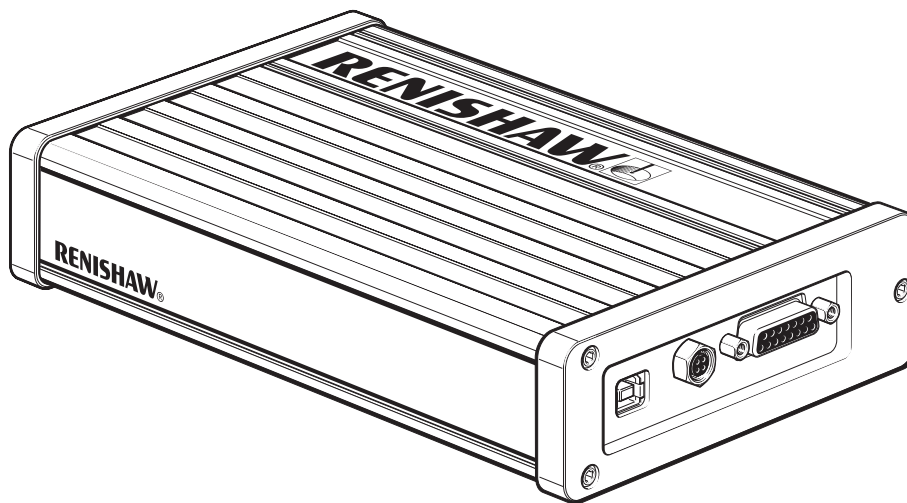


RSU10 USB interface



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Warranty

Renishaw plc warrants its equipment provided that it is installed exactly as defined in associated Renishaw documentation.

Safety

The RSU10 should not be used as part of any feedback system or in any safety critical applications.

The RSU10 has been designed for use with an RLE laser encoder only. Its use is not supported with other encoder systems.

FCC notice

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference and (2) this device must accept any interference received, including interference that may cause undesired operation.

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

The user is cautioned that any changes or modifications not expressly approved by Renishaw plc or authorised representative could void the user's authority to operate the equipment.

EC compliance



Renishaw plc declares that the RSU10 USB interface complies with the applicable directives, standards and regulations. A copy of the full EC Declaration of Conformity is available at the following address:

www.renishaw.com/RLECE

WEEE



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1 System overview

The RSU10 converts 1 Vpp analogue quadrature signals from an RLE laser interferometer encoder system into a position reading, which is available through a USB interface. A typical system set-up, showing a single axis RLE with an RSU10 is shown in Figure 1. The RSU10 is powered over the USB bus.

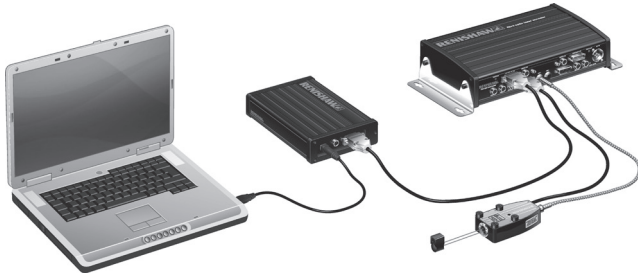


Figure 1 - Typical RSU10 set-up

Part numbers

The following saleable part number is available:

- RSU10-XX-XX RSU10 USB interface kit

2 Installation

The RSU10 has three connector ports as shown in Figure 2 below.

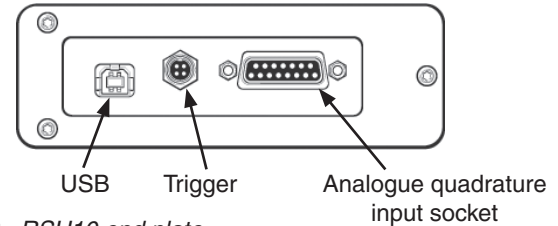


Figure 2 - RSU10 end plate

2.1 Software

The RSU10 USB interface is compatible with the established calibration software suite: LaserXL™ (part number A-9908-0301) and QuickViewXL™ (part number A-9908-0302).

A 30-day-trial version of QuickViewXL™ software is available, which is intended to give users sufficient time to familiarise themselves with system operation and to determine the benefits it offers.

The RSU10 kit includes a software development kit (Laser USB SDK) which provides the capability for user development of application specific software.

Note: Laser USB SDK does not support dynamic data capture (max update rate = 20 Hz).

Do not unplug the RSU10 USB connection during operation as this may cause open software applications to freeze. Should this occur, follow the on-screen instructions to safely close the application, and then re-start.

LaserXL™ and QuickViewXL™ software packages provide a visual indication of signal strength. Within these applications the Beam low and Beam blocked conditions occur at different signal strengths than those seen when operating an RLE system without an RSU10: see Table 1 below for details.

Table 1 - Signal strength

Condition	Signal strength
Beam low	40%
Beam blocked	15%

2.2 Cabling

All necessary cabling is supplied within the RSU10 kit, however the specification of any replacement cables required for this application is very important. For RLU to RSU connection we recommend a cable with an overall foil and braid screen and twisted pairs. An example of a suitable cable is the Belden 8104 cable. The maximum recommended cable length is 3 m.

Any replacement USB cable should be sourced from a reputable supplier and should not exceed 3 m in length.

2.3 Analogue quadrature interface

The RSU10 accepts the nominal 1 Vpp analogue quadrature from the RLE. Signal termination is contained within the RSU10 itself. There is no need for any other termination to be used. (Signal strength will be adversely affected if external termination is used.)

Table 2 - Signal wiring between RLE and RSU10

Signal	Function
1 st pair	Sine and /Sine
2 nd pair	Cosine and /Cosine
3 rd pair	Error and /Error
Outer screen	Case/shell (both ends)



WARNING: It is essential that the error line inputs are connected so that the RSU10 can determine if any errors have occurred in the RLE system. If the analogue quadrature is incorrectly wired, the system may still work but measure distances that are not expected and in the opposite direction to that expected. If a voltage exceeding ± 7 V is applied on any of the signals, damage to the unit can occur.



WARNING: Care should be taken to ensure that individual signal wires do not short. It is advised that all joints are sleeved. If input signal wires short, the position output will be unreliable and the error signal may not work reliably.

Connector pinout

The analogue quadrature input connector pinout is shown in Table 3. All pins are protected to ± 7 V. The connector on the RSU10 is a 15-way female D-type. Figure 3 shows the mating D-type connector.

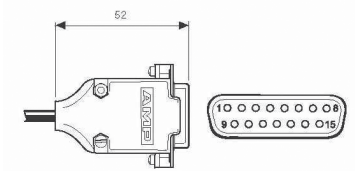


Figure 3 - Analogue quadrature input mating connector (15-way D-type male connector)

This connector is viewed from the wiring side.

Table 3 - Analogue quadrature input (15-way D-type male)

Pin number	Function
1	0 V
2	-
3	Error
4	-
5	Sine
6	Cosine
7	-
8	-
9	-
10	/Error
11	-
12	/Sine
13	/Cosine
14	-
15	-
Shell	Chassis ground

2.4 Trigger interface

The trigger facility allows data to be captured upon receipt of a trigger signal generated remotely, e.g. from a machine under test.

Table 4 - Trigger input (4-way binder 712 male)

Pin number	Function
1	Trigger
2	0 V
3	-
4	-



Figure 4 - TP fast (4-way binder 712 male connector)

This connector is viewed from the wiring side.

The trigger input signal provides a high-speed hardware trigger facility with a short delay ($<1 \mu\text{s}$) between the leading edge of the trigger input pulse and the instant that the laser reading is recorded. Trigger mode is ideal for recording measurements when the machine under test is moving.

The trigger signal must be a clean, debounced TTL, CMOS or SSR signal applied to the fast trigger pin on the auxiliary I/O connector, as shown in Figure 5.

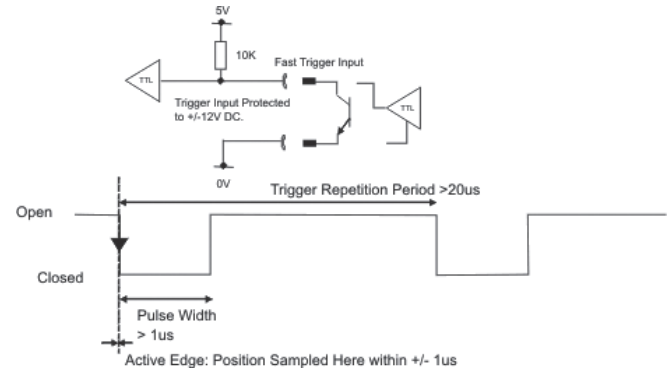


Figure 5 - Electrical interface for fast triggering

Table 5 - Trigger specifications

Active edge	Falling
Minimum pulse width	1 μs
Maximum trigger rate	50 kHz
Trigger delay	$\pm 1 \mu\text{s}$
Maximum input voltage	$\pm 12 \text{ V}$

2.5 RLE set-up - configuration switches

Care should be taken setting the RLU configuration switches correctly.

RLU switch number 5 must be set DOWN to give analogue quadrature output.

RLU switch number 11 must be set DOWN so that the system does not tri-state the quadrature on error.

RLU switch number 12 should be set UP unless the fine digital quadrature output from the system is also required (in addition to the RSU10 position output).

RLU switch number 13 must be set DOWN so that the system does not latch errors. The RSU10 will latch any flagged errors.

Note: The RLE axis direction reversal switches 6 and 7 only affect the direction of the digital quadrature from the RLE and not the analogue quadrature.

Note: The RLE will flag an error when the measurement velocity reaches a level at which the required output update rate of the digital quadrature exceeds the digital bandwidth limit of the RLE. The digital bandwidth limit depends on the digital quadrature resolution and maximum output bandwidth selected with the RLE DIP switches. The digital quadrature resolution and the digital output bandwidth should be selected so that the RLE measurement velocity limit is sufficient for the application. It is therefore recommended that fine quadrature is disabled by setting RLE switch number 12 UP.

For further information on the RLU front panel switches refer to *RLE fibre optic laser encoder installation guide* (Renishaw part no. M-5225-0568).

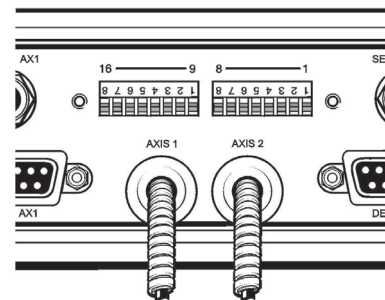


Figure 6 - RLU configuration switches

2.6 Scale factors and compensation

Axis 1 and 2 operation

Axis 1 and 2 of the RLU laser unit have slightly different vacuum wavelengths. The wavelength programmed into the RSU10 is that of axis 1 of the RLU laser unit. In order to use the RSU10 with axis 2 of an RLU laser unit, a scale factor increase of 2.29 ppm should be applied to the position reading.

For example, when using axis 2, if the position reading given by the RLE system is 100 mm, implementing the scale factor gives the actual position reading of 100.000229 mm.

Optical target

A scale factor also needs to be applied if using the RSU10 with an RLE system containing a plane mirror optical target. This scale factor is also axis dependant: see Table 6 below for details.

Table 6 - Scale factors

	Axis 1	Axis 2
PMI	0.5	0.500001145
RRI	1	1.00000229

To adjust the scale factor in LaserXL™, use Explorer to locate and open the file named Current.Rcf. Amend the Linear Factor figure as required, save the file, and close.

To amend the scale factor within QuickViewXL™, select Configure from the menu bar, followed by Scale factor. Type the correct scale factor and then press Enter.

Air refractive index compensation

If the system is used in conjunction with an XC-80 compensation unit, air refractive index compensation can be automatically applied to the results. If an XC-80 is not used, then the default environmental parameters (20 °C, 1013.25 mbar, 50% RH) will be used.

Appendix A - Specification

Values in this table define the contribution of the RSU10 to the system performance, NOT the complete laser interferometer system performance.

Table 7 - Measurement performance

		PMI	RRI
LSB resolution		9.64 pm	19.28 pm
Maximum speed		1 m/s	2 m/s
Positional noise contribution (RMS)		<0.1 nm	<0.2 nm
SDE contribution (signal strength >75% and <120%)	Velocity <50 mm/s (PMI) Velocity <100 mm/s (RRI)	±3 nm	±6 nm
	Velocity >50 mm/s <1 m/s (PMI) Velocity >100 mm/s <2 m/s (RRI)	±4 nm	±8 nm
Maximum update rate		50 kHz	

Table 8 - Environmental specification

Pressure	Normal atmospheric (650 mbars to 1150 mbars)	
Humidity	0% to 95% RH (non-condensing)	
Temperature	Storage	-20 °C to +70 °C
	Operating	+10 °C to +40 °C

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