WDI™
WISE DEVICE INC

CTR-ML Controller Datasheet

2026

CTR-ML Description

The CTR-ML is a device intended to be used to control a stepper motor based motion device such as WDI's OOA or ZAA-STD in an standalone application.

The controller can drive a two-phase stepper motor to quickly and accurately move the motion device as instructed, while providing connection for two configurable limit switch inputs. The controller is also able to control either up to two 1.5 A LED illuminators, or one 3 A LED illuminator (purchased separately).

The CTR-ML is connected to a windows-based PC via a standard USB-C cable or an RS485 connection and controlled via WDI's Motion and Light console and SDK.

NOTE: *If the Z-stage is to be used with a PFA-DT or PFA-LN sensor for autofocus, please use the CTR-AFML controller.*

Ordering Info

Table 1 CTR-ML Types

Type	Part Number
Controller (CTR-ML)	976860

Product Specifications

Table 2 CTR-ML Specifications

Description	Value
Weight (kg)	0.285
Dimensions	See *"Mechanical Dimensions" on page 8*

Electrical Connections

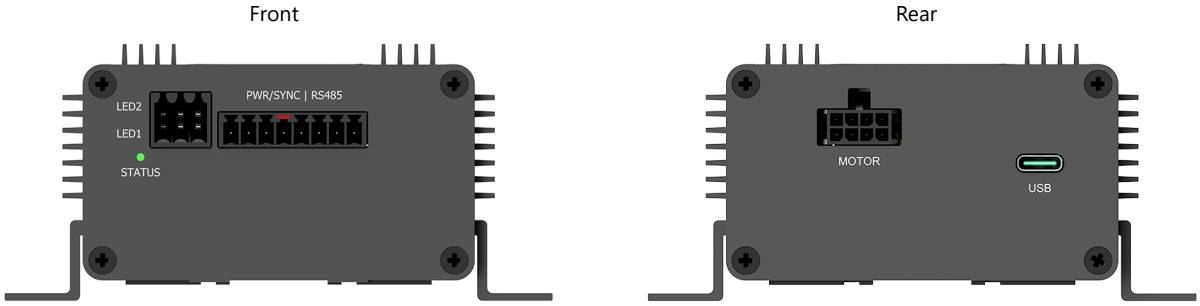

Figure 1 *CTR-ML Connectors*

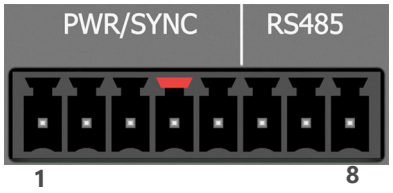

Figure 2 *Power/Sync and RS485 connector*

Table 3 Power/Sync and RS485 Connector Pin Assignments

Pin	Signal	Description
Power/Sync Connector		
1	+24V	+24V Power Supply.
2	GND	Power Supply Return.
3	ESTOP	Emergency Stop (Laser Enable), normally wired to supply voltage through a mushroom button. Actively drive high to enable the PFA-DT/LN laser diode.
4	DI	Digital input.
5	DO	Digital output.
RS485 Connector		
6	GND	IO Return.
7	RS485-	Inverting RS485 Receiver Input and Driver Output.
8	RS485+	Non Inverting RS485 Receiver Input and Driver Output.

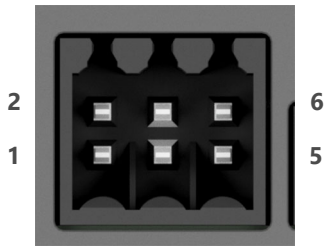

Figure 3 *LED Driver Connector*

Table 4 LED Driver Connector Pin Assignments

Pin	Signal	Description
1	LED1 Anode	LED1 Anode current output
2	LED2 Anode	LED2 Anode current output
3	NC	Not Connected, do not connect
4	NC	Not Connected, do not connect
5	LED1 Cathode	LED1 Cathode (return)
6	LED2 Cathode	LED2 Cathode (return)

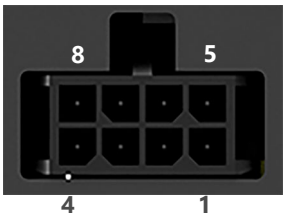

Figure 4 *Motor Drive Connector*

Table 5 Motor drive connector pin assignments

Pin	Signal	Function
1	5V	5V output for limit switches
2	CWLIM	CW limit switch
3	GND	5V return ground
4	CCWLIM	CCW limit switch
5	A+	Motor coil A+
6	A-	Motor coil A-
7	B+	Motor coil B+
8	B-	Motor coil B-

Connector specifications

Table 6 Power/Sync and RS485 connector[a]

Item	Qty	Description	Manufacturer	Manufacturer Part #	Note
1	1	CONN,TH,5 POS,TERM BLOCK,3.5MM,PLUG	TE Connectivity	2213936-5	Keyed by WDI
2	1	CONN,TH,3 POS,TERM BLOCK,3.5MM,PLUG	TE Connectivity	2213936-3	

a. *This connector is provided by WDI.*

Table 7 Motor connector[a]

Item	Qty	Description	Manufacturer	Manufacturer Part #
1	1	connector, 8pos, 2x4, 3mm, vert	Molex	43025-0800
3	8	crimp pin, 63645 series, 20-24AWG, 30u gold	Molex	43030-0009

a. *This connector is not provided by WDI, not required if motion device is purchased from WDI.*

Table 8 LED illuminator connector[a]

Item	Qty	Description	Manufacturer	Manufacturer Part #
1	1	CONN,6 POS,3.5MM,2 ROWS,SPRING CAGE,PLUG	Weidmuller	1277470000
2	6	FERRULE,#20-24AWG,INSULATED,ORG, 10mm	American Electrical Inc.	11102050

a. *This connector is not provided by WDI, not required if illuminator is purchased from WDI.*

Table 9 Included Connector Kit

Item	Description	Manufacturer	Manufacturer Part #	Note
Power/Sync and RS485 Connector	A five position plug for Power/Sync.	TE Connectivity	2213936-5	Keyed by WDI
	A three position plug for RS-485.	TE Connectivity	2213936-3	
	Eight ferrules.	American Electrical Inc.	1181050	

Electrical Specifications

Table 10 Electrical characteristics

Parameter	Minimum	Typical	Maximum	Units	Conditions
Power supply					
Supply voltage	22	24	26	VDC	
Supply power	2.4		40	W	See *Table 11 "WDI LED Output Specifications"*
DI					
Input voltage low (VIL)	-0.5	0	1.5	V	
Input voltage high (VIH)	3.5	5	5.5	V	
Input Resistance		7.5		KΩ	
DO					
Output type	Open Drain with 1KΩ pull up to 5V				
Output voltage low (VOL)		5		V	High impedance load
Output voltage high (VOH)	0		0.4	V	
Output impedance		5		KΩ	
Drain current			100	mA	
RS485					
Differential driver output voltage	2	3.3	V		
Receiver differential threshold voltage	50	105	200	mV	
Differential termination resistor		120		Ω	
Data rate		115200		bps	

Table 11 WDI LED Output Specifications

Parameter	Condition	Min	Typical	Max	Units
Dual Channel LED Driver, Each Channel					
LED Forward Voltage	Vsupp=24V	1.6		22	V
Output Current		0.05		1.5	A
LED Output Power Each Channel				15	W
Output Current Ripple			15	25	mA
Pulse Width		5[a]			µs
Analog Dimming Range			30:1		
PWM Dimming Range			1000:1[a]		
PWM Frequency		1		100000	Hz
Pulse Edge Position Accuracy			1		µs

a. Minimum pulse width can restrict minimum duty cycle, and dimming range, in PWM mode.

Table 12 Motor Driver Electrical Specifications

Parameter	Minimum	Typical	Maximum	Units	Conditions
Stepper Motor Driver MCOIL A+/A- B+/B-					
Motor Output Current			1.2	A RMS	
Peak Motor Output Current			2	A	
Output Voltage			24	V	
Micro Stepping	1		256	µstep	
Limit Switch Power Output					
Supply Voltage		5		VDC	
Supply Current			20	mA	
Limit Switch Inputs CWLIM, CCWLIM					
Input Voltage High (VIH)	2		5.5	V	
Input Voltage Low (VIL)	-0.5		0.7	V	
Input Resistance		5		KΩ	

Environmental Specifications

Table 13 CTR-ML Environmental Specifications

Description	Value
Operating Ambient Temperature	20ºC to 30ºC
Transport Temperature (sealed container)	-20ºC to 50ºC
Storage Temperature	10ºC to 40ºC
Relative Humidity	10% to 80% non-condensing

Mechanical Dimensions

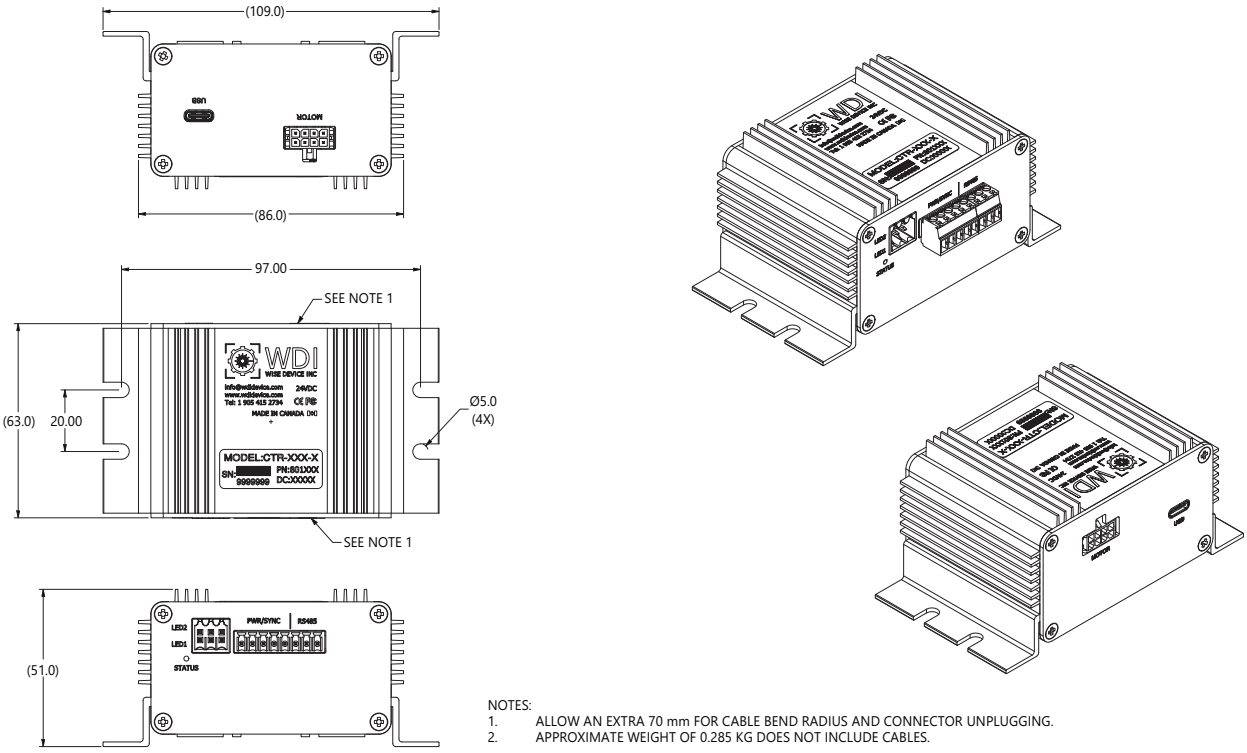

Figure 5 *CTR-ML Dimensions*

Available Accessories

Table 14 CTR-ML Accessories

KIT Accessories[a]	Part Number	Remarks
Cable (CAB-USB-RS485), 5m	801464	Cable, USB type A to RS485, wire end, 5000 mm length.
Cable (CAB-USB-RS485), 1.8m	801464-1	Cable, USB type A to RS485, wire end, 1800 mm length.

a. *This controller comes with two communication methods, USB-C and RS485 (see Figure 1). These accessories are available for use with the RS485 connection (see Figure 2). If using the USB-C connection, the controller converts to RS485 internally.*