

Maglev 200™ Handle Connector Interface Kit

Adding a custom user handle

The Maglev 200 handle connector kit is an inexpensive option which allows users to design their own handles which may support extra features, *e.g.*, a 7th degree of freedom. For example, one may wish to replace the standard mouse-like handle with that of a surgical instrument handle, for a more realistic interaction experience.

The kit circumvents the tedious and difficult task of designing a custom handle connector, while allowing the user to retain the original handle.

The kit includes the parts shown: headers, circuit board, screws, spacers, alignment pins, handle nut, and precision machined housing. The alignment pins are pre-installed in the housing to ease assembly. Also included is 30 AWG wire and solder. Step-by-step instructions are supplied.

Besides providing a rigid, removable mechanical attachment to the Maglev 200 flotor, the interface provides 10 electrical connections. Signals include a current output and return which can source up to ± 3.7 A at 12 bit resolution, a ratiometric analog input with 16 bit resolution, with ± 10 V range, a pair of digital switch inputs, ground, and a pair of undedicated lines.

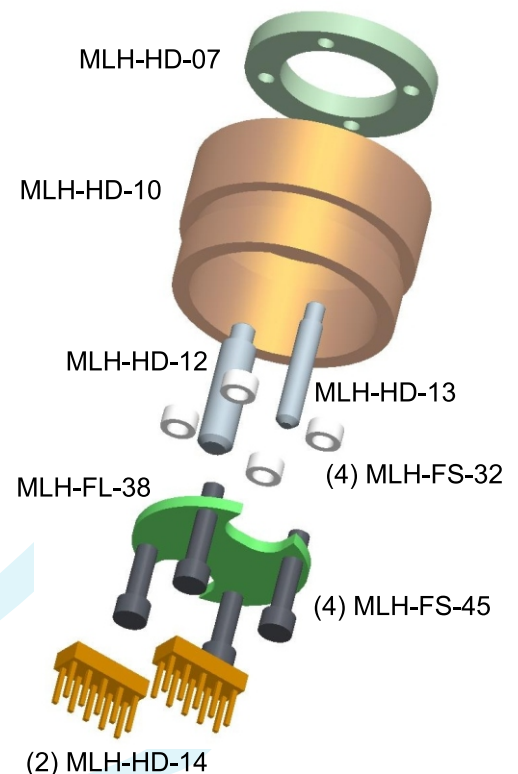
The Maglev 200 API and client side monitor program fully support the analog output, analog input, and switch inputs.

Example 1: a pinching or grasping type handle

The user supplies a handle in which it is desired to have haptic feedback between the thumb and forefinger. In this case, the ratiometric analog input can be used to sense the position or angle of a potentiometer wiper arranged to measure the thumb/forefinger separation. A small brushed DC motor and transmission in the handle can be driven with the analog current output to provide force between thumb and forefinger. The built-in 7th DOF API functions can be used to read position and output forces.

Example 2: a joystick type handle with many buttons

The user supplies a joystick-shaped handle which is equipped with 10 buttons. But the interface only supports 2 buttons. A simple circuit board connecting the remaining 8 buttons with a resistor network connected to the ratiometric analog input can be used to set a voltage representing the combination of buttons pressed. A simple client-side program can read the voltage to determine which buttons are pressed.



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Details of handle connector interface

Wiring Table

Pin	Signal	Description
1	CO7	Current output*
2	CI7	Current return
3	GRASPHI	+10V output
4	GRASPV	Analog input
5	GRASPLO	-10V output
6	SW1	Switch input 1
7	SW2	Switch input 2
8	SENSEGND1	Ground connection
9	S1 (spare)	undedicated line
10	S2 (spare)	undedicated line

* into nominal 10 ohm load

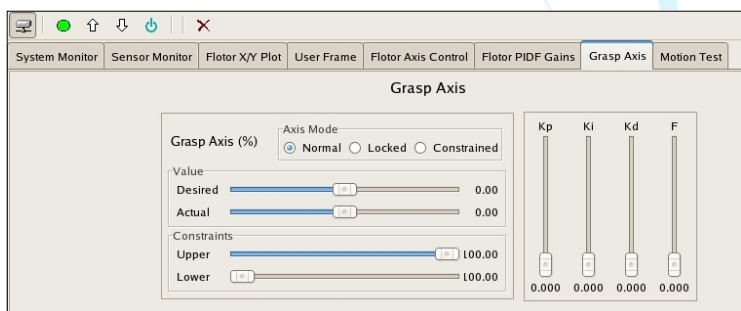
Please refer to the table on the left for signal connections.

The current output can be used to drive a small actuator having a nominal 10 ohm resistive/inductive load to provide a force or a torque.

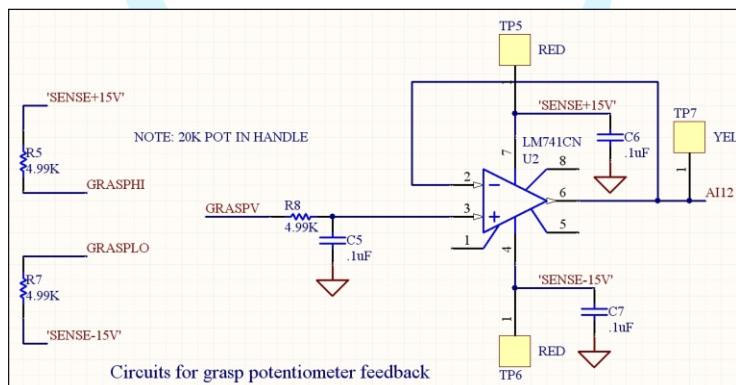
Position or angle can be sensed with a potentiometer. The potentiometer (nominally 20K ohms) can be connected between the GRASPHI and GRASPLO pins, with the wiper connected to the GRASPV pin. The Interface board built in to the Model 201 device includes the voltage follower circuit (below left) for ratiometric analog input.

The Interface Board also has a circuit (below right) which is used to debounce the (SPST) switch inputs.

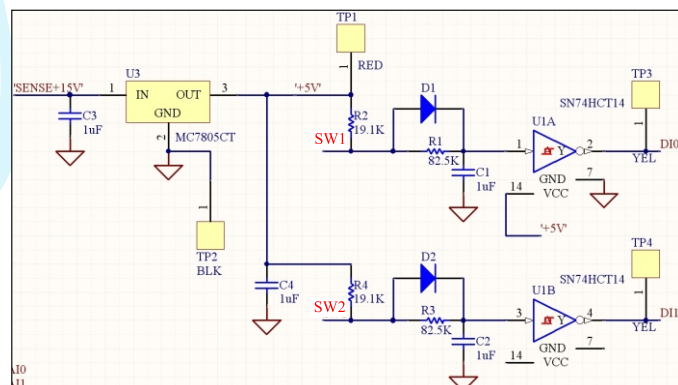
The Maglev 200 API as well as the client monitor program (screen shot on left) supports the addition of the 7th DOF in a manner similar to that of the normal 6 DOFs.



Monitor GUI



Built-in circuit for ratiometric analog input



Built-in switch debounce circuit