------------------------------|

|-------------------------| 🡨 shutter position

Closed Open

**Bad scenarios: (Solution: loosen/remove belt and turn pot by hand until it is OK)**

(pot limit) (pot limit)

|---------------------------------------------------------------------------|

|-------------------------| 🡨 shutter position

Closed Open

(pot limit) (pot limit)

|---------------------------------------------------------------------------|

|-------------------------| 🡨 shutter position

Closed Open

Firmware

The Arduino firmware is written in C++.

Error Indication

If the Arduino detects something wrong, it will shut off the motors and flash its yellow LED on the Arduino.

Possible causes:

* Feedback loop broken (considered to be broken when the position feedback indicates 0 or maximum readout).
* The motor has been driving too long (suggests that it has stalled).

Troubleshooting: uncontrolled driving

If the motors are driving in a way that isn’t healthy, unplug the “brick” power supply going to the motor driver board.

Troubleshooting: motor not driving

Is the yellow LED on the Arduino board flashing? (1 Hz). If so, see “Error indication” section in this document.

Is the Arduino powered? Is the “brick” power supply plugged in and working?

Procedure: how to turn off the system

Safest is to disconnect the “brick” power supply from the wall outlet.

Procedure: recalibrate limits in a room

You can do the following:

\* the extreme open/closed positions might not be perfectly accessible with the motor.

1. Disconnect the “brick” power supply from the wall outlet (we want to disable the motors)
2. Install “terminal” software (such as <https://www.compuphase.com/software_termite.htm> ) on your computer.
3. On your computer, connect a USB port to the Arduino (it might need to install drivers)
4. Select the correct com port, 9600, N, 8, 1
5. “Connect”
6. Type anything and press Enter (you should see an error like “Unrecognized command!”)
7. Using your hands, move the shutters in a room to the “closed” position\*
8. Type Room1SetClosedLimit (or Room2SetClosedLimit) and press Enter
9. Using your hands, move the shutters in a room to the “open” position\*
10. Type Room1SetOpenedLimit (or Room2SetOpenedLimit) and press Enter
11. Reconnect the “brick” power supply
12. Type Room1Test (or Room2Test) and press Enter

Possible future change: Motor replacement

You could replace both the motor with 12VDC motors instead. Then you can power the motors from the 12VDC supply powering Syndyne.

Any motor replacement would need to have enough torque.

<https://www.servocity.com/>

https://www.sparkfun.com/

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Possible future change: Motor belt replacement

You could use a coarser pitch of toothed belt but then you’ll also need to change the sprocket to a matching pitch.

We have extra belt material attached to the door assembly.

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