LCM

EtherCAT Laser Control Module

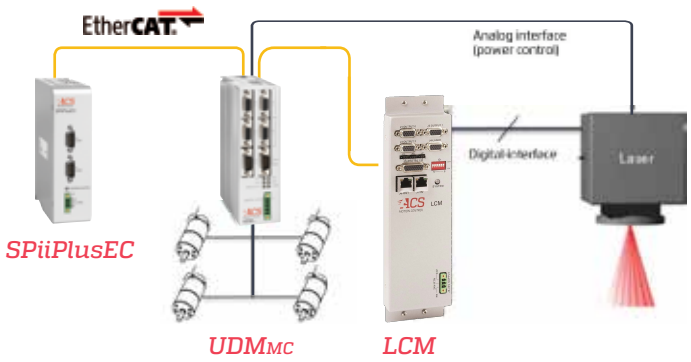
The LCM EtherCAT slave module provides all ACS Controllers and Control Modules the ability to control a laser source directly and to synchronize its activation and pulsing to motion and to achieve the highest quality laser micro-machining and optimal throughput. It interfaces with a variety of lasers such as DPSS, CO_2, excimer, fiber, Q-switched, picosecond, femtosecond, to name a few.
Programming the LCM is made simple by utilizing the dedicated high level function commands that are a part of the ACSPL+ motion programming language.

Laser Micro-machining Made Simple

- Dynamic laser power control by digital pulse modulation
- Pulse synchronization with XYZ motion path at random points as well as at programmble intervals
- Laser gating (on/off) synchronization with XYZ motion path at specific positions
- Flexible electrical interface: laser enable output safety interlock input, fault input for robust safety implementation, general purpose programmable I/O
- User defined operational zones
- Programmable laser delay compensation
- Ability to combine different laser operation modes to meet unique application requirements
- Ability to output virtual trajectory path (single-axis or multi-axis) as AqB or P/D signals (optional)
- Easy programming with high level operation commands

A Wide Range of Laser Control Modes to Address Many Machining Application

- Digital Modulation Mode (for power control)
  - › Fixed frequency
  - › Fixed pulse width
  - › Fixed duty cycle
- Tickle Mode
  - › Fixed frquency and pulse width
- Fixed Distance Pulse Firing Mode
- Random position, Array Based Pulse Firing Mode
- Array Based Gating Mode
- Axis Range Windowing Mode
- Hybrid modes combining many operation modes



All ACS Motion Controllers Support the Multi-dimentional Motion for Laser Micro-machining

- Rapid point to point positioning on a single or multi-axis using 3rd order interpolation
- Up to 5 axes coordinate motion path with G-Code or ACS native XSEG motion commands with advanced look-ahead and corner rounding algorithms
- Enhancing accuracy by dynamic error mapping compensation
- Supporting Cartesian and non-Cartesian coordinate systems

CE (Pending)

Contact us: sales@acsmotioncontrol.com | **www.acsmotioncontrol.com**

ACS MOTION CONTROL

Specifications

Control supply
Input voltage: 24Vdc ±10%.
Max. input power: <3 W.
Input current: <0.2A.

Laser Electrical Interface
Laser enable output: One, opto-isolated, two terminal.
Current: Min. 5mA, Max. 20mA. 5Vdc(±10%)/24Vdc(±20%), sink/source
Laser fault input: One, opto-isolated, two terminal.
Current: Min. 5mA, Max. 20mA. Configured as sink or source by interconnection with laser interface and external power supply 5Vdc (±10%) or 24Vdc (±20%)
Laser control signal output: One, differential, RS422
Laser safety input: One, single-ended, opto-isolated.
Current: Min. 3mA, Max 15mA. Automatic voltage detection

Time Based (Pulse Modulation) Modes
Fixed frequency and variable duty cycle
Fixed pulse width and variable frequency
Fixed duty cycle and variable frequency
Pulse Frequency Range: 0.035Hz - 1MHz
Duty Cycle: 0-100%:
Duty Cycle Update Rate: (CTIME of controller)
Pulse width min 6.67nS
Pulse width max 111ms.

Position Based Mode
Fixed Distance (Constant Spacing) Pulse Firing Mode
Pulse Frequency Range: 0 - 10MHz
Max Interval between Pulses: Unlimited
Pulse Width min: 26.6ns
Pulse Width max: 1.75ms
Pulse Width Resolution: 26.6ns
Optional Additional Time Based Pulses: Up to 2^16 with period range of 53.2ns to 1.75ms and 26.6ns resolution
Max Position Resolution: equal to encoder resolution

Tickle Mode
Pulse Frequency Range: 1.1kHz – 1 MHz
Pulse width min: 106ns
Pulse width max: 27.3ms

Array Based Pulse Firing Mode
Max size of Array (Pulse Positions): 256 points
Pulse Frequency Range: 0 - 10MHz
Pulse Width min: 26.6ns
Pulse Width max: 1.75ms
Pulse Width Resolution: 26.6ns
Optional Additional Time Based Pulses: Up to 2^16 with period range of 53.2ns to 1.75ms and 26.6ns resolution
Max Position Resolution: equal to encoder resolution

Array Based Gating Mode
Max Number of Array Points (On/Off Positions): 256
Max Gating Frequency: 10MHz
Max Position Resolution: equal to encoder resolution

Axis Range Windowing Mode
Up to three independent ranges
Window Min and Max Position Resolution: equal to encoder resolution

Laser Delay Compensation Feature
Within controller cycle with a resolution of 320nS

Digital I/O
Digital Inputs: Eight general purpose inputs. Single ended, opto-isolated, 5Vdc or 24Vdc, sink or source, automatic voltage detection.
Input current: <15mA each.
Digital Outputs: Eight general purpose outputs. Single ended, opto-isolated, 5Vdc or 24Vdc, sink or source (default).
Output current: <50mA each.

Communication:
Two EtherCAT ports, In and Out, RJ45 connector.

Environment:
Operating range: 0 to + 50°C.
Storage and transportation range: -25 to +60°C.
Humidity (operating range): 5% to 90% non-condensing.

Dimensions
HxWxD: 264 x 75 x 25 (mm³)
Weight
350g

Accessories
LCM-ACC1: Mating connectors kit.

Ordering options

Ordering Options	Field	Example User Selection	Values
Support for AqB and P/D output	1	N	Y - Yes, N - No
Future Option	2	N	Y - Yes, N - No
Future Option	3	N	Y - Yes, N - No
Future Option	4	N	Y - Yes, N - No
Future Option	5	N	Y - Yes, N - No
Future Option	6	N	Y - Yes, N - No

Example: LCM-NNNNNN

Field		1	2	3	4	5	6
PN	LCM	N	N	N	N	N	N

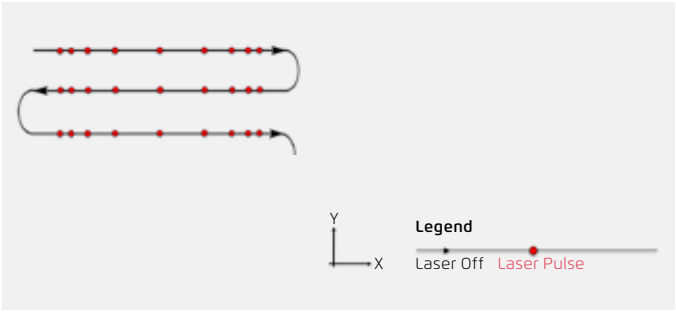
ACS MOTION CONTROL

Capabilities for Laser Processing Applications

It is simple to implement complex micro-machining jobs utilizing the ACSPL+ high level commands dedicated for the LCM operation and related motion.

Array Based Pulse Firing Mode

Pulsating the Laser at Pre-Defined Positions Along the Path



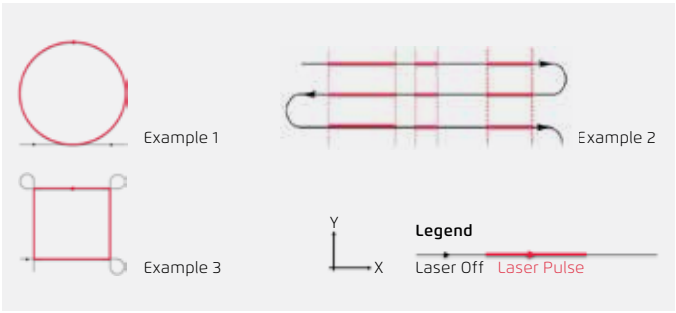
Sample Program

LCRandomDist(Index,XY,Width,0,10,Points)

* Index – LCM index
* XY – the pulses will be fired along 2D XY path
* Width – pulse width
* Points – array of the pulse locations, starting from the first pulse at Points[0] to the last pulse at Points[10]

Array Based Pulse Gating

Turning the Laser On/Off at Pre-Defined Positions Along the Path



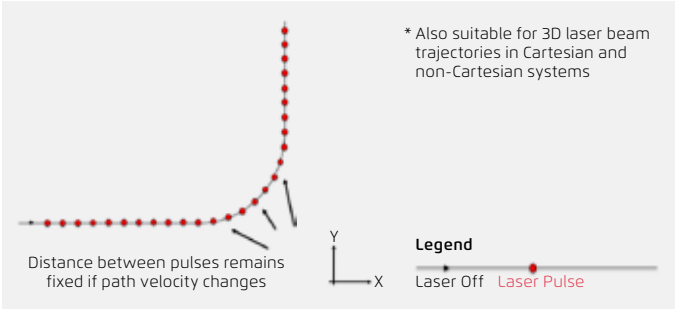
Sample Program

LCRandomDist(Index,XY,Width,0,10,Points,States)

* Index – LCM index
* XY – the pulses will be fired along 2D XY path
* Width – pulse width
* Points – array of the pulse state change locations, starting from the Points[0] to Points[10]
* States – array of signal state ('1' ON or '0' OFF), starting from the States[0] to States[10]

Fixed Distance Pulse Firing Mode

Triggering Laser Pulses at Precise Positions with Fixed Distance Interval



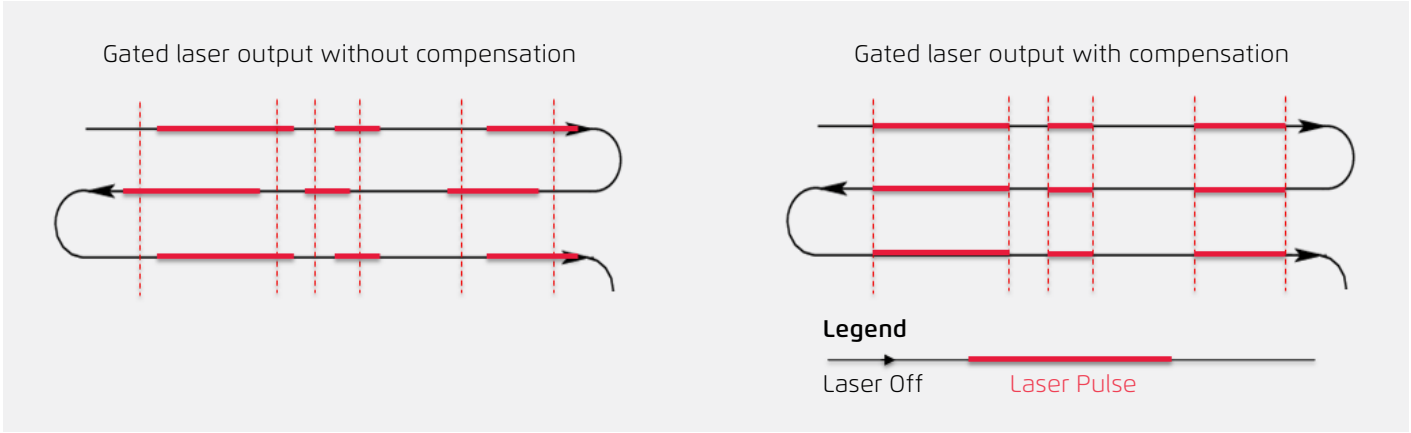
Sample Program

LCFixedDist(Index,XY,Width,Start,Interval,Stop)

* Index – LCM index
* XY – the pulses will be fired along 2D XY path
* Width – pulse width
* Start - first pulse location
* Interval – interval between pulses
* Stop – last pulse location

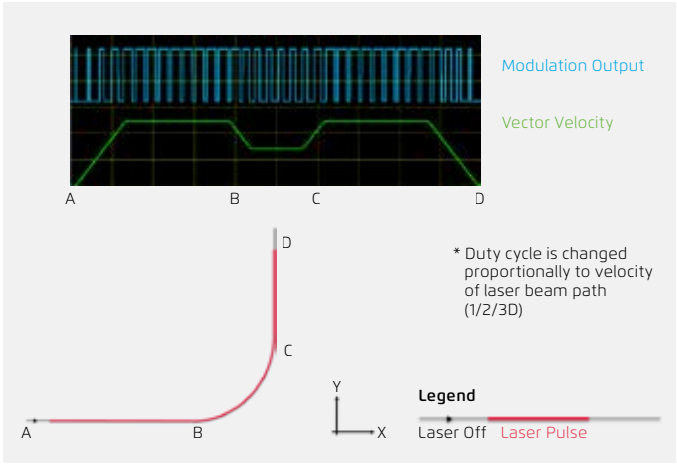
Laser Delay Compensation Feature

Compensating for Laser Time Shift (Delay, Advance) Relative to the Motion



Pulse Modulation Mode

PWM Modulation as a Function of Velocity



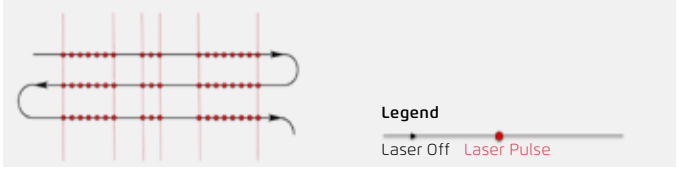
Sample Program

LCModulation(Index,Mode,Freq,Width,DC,XY)

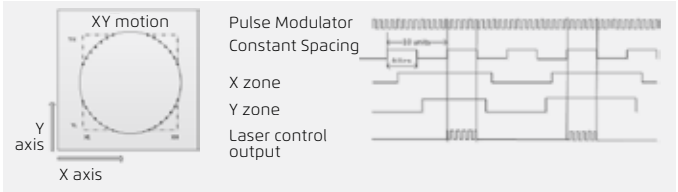
* Index – LCM index
* Mode – laser signal modulation with fixed frequency
* Freq – modulation frequency
* Width – pulse width (has no effect in this mode)
* DC - initial duty cycle. The duty cycle will be automatically updated according with motion vector velocity
* XY – vector velocity is calculated according with (X,Y) axes motion

Examples for Combined Mode

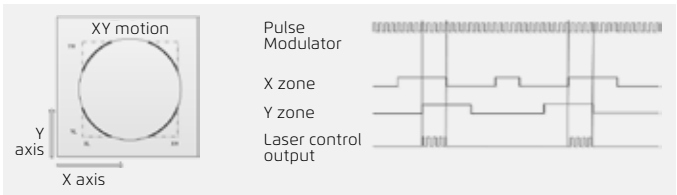
Firing at Fixed Interval Pulse within specific zones defined by Array Based Gating



Fixed Distance Pulse Firing, Digital Modulation & Axis Range Windowing



Axis Range Windowing & Digital Modulation



ACS MOTION CONTROL