WDI
WISE DEVICE INC

RDF Illuminator Datasheet

2025

RDF Illuminator Description

The Reflective Dark Field (RDF) Illuminator is a medium power LED illuminator designed for modern inspection and review applications. It is designed to minimize the amount of light hitting a sample outside the FOV of the objective lenses and also to acquire RDF images with the lowest possible background. The illuminator should be used in conjunction with Mitutoyo BD Plan Apo objective lenses. For multiple lens systems, the illuminator is compatible with the iLLC-3MBD using an adapter plate (see *Table 9*) which supports up to three objecitives. For single lens applications, an accessory kit is required (see *Table 9*).

The RDF Illuminator is controlled by the WDI HPLED COB controller, which provides the unit with power and also controls the LED's intensity, timing, and mode of operation (i.e., Continuous, Pulse Width Modulation, Pulse Follow and Pulse Trigger modes). The controller includes a PFABUS connector kit for user-configurable wiring for connecting the controller to the system. Alternatively, refer to cable options under *"Accessories" on page 7*.

Ordering Info

Table 1 RDF Illuminator Types

Type	Part Number
Illuminator (ILL-BD)	801141

Table 2 Controller Types

Type	Part Number
Controller (CTR-PBI-COB)	976840
Controller (CTR-PBS-COB)	976830

Product Specifications

Table 3 RDF Illuminator Specifications

Parameter	Value
Objective Compatibility	Mitutoyo BD Plan APO
Compliance	Clean Room Class 1000 (ISO6)

Electrical Specifications

Table 4 RDF Illuminator Electrical Specifications

Parameter	Condition	Minimum	Typical	Maximum	Units
Input Voltage				48	V
Input Current		0.030		0.250	A
Output Power				12	W
Minimum Pulse Width	Minimum pulse width is defined as time between rising and falling edges crossing 50% of the peak level with 30cm cable.		10		µs
Trigger to Optical Pulse Latency			550		ns

Table 5 COB Controller Electrical Specifications

Parameter	Condition	Minimum	Typical	Maximum	Units
Input Voltage		21.6	24	26.4	V
Input Current				1.5	A
Voltage				48	V
Output Ripple	Photodiode signal measured on scope in AC. Controller in continuous mode at 5A.			3.5	%
Duty Cycle	0.1% increment. Pulse width condition applies.	0.5		100	%
PWM Mode Frequency		1.526		100000	Hz
Analog Dimming	0.1% increment. Pulse width condition applies.	10		100	%
Optical Output Rise Time	30cm cable		2.5		µs
Optical Output Fall Time	30cm cable		0.4		µs
Minimum Pulse Width	Minimum pulse width is defined as time between rising and falling edges crossing 50% of the peak level with 30cm cable.		10		µs
Minimum Pulse Width with Current Dimming Functionality	Below this value, the current dimming is not guaranteed to be linear over the full range. Tested with 30cm cable		15		µs
Trigger To Optical Pulse Latency	Time measured between the rising edge of the external trigger signal on DIO and rising edge of the optical. 30cm cable pulse read on the oscilloscope with a photodiode.		550		ns
RS485, DIO5					
Differential Driver Output Voltage		2.0		3.3	V
Receiver Differential Threshold Voltage		10	105	200	mV

Table 5 COB Controller Electrical Specifications (continued)

Parameter	Condition	Minimum	Typical	Maximum	Units
Differential Termination Resistor	Turned on under software control. Not applicable for DIO5		120		Ω
RS485 Baudrate	Not applicable for DIO5		115,200		bps
Digital Inputs (IO1,IO2,IO3,IO4)					
Input Voltage High (VIH)	All IOs except IO4	2		5.5	V
Input Voltage Low (VIL)	All IOs except IO4	-0.5		0.7	V
Input Voltage High (VIH)	IO4	2.8		28	V
Input Voltage Low (VIL)	IO4	-0.5		1	V
Input Resistance			5		KΩ
Output Voltage High (VOH)		4.5	5		V
Output Voltage Low (VOL)		0		0.4	V
Output Impedance	All IO except IO4 which is 6KΩ		40.2		Ω

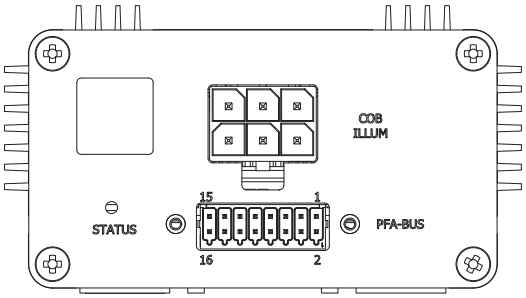


Figure 1 *COB Controller PFABUS Connector*

Table 6 COB Controller PFABUS Connector Pin Outs

Pin #	Signal Name	Description
1,2	+24V	+24V Power Supply.
3,4	GND	Power Supply Return
5	Reserved	Reserved
6	Reserved	Reserved
7	IO1	Digital Input/Output 1
8	GND	IOs Return
9	IO3	Digital Input/Output 3
10	IO2	Digital Input/Output 2
11	RS485-	Inverting RS485 Receiver Input and Driver Output
12	RS485+	Non Inverting RS485 Receiver Input and Driver Output
13	GND	IOs Return
14	IO4	Enable IN (optional – not used with factory settings)
15	IO5-	Inverting Differential IO5 Receiver Input and Driver Output
16	IO5+	Non Inverting Differential IO5 Receiver Input and Driver Output

Optical Specifications

Table 7 Luminous Flux Parameters

Parameter	Value
Radiometric flux on output	120 mW (250 mA)
Color temperature	5000 K
Typical spectrum	See *Figure 2*
Optical Output Rise Time	1.0 µs – 30cm cable (Duty cycle >10%)
Optical Output Fall Time	1.0 µs – 30cm cable (Duty cycle >10%)

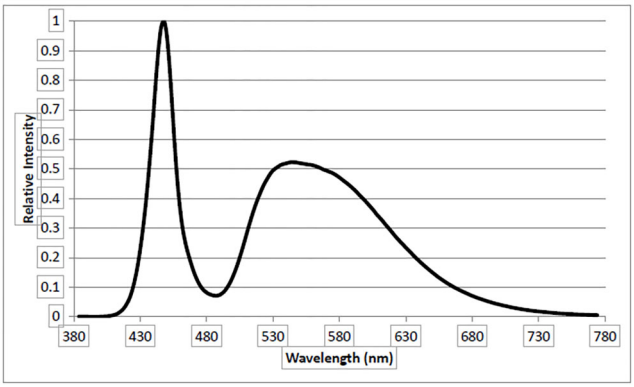


Figure 2 *Typical spectrum*

Environmental Specifications

Table 8 RDF Illuminator Environmental Specifications

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

Mechanical Dimensions

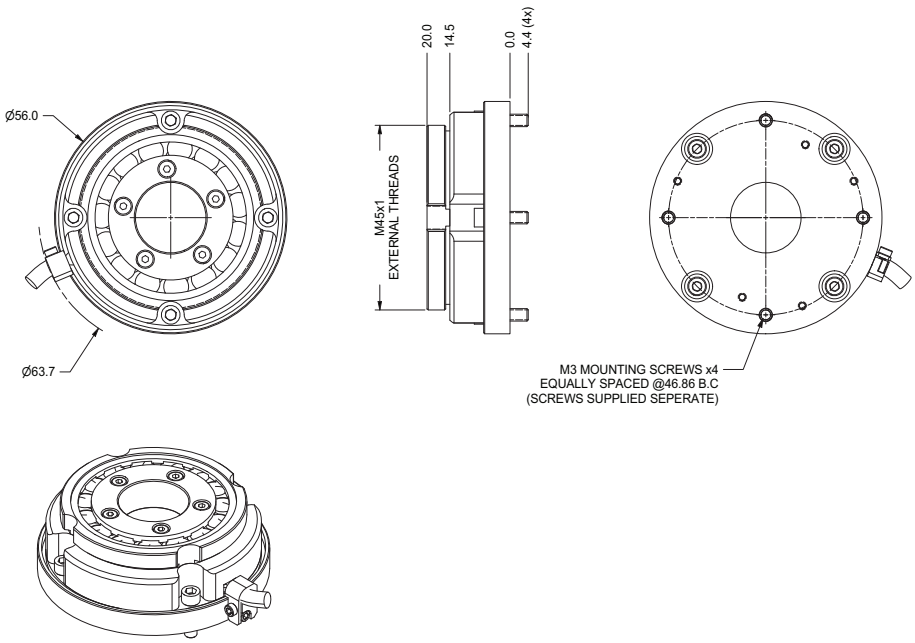


Figure 3 *RDF Illuminator – Unit Dimensions*

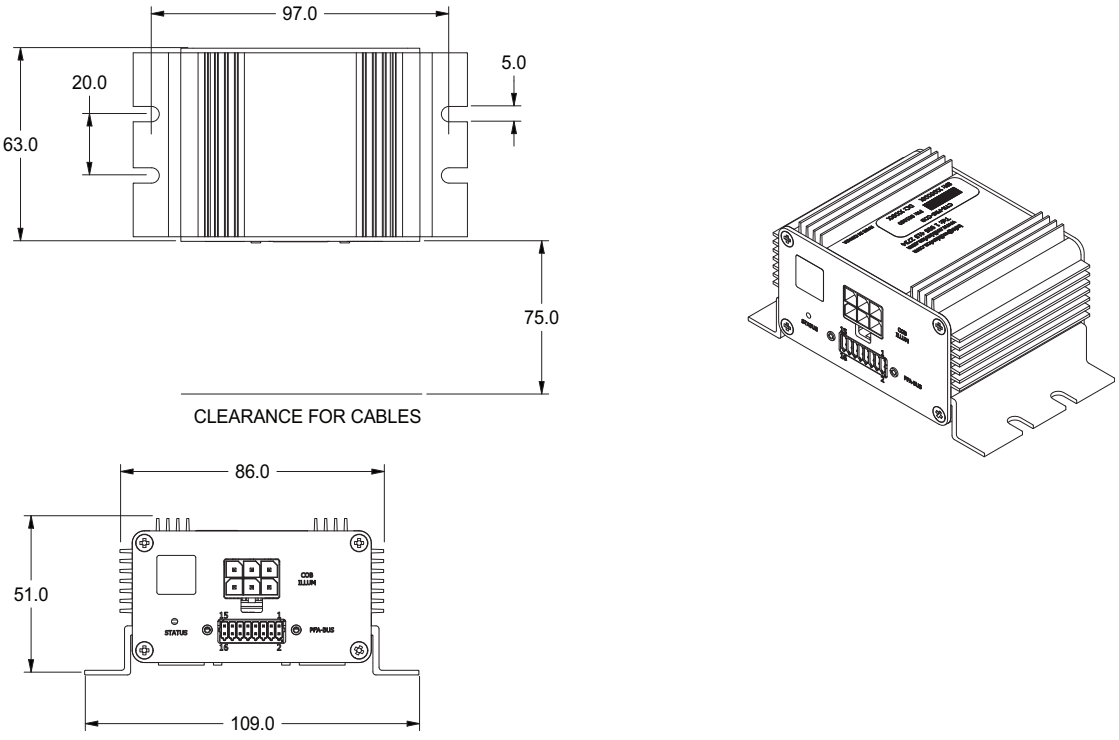


Figure 4 *PFABUS COB Controller Dimensions – PBS Mounting*

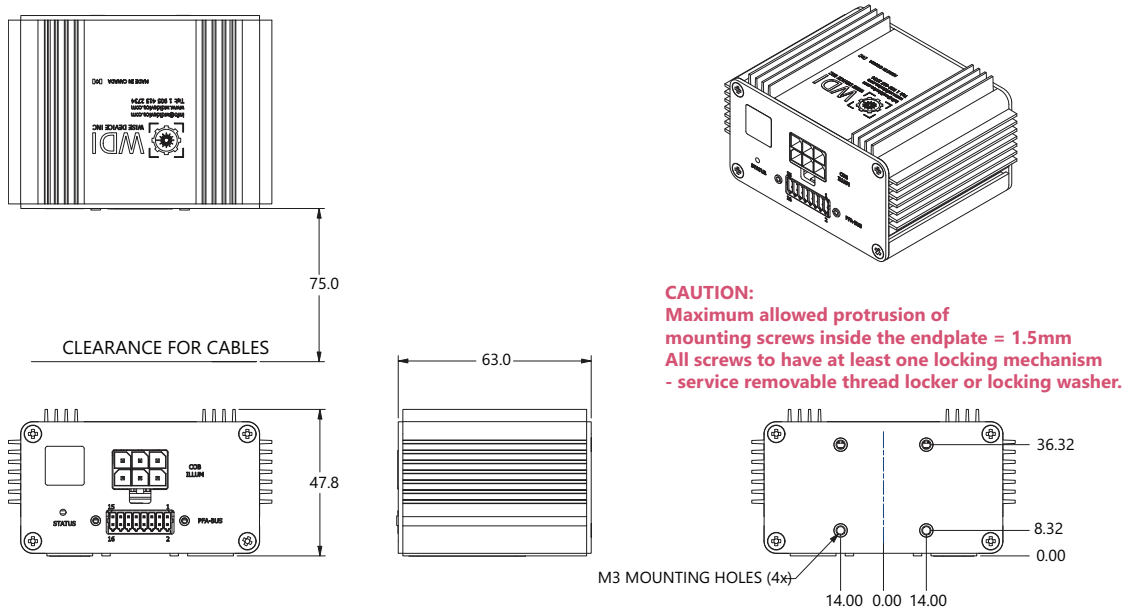


Figure 5 *PFABUS COB Controller Dimensions – PBI Mounting*

Accessories

Table 9 RDF Illuminator Accessories

KIT Accessories	Part Number	Remarks
ADAPTER PLATE ASSY, iZAA TO iLLC-3MBD	601876	This adapter is used to mount the illuminator on a iLLC-3MBD LLC (see *Figure 6*).
ILL-BD Single Lens Accs (Adapter M45 to M40 & HS)	601456	This adapter is needed for single BD lens applications (see *Figure 7* and *Figure 8*).
Cable (CAB-PFABUS-PWR/USB TO RS485),1800mm	801483	This is flying leads terminated (see *Figure 9*).
Cable (CAB-PFABUS-PWR/USB TO RS485),DIN4,1800mm	801304	This is DIN4 terminated (see *Figure 10*).

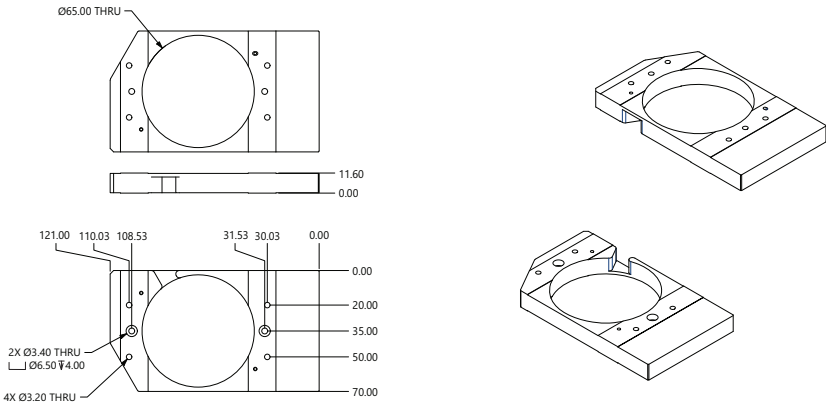


Figure 6 *Adapter Plate, iZAA to iLLC-3MBD*

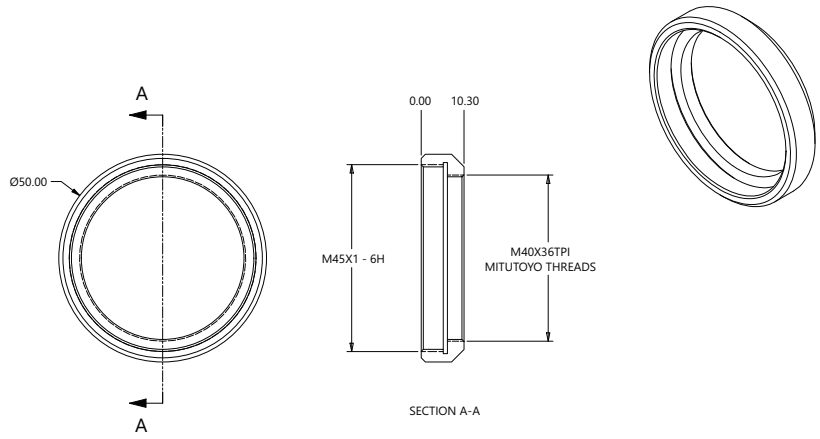
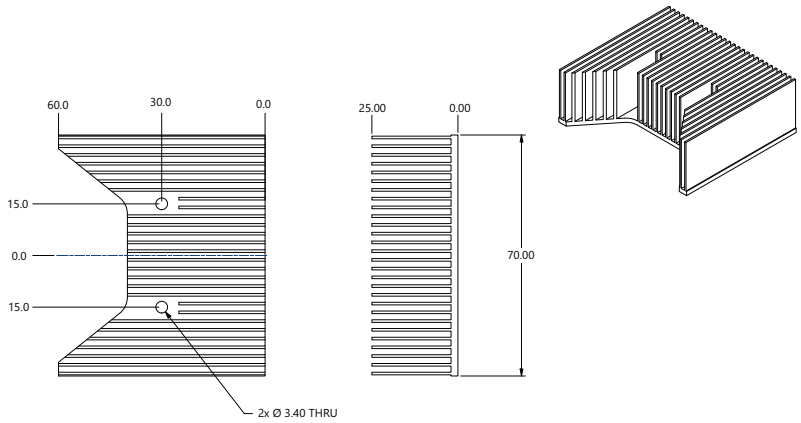
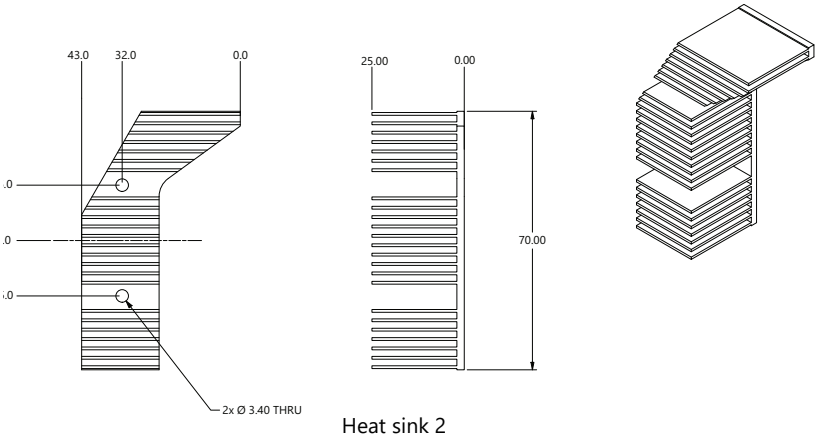


Figure 7 *ILL-BD Single Lens Adapter Plate*

NOTE: *This adapter is used only in single objective microscope system installations.*



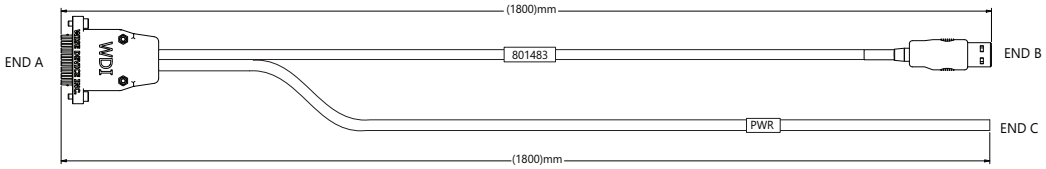
Heat sink 1



Heat sink 2

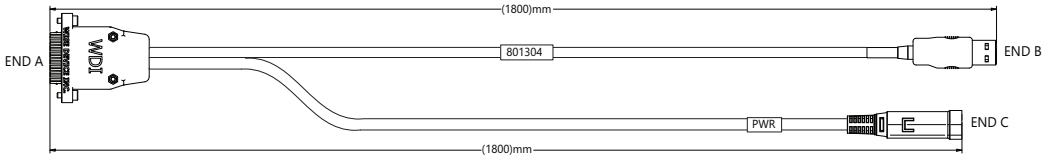
Figure 8 *ILL-BD Single Lens Heat Sinks*

NOTE: *These heat sinks are used only in single objective microscope system installations.*

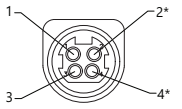


Pin# at end A	Signal	Wire color at end C
1	24V	Red
3	Ground	Black
14	E-Stop	White

Figure 9 *CAB-PFABUS-PWR/USB TO RS485 Cable Wiring*



Pin# at end A	Signal	Pin# at end C	Wire color at end C
1	24V	1	Red
3	Ground	3	Black
14	E-Stop	1	White



DIN4 front view
*Pins 2 and 4 not connected

Figure 10 *CAB-PFABUS-PWR/USB TO RS485 DIN4 Cable Wiring*