Iris Dynamics Ltd.

Magnetic Suspension Joystick (IDL-20005)

Overview

The Iris Magnetic Suspension Joystick is a high-fidelity, force-feedback controller capable of generating forces within a millisecond of receiving a signal, within milligrams of resolution. It is reliable, precise and economical.

Through proprietary multidimensional magnetic field modeling and optimizations, Iris Dynamics seeks to leverage its intellectual property with today's leaders in control loading and motion control.

This style of joystick removes the mechanics used by the traditional rotary or linear motor systems. This new simplicity completely eliminates backlash in the motor and provides a truly zero-cogging motion.

With only magnetic field interactions between the user and the system, miniscule variations can be felt without convolution from motor harmonics or gear meshing.

An on-board processor can store and sample effects such as springs, dampers, detents and vibrations, making them feel completely indistinguishable to their real-life counter-parts while adding the ability to dynamically change or add effects in real time.

A long mean time to failure is assured due to the touchless nature of the motor and touchless magneto-resistive position sensing elements.

Contactless motor design means the device is completely silent during operation.

Integration is made possible using one of two APIs (Microsoft DirectInput and Iris USB Serial), or by contracting the Iris Development team to put together firmware that works for a specific application.

Humans have always relied on their somatosensory system (sense of touch) to interact with and manipulate the world. Iris Dynamics seeks to reintroduce the fastest and most primitive of our senses into industry and consumer electronics.

Features and Benefits

- Arduino-compatible 32 bit, 96 MHz ARM microcontroller for local effect processing
- Rugged aluminum gimbal assembly and Igus bearings
- Contactless, solid state magneto-resistive position detection circuits
- High speed and precision, bi-directional current sensors
- Efficient and powerful NMOS synchronous H-Bridge circuits deliver up to 25 amps and 35 V to each axis
- USB 2.0 DirectInput HID for force-feedback effects, or a simple proprietary USB Serial interface
- C++/Arduino firmware
- UART or SPI interfaces available
- Temperature sensing and variable speed fan
- Imagined, designed, fabricated, assembled and tested in Canada

Absolute Maximum Ratings

Logic Supply Voltage ....5 V
Motor Supply Voltage ....35 V
Operating Temperature Range .... -40 C to +85 C
Peak Power Consumption[1] ....1.75 kW
Sustained Power Consumption at 25 C .... 135 W
Maximum Instant Force Output .... 6.5 N
Maximum Sustained Force Output at 25 C... 1.8 N
Stick Travel[2] .... +/- 20 degrees per axis

[1] Requires 35 V, 50 amp power supply
[2] Can be reduced using replaceable mechanical stop

Specifications

Parameter	Notes	Min	Typ	Max	Unit
Electrical					
Logic Supply	ATX, USB or other	4.5	5	5.5	V
Motor Supply	ATX connector option for 12 V	10	12	35	V
Winding Current	Per axis			25	Amps
Winding Resistance	At 25 C	1.25	1.3	1.5	ohm
Thermal					
Thermal Resistance	At outside of acrylic case		0.46		C/watt
Thermal Settling Time			1800		seconds
Winding Temperature	Limited by firmware			110	C
Sensing Resolution		0.25			C
Fan Speed Resolution			2048		levels
Mechanical					
Gimble Range	Using interchangeable mechanical stop	0	40	40	degrees
Weight			3.5		lbs
Motor Height			15.5		cm
Motor Width			11		cm
Motor Height			11		cm
Stick Height	Above gimble pivot		12		cm
Forces					
Force Constant	Measured at 10 cm from pivot		0.25		N/amp
Torque Constant			0.025		N-m/amp
Force at knob	At 25 amps, single axis			6.25	N
Resolution		2.5			mN
Effects					
Bandwidth			1.0		kHz
Sampling Frequency	Motion-based / Frequency Based			2.6 / 4	kHz
Simultaneous Effects				32	
Position Sensor					
Angle Resolution			0.039		degrees
X- and Y-axis refresh				2.6	kHz