DCLM DLL Userguide

Digitally Controlled Laser Module

Digital Control via USB for Laser Modules

Introduction

Thank you for your interest in the Global Laser Solutions DCLM unit.

The DCLM unit can directly communicate and be driven from a customer's application software. The driver which you will be using is a Beta release of the digital driver.

This commercial version, will be based upon incorporating the findings of tests from the select group of customers who are working with us to refine the offering, making it more relevant to customer requirements and operational needs.

In summary, the digitally controlled laser uses specialist electronics unique to Global Laser Solutions with an on-board PIC which contains copyrighted firmware developed by Global Laser Solutions. This laser based firmware enables our customers to communicate in real time via their own applications software to modify the way in which the laser is operating to better match our customer's real time operational requirements.

We very much look forward to working with you and to responding to your input which will bring through the digital driver as a commercial product much more relevant to your needs.

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Overview of Functions

DLL Function	Description
FindDCLM	Looks for attached DCLM devices on the USB ports.
ValidateDCLM	Verifies the DCLM is functioning correctly with no errors. Returns DCLM serial number.
SetDCLMLaserDiode	Turns the laser diode on or off.
SetDCLMOutputToCW	DCLM outputs a Continus Wave at a specified percentage of full power.
SetDCLMOutputToModulation	DCLM outputs a Modulation signal at a specified waveform and frequency.
SetDCLMOutputToTTL	DCLM outputs a TTL level at a specified frequency.
SetDCLMOutputPWM	DCLM outputs a Pulse Width Modulation signal at a specified Mark percentage.
SetDCLMPowerLevel	Changes the output power level.
SetDCLMFrequency	Changes the Modulation or TTL frequency.
SetDCLMDutyCycle	Changes the PWM Mark percentage.
SaveDCLMSettings	Stores the active Function as the Start Up Function.
ResetDCLM	Causes the DCLM to reset and detach itself from the USB port.
RestoreDCLMToFactorySettings	Resets the DCLM to the factory configuration. Useful if the configuration data has been corrupted.
GetDCLMStatus	Retrieves information about the DCLM current running status.
GetDCLMConfiguration	Retrieves information about the DCLM setup.
GetDCLMDLLError	Retrieves latest error information.
CloseDCLMDLL	Closes communication link with the DCLM and unloads the DLL.

At present only one DCLM can be accessed through these functions but it is intended at a future date to be able to access multiple DCLM's.

Supported Operating Systems

The dll can be used on the following operating systems on both 32 and 64 bit platforms:-

Windows XP

Vista

Windows 7

Windows 10

Windows 11

Installing the DCLM

The DCLM uses the Windows USB HID driver so does not require any special installation procedure.

Warning: If due to computer operation/settings the DCLM is not recognised by the operating system on connection to a USB port, the DCLM may turn on and run in its independent mode. This will mean the DCLM will emit laser radiation after a 10 second delay from being connected in accordance with the programmed start up settings, which is factory set at below 1mW CW.

Function Details

FindDCLM

Syntax

int32 FindDCLM(void)

Parameters

None.

Return

-1	Error
+1	Success

Description

This function must be called first to set up a communications link with the DCLM.

ValidateDCLM

Syntax

int32 ValidateDCLM(int32 *serialNumber)

Parameters

*serialNumber:

Holds the serial number of the DCLM.

Return

-1	Error
0	Pending Callback
+1	Success

Description

A call to ValidateDCLM is of a non blocking type. You will need to repeatedly call ValidateDCLM

SetDCLMLaserDiode

Syntax
int32 SetDLCMLaserDiode(byte mode)

Parameters
mode.

0	Turns the laser diode off.
1	Turns the laser diode on.

Return

-1	Error
+1	Success

Description
For safety reasons when the DCLM is connected to a USB port the laser diode will remain off (refer to safety notice) until a user command informs the DCLM to turn the diode on.

SetDCLMOutputToCW

Syntax
int32 SetDCLMOutputToCW(byte powerLevel)

Parameters
powerLevel:
A percentage of full power from 0 to 100.

Return

-1	Error
0	Function Unavailable
+1	Success

Description
Commands the DCLM to switch its output to Continuous Wave with the specified power level percentage.

SetDCLMOutputToModulation

Syntax
int32 SetDCLMOutputToModulation (byte waveform, int32 frequency)

Parameters
waveform:
A value of 0 = Sine wave, value of 1 = Triangle

frequency:
A value from 1 to the maximum -3dB specified frequency of the DCLM type.
Refer to the DCLM specification data.

Return

-1	Error
0	Function Unavailable
+1	Success

Description
Commands the DCLM to switch its output to modulation mode with the specified waveform and frequency.

SetDCLMOutputToTTL

Syntax
int32 SetDCLMOututToTTL (int32 frequency)

Parameters
frequency:
A value from 1 to the maximum specified frequency of the DCLM type
Refer to the DCLM specification data.

Return

-1	Error
0	Function Unavailable
+1	Success

Description
Commands the DCLM to switch its output to TTL mode with the specified frequency.

SetDCLMOutputPWM

Syntax
int32 SetDCLMOutputPWM (byte percentage)

Parameters
markPercentage:
A value from 0 to 100.

Return

-1	Error
0	Function Unavailable
+1	Success

Description
Commands the DCLM to switch its output to Pulse Width Modulation with the specified Mark ratio percentage.

SetDCLMPowerLevel

Syntax
int32 SetDCLMPowerLevel(byte powerLevel)

Parameters
percentage:
A percentage of full power from 0 to 100.

Return

-1	Error
0	Function Unavailable
+1	Success

Description
Sets the output power level of the laser diode.
The DCLM output must be configured as CW before this function can be used.

SetDCLMFrequency

Syntax
int32 SetDCLMFrequency(int32 frequency)

Parameters
frequency:
A value from 1 to the maximum specified frequency of the DCLM type.
Refer to the DCLM specification data.

Return

-1	Error
0	Function Unavailable
+1	Success

Description
Changes the frequency of the running modulation or TTL mode from the specified frequency parameter. The DCLM output must be configured as Modulation or TTL before this function can be used.

SetDCLMDutyCycle

Syntax
int32 SetDCLMDutyCycle(byte percentage)

Parameters
markPercentage:
A value from 0 to 100.

Return

-1	Error
0	Function Unavailable
+1	Success

Description
Changes the Mark ratio percentage of the running PWM Function.
The DCLM output must be configured as PWM before this function can be used.

SaveDCLMSettings

Syntax
int32 SaveSettings (void)

Parameters
None.

Return

-1	Error
+1	Success

Description
When the DCLM is connected to the USB port the output is determined by what is stored in the DCLM Start Up section of the onboard memory.
The DCLM can be programmed to start up in any valid Function by setting the DCLM to output the desired Function and then calling SaveDCLMSettings().
The next time power is applied to the DCLM it will output the new saved Function.

ResetDCLM

Syntax
int32 ResetDCLM (void)

Parameters
None.

Return

-1	Error
+1	Success

Description
This function will perform a firmware re-set which will be seen by the operating system as a de-tach/attach on the USB port. This function will also close the communication path to the DCLM which means that if you require to re-communicate with the DCLM you will have to call the Find-DCLM and ValidateDCLM Fucntion to set up a new communication link.

RestoreDCLMToFactorySettings

Syntax
int32 RestoreDCLMToFactorySettings (void)

Parameters
None.

Return

-1	Error
+1	Success

Description
This function will restore the DCLM to the same state as it was when shipped.
The Start Up section is also over written.
After the restore has been completed the DCLM will carry out a reset, refer to the ResetDCLM Function for a description on the effect this has on the DCLM operation.

GetDCLMStatus

Syntax
int32 GetDCLMStatus(int32 *statusData, int32 statusDataSize)

Parameters
*statusData
This is an array of thirty elements of type int32.

statusDataSize
Size of the statusData array.

The following table describes the data returned in statusData.

Element	Element Description	Data	Data Description
0	Call back status	0	Error
		1	Normal running
		2	Diode control complete
		3	Change output mode complete
		4	Change power level complete
		5	Change frequency complete
		6	Change duty cycle complete
		7	Save settings complete
		X	Any other value is for Factory use only
1	Active modulation waveform	0	SINE
		1	RAMP
2	Diode status	0	Off
		1	On
3	Time in seconds	X	Total time the laser diode has been on since leaving the factory.
4	Time in minutes	X	
5	Time in hours	X	
6	Time elapsed minutes	X	From the last time the laser diode was turned on.
7	Time elapsed hours	X	
8-29	Reserved	-	None
X = Any int32 value			

Return

-1	Error
0	Pending data return
+1	Success

GetDCLMConfiguration

Syntax
int32 GetDCLMConfiguration(int32 *configBuf, int32 configBufSize)

Parameters
*configBuf:
This is an array of thirty elements of type int32.

configBufSize
Size of the configBuf array.

The following table describes the data returned in configBuf.

Element	Element Description	Data	Data Description
0	Build Configuration	1	Client
		X	Any other value is for factory use only
1	Boot Mode	0	PC only. Can only be run using Software.
		1	PC and Independent. Can run as either a stand alone unit or from software.
		2	Reserved.
		3	Independent - Can run from a power supply unit other than a PC.
2	CW Mode	0	Function Disabled
		1	Function Enabled
3	Modulation Mode	0	Function Disabled
		1	Function Enabled
4	TTL Mode	0	Function Disabled
		1	Function Enabled
5	PWM Mode	0	Function Disabled
		1	Function Enabled
6	Firmware version	X	Major
7	Firmware version	X	Minor
8	Firmware Version	X	Revision
9	Maximum sine wave frequency	X	Frequency at the -3dB point
10	Maximum ramp frequency	X	Frequency at the -3dB point
11	Maximum TTL frequency	X	Frequency at the -3dB point

Element	Element Description	Data	Data Description
12	Start up function	0	CW
		1	Modulation
		2	TTL
		3	PWM
13	Modulation waveform	0	SINE
		1	RAMP
14	Sine wave frequency	X	The frequency that the DCLM will output if modulation is set to SINE wave
15	Ramp wave frequency	X	The frequency that the DCLM will output if modulation is set to RAMP wave
16	TTL frequency	X	The frequency that the DCLM will output if TTL mode is selected
17	CW power level	X	As a percentage of full power
18	PWM duty cycle	X	As a percentage of Mark Ratio
19-29	Reserved	-	None
X = Any int32 value			

Return

-1	Error
0	DCLM not set up
+1	Success

GetDCLMDLLError

Syntax
void GetDCLMDLLError (int32 *errorType, int32 * errorCode)

Parameters
*errorType

The following table displays the error types returned from the DLL.

No	Type	Description
0	No Error	None
1	DCLM System	This is due to a start up error.
2	DCLM Run	Errors generated at run time.
3	DCLM Monitor	These are on board monitoring errors
4	Communications	Errors relating to the USB communication.
5	DCLM Data	Data errors returned from the DCLM.
6	Program	Internal dll errors.
7	Operational	Invalid data errors received by the dll

*errorCode

Code	Description	Possible Solution
0	No Error	None
1-9	The DCLM failed to process the Command	Resend the command or reset the DCLM (refer to the ResetDCLM function to understand its effect on the communications link).
10-14	Factory Control Errors	If you receive any of these codes please contact Global Laser.
15	The DCLM did not recognise the Command	Make sure the command is valid and resend.
16-23	The DCLM has had an internal error	The DCLM will be in a disabled state so it will need to be reset (refer to the ResetDCLM function to understand its effect on the communications link)
24-255	Not Used	
256-260	There has been a communications problem	If the DCLM is still connected, re-connect it to the usb port and call the FindDCLM and ValidateDCLM functions to re-establish communications.
261-266	A problem was found with the data returned from the DCLM	The DCLM will be in a disabled state so it will need to be reset. (refer to the ResetDCLM function to understand its effect on the communications link)
267	DLL failed to allocate sufficient memory.	Close the dll with a call to CloseDCLMDLL() and check you have sufficient memory available to run the software.

Code	Description	Possible Solution
268-269	Internal DLL error	Please contact global laser with the error code. The DCLM will have been closed and you will need to make a call to the FindDCLM and ValidateDCLM functions to re-establish communications.
270	A communications link with the DCLM has not been established before sending a command	Set up a communications link by calling the FindDCLM and ValidateDCLM functions.
271	The DCLM has not yet been validated	Make a call to ValidateDCLM function
272	A control command was sent to a disabled dll function	Either a communications link has not yet been established with the DCLM, if so then set up a communications link by calling the FindDCLM and ValidateDCLM functions. Or the validation had failed in which case you can reset the DCLM. (if you send a reset command then refer to the ResetDCLM function to understand its effect on the communications link).
273	The DCLM has been configured as an independent laser.	The DCLM can not be controlled from the dll, you will need to purchase a non independent version. If you believe the DCLM to be a non independent type then contact Global Laser.
274-275	Data sent to the dll function is not valid.	Make sure you are using the function correctly.

Return
None

Description
The function stores the latest error type and error code in the passed parameters. After a call to this function the error type and error code are reset to No Error.

CloseDCLMDLL

Syntax
void CloseDCLMDLL (void)

Parameters
None.

Return
None

Description
This function needs to be called once you have finished using the dll

Using the DLL

To use the DCLM with the dll you will need to call the following functions in order:

FindDCLM()
ValidateDCLM()

DCLM is now ready to be controlled.

Once finished with the dll, call CloseDCLMDLL.

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Please Note: Global Laser reserve the right to change descriptions and specifications without notice.

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