ENCODER MIKE™ CONTROL SYSTEMS

18113 Encoder Mike™ Control System controlling a three axis combination positioner.

- **One axis and three axis control**
- **Simultaneous control of any trajectory**
- **32-bit microprocessor for high speed and precision**
- **0.1 µm resolution, 200 µm/s velocity**
- **Easy-to-use software application and development tools**

Our **new** Encoder Mike™ Control Systems provide a simple, cost effective solution to motion control of Oriel Encoder Mike™ actuators. These PC plug-in card controllers meet the requirements of most laboratory motion control needs. All you need is a PC with an ISA bus. We offer two versions of controller: a single axis and a triple axis.

WHAT MAKES UP AN ENCODER MIKE™ CONTROL SYSTEM?

Three components make up these systems:

- PC plug-in controller card
- Amplifer box
- Software package

PC Plug-in Controller Card

The card has an on-board 32-bit microprocessor and memory which allow the controller to execute your motion program independently of the PC. In other words, once you've downloaded your motion sequence to the controller's EEPROM, you can execute it while the computer is performing other tasks.

Twenty external I/O connections allow limit switches and other external events to be included in the motion control program. Your motion program can trigger external events, or respond to them through TTL connections, operating totally independently of the PC.

Amplifer Box

The amplifer box amplifies the current from the board to the level needed to drive the Encoder Mikes™.

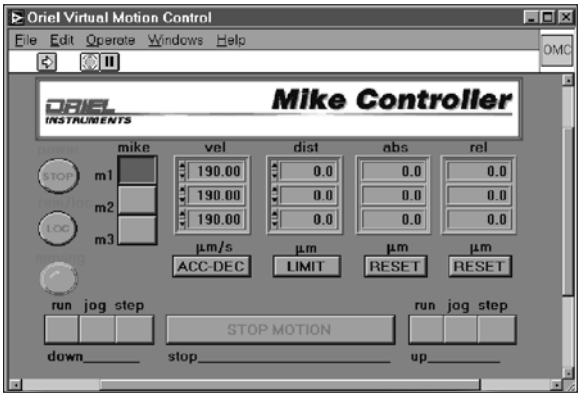

Fig. 1 With the Oriel Virtual Motion Controller™ you can control up to three Oriel Encoder Mikes™ or Stepper Mikes™.

Virtual Motion Controller™ Software Package

The software package is a virtual motor controller; it simulates a hand controller, on screen. Written under LabView™, this simple application commands up to three Encoder Mikes™ sequentially. It has run, step and jog virtual buttons. You can set the velocity and step distance and zero the displays. A large seven digit virtual display shows the current position of the active motor. The positions and other motion parameters of the inactive motors are stored in non-volatile memory. All operating parameters can be saved for later retrieval.

Monitoring of Motion Position

Fig. 1 shows the control screen for the Virtual Motion Controller™. We modeled it after the popular 18011 Stand Alone Controller. The application has an internal feedback system that tightly regulates the speed of the motor. It also has a backlash compensation feature. The commanded motion sequence is always completed from the same direction (+vel). When you command movement in the minus direction, the actuator moves 14 µm past the target, and then returns to the target.

TECH NOTE

Encoder Mikes™ produce very little vibration compared to stepping motor based actuators, and they run cooler. Because of their smooth motion, Encoder Mikes™ are ideal for integration into laser systems. An Encoder Mike™ can be used to tune components residing in a laser cavity.

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Basic Functions

These are the basic functions of the Virtual Motion Controller™ software:

- MOTOR: Selects the active actuator.
- RUN: This button runs the active mike at the programmed speed* until the button is activated again or until an internal or external mechanical stop is reached.
- JOG: This button runs the active mike at the programmed speed*, for as long as it is activated.
- STEP: This button drives the active actuator over the programmed distance.
- VEL: This function allows you to program the speed of each actuator in the "Run," "Jog," or "Step" modes.
- DISTANCE: Allows you to enter the distance traveled in the "Step" mode.
- ABS: Activates the "absolute" scale. You can zero it anywhere in the travel range. The absolute scale measures the range you travel.
- REL: Displays the "relative" scale; its zero point can be set at any point. The relative scale displays the position of the actuator relative to a fixed location.

*** Provided these functions are operative long enough for the actuators to accelerate to the set speed.**

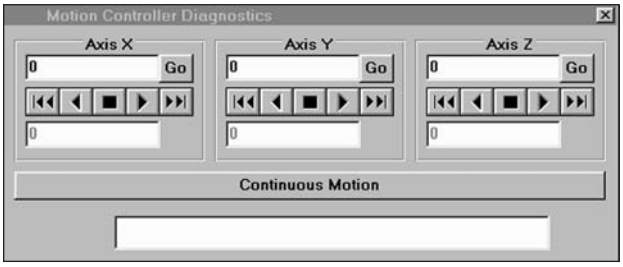

Fig. 2 The diagnostics program lets you execute simple motion commands.

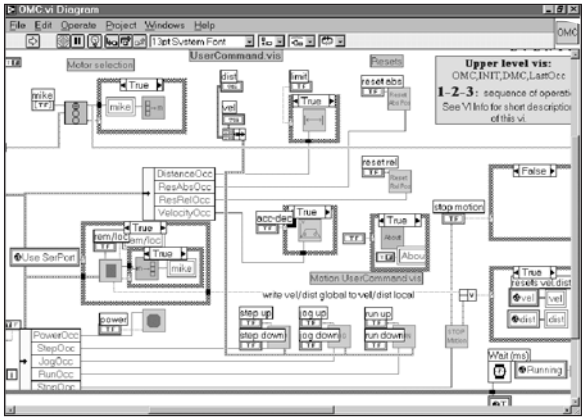

Fig. 3 We include VIs for LabView™ development.

Software Development Tools

This package of tools includes a motion control diagnostics application and a terminal emulation package. The diagnostics program (Fig. 2) lets you execute simple motion commands, i.e. forward, reverse. A loop mechanism has been employed to allow cyclic motion. We provide the Visual Basic™ source code for this program as a useful example for creating your own specialized applications.

We also include DLLs for Windows™ programming and VIs for LabView™ development for those who wish to write their own application.

FOR DATA ACQUISITION...

For position dependent data acquisition, use the **new** Oriel Fast Start™ Software with the 18113 Control System. The combination of Fast Start™ and 18113 allows you to simultaneously measure both signal and reference, and calculate the normalized signal. We talk about Fast Start™ in detail on page 19-57. To use Fast Start with the 18113 Encoder Mike™ Control System, you will need to order the 18154 I/O Option.

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I/O OPTION

The 18154 I/O Option adds two analog input channels to your 18113 Controller Board. Use these to interface your motion system with analog outputs from laboratory instruments such as lock-in amplifiers, boxcars, pressure gauges, etc. The included library of LabView™ VIs adds inexpensive automation to the most common laboratory experiments including various stabilization, beam profiling and pump and probe arrangements.

Also see these catalog pages...

We offer data acquisition systems based on these controllers, on ***page 19-40****. These systems include a motorized linear or rotary combination positioner, the 18113 Triple Axis Controller with 18154 I/O Option and dedicated software to get you up and running without the programming downtime. The 18154 gives you access to the analog outputs from many laboratory instruments so you can measure your signal and reference, and calculate the normalized signal.*

TECH NOTE

Many experiments require the use of an excitation source with constant power across the whole tuning range, e.g. Photo Luminescence Excitation (PLE) and Resonant Raman Scattering (RRS). In these experiments the intensity of the photoluminescence (or Raman) emission is measured as a function of the excitation wavelength.

In both RRS and PLE, power changes due to the wavelength tuning of the excitation source may change the conditions of the experiment and distort the results. For example, most tunable laser systems have very steep tuning curves; their power is strongly dependent on the wavelength at which they lase.

An easy solution to this problem is to employ a simple stabilization arrangement, as shown in Fig. 1. In this setup, a linear variable neutral density (ND) filter, model 28629 is mounted on an Encoder Mike™ driven linear stage, model 16138. The optical density of this filter varies linearly along its length. The motion system controls the power of the transmitted light, by changing the place at which the light is incident on the filter. The power of the output beam is probed by a UV Enhanced Silicon Detector, and is compared to the desired power level. The position of the filter is adjusted until the measured power is equal to the set level.

You may use one of the remaining axes of the Controller, to control the wavelength of the laser. Replace the micrometer driving the grating in the dye module, with an Encoder Mike™

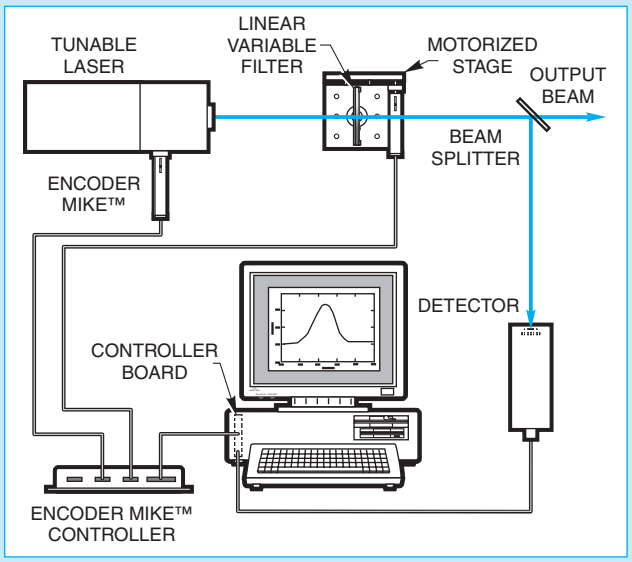

Fig. 1 Stabilization set-up for a tunable laser system.

Encoder Mike™

Fig. 2 shows the luminescence intensity as a function of the excitation energy, E_{ex}. When E_{ex} is equal to E_{ab}, then the luminescence intensity (energy E_{pl}) reaches its maximum. The position, width, and area of the intensity peak contain information about the energy E_{ab}: the widths of the energy levels A and B, and the density of the states. PLE is used commonly in solid state spectroscopy; it provides information similar to that obtained from an absorption measurement, without the difficulties, particularly when working with strongly absorbing media.

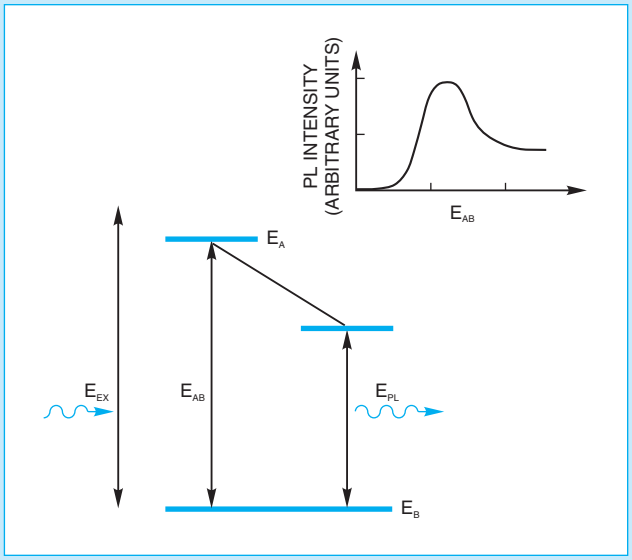

Fig. 2 Luminescence intensity as a function of the excitation energy E_{ex}.

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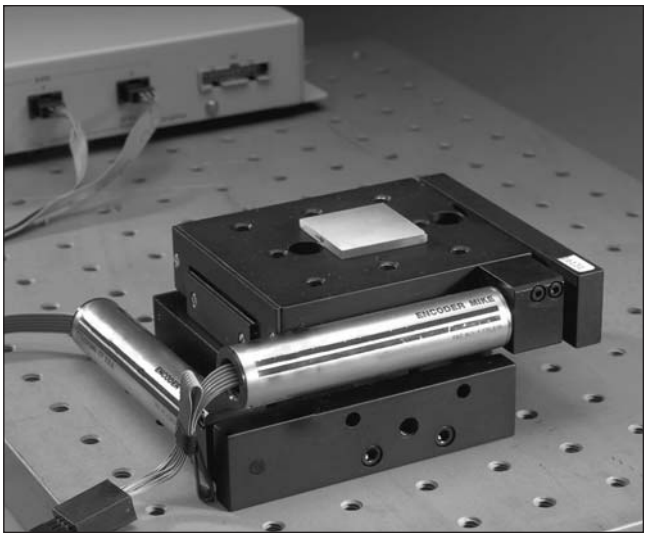
With our 18113 Encoder Mike™ Control System, you can control up to three Encoder Mikes™ sequentially.

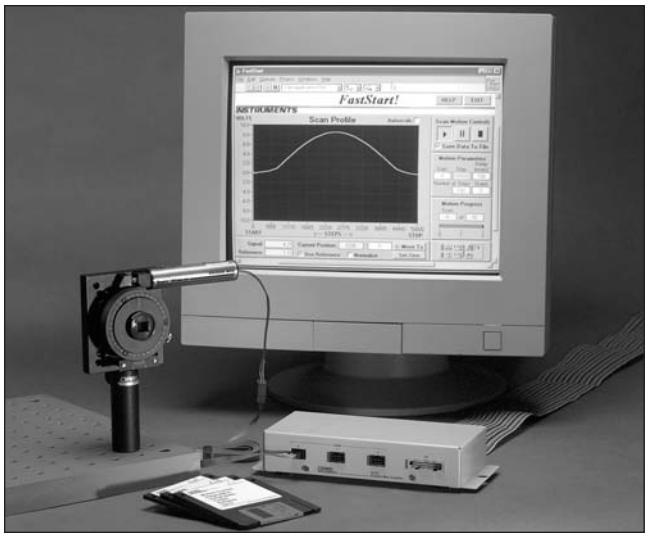


18132 X-Z System.

Virtual Motion Controller™ Packages

We chose the most popular Encoder Mike™ driven combination positioners and bundled them with the Virtual Motion Controller™ to offer the following packages:

- 18130 X-Y-Z System comprised of:
  - One, 16618 Encoder Mike™ Driven Vertical Translator, described on page 19-20
  - Two, 16038 Encoder Mike™ Driven Horizontal Translators, described on page 19-16
  - 18113 Encoder Mike™ Control System
- 18131 X-Y System comprised of:
  - One, 16038 Encoder Mike™ Driven Horizontal Translator, described on page 19-16
  - One, 16618 Encoder Mike™ Driven Vertical Translator, described on page 19-20
  - 18113 Encoder Mike™ Control System
- 18132 X-Z System comprised of:
  - Two, 16038 Encoder Mike™ Driven Horizontal Translators, described on page 19-16
  - 18113 Encoder Mike™ Control System



Encoder Mike™ Driven Rotator commanded by 18113 Control System and Fast Start™ Software.

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MODES OF MOTION

The Encoder Mike™ Motion Control System gives you various modes of motion.

Independent Axis Positioning, Multi-tasking capability

In this mode each axis independently follows its own prescribed profile. The user can specify the absolute or relative position, and all motion parameters, such as acceleration and deceleration rate. The current position, speed and acceleration can be interrogated at any time. The controller is capable of running up to four independent programs, simultaneously.

Jogging

In this mode the motor(s) continues the motion at the prescribed speed until the controller receives the stop command. The speed can be interrogated at any time.

Linear Interpolation

This mode coordinates the motion for all axes in order to maintain the prescribed vector speed, acceleration and deceleration rate along the prescribed path of motion.

Contouring

This mode allows the user to prescribe any arbitrary position trajectory. This mode is useful when following complex multidimensional computer generated trajectories.

Homing

It is possible to home the motor(s) to an external mechanical reference, using an external encoded signal.

COMMAND SUMMARY

The Encoder Mike™ Motion Control System uses a large command set; below are just a few examples

Motion

AB	Abort
AC	Acceleration
BG	Begin Motion
DC	Deceleration

Program Flow

HX	Halt Execution
IN	Input Variable
MR	Reverse Motion to Position
XQ	Execute Program

General Configuration

QD	Download Array
RC	Record
RS	Reset
UL	Upload (program)

SPECIFICATIONS:

Minimum system requirements:	Windows™ 3.x, 95, NT PC; 486 CPU or higher; ISA BUS
Synchronization:	All axes in the same card are perfectly synchronized and share the same servo cycle. All cards sharing synchronization signal are perfectly synchronized in the same servo cycle.
Controller servo loop:	
18111:	375 µs
18113:	500 µs
Inputs/Outputs:	
General purpose inputs:*	4 optoisolated inputs
General purpose outputs:*	1 TTL output (for 18154)
General purpose analog inputs:*	2, ±10 V; 12 bit resolution (not available for 18111)
Programming:	500 lines x 40 characters 126 symbolic variables array storage 1600 elements (1000 elements for 18111)
Power requirements:	+5 V, 850 mA +12 V 40 mA, 100 mA max motor -12 V 40 mA, 100 mA max motor

*** Limit and home switches for all axes.**

ORDERING INFORMATION

18111	Single Axis Encoder Mike™ Control System
18113	Triple Axis Encoder Mike™ Control System
18130	X-Y-Z System
18131	X-Y System
18132	X-Z System
18154	I/O Option

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