

# RECLINE Cable and Connector Information

RECLINE: REmote inCLINEnometer system

Version 2.2 February 2017

This guide gives the user information on the following:

- Choice of connector
- Connector wiring
- Adaptor cables
- Maximum cable length

For any additional information, please contact us. info@ksgsensors.com



# **Connector Choice**

This section is intended to enable the user to decide which type of connector suits their need best

The connectors break down into two types:

- Those that allow the independent control of the laser
- Those that do **not** offer independent control of the laser

They are as follows:

Independent control of the laser	No independent control of the laser
XLR5	XLR3
XLR6	
RJ45 etherCON	

Table 1: Connector Comparison

The basis of this is that XLR5, XL6 and RJ45 etherCON have more conductors inside the cable, therefore there are more options for control lines and separate power busses



#### **Examples:**

Below are some examples of connector type and their functionality. The equipment shown is 1 x DID and 2 x SSU connected to input 1 & 2. -45.5deg indicates that there is either no SSU connected or the SSU has no power

#### XLR5, XLR6, RJ45 etherCON



In this example (XLR5, XLR6 and RJ45 etherCON) you can see that the sensors have power independently of the laser

This allows the angle measured to be displayed on the screen even if the laser is off

The laser can put switched on and off as required



#### **Examples Continued**

XLR3



In this example (XLR3) you can see that the sensor uses the same power supply as the laser If the SSU has no power, no angle can be output from the sensor circuit When the laser switch is pressed, the circuit sends power to both the laser **and** the sensor There is no independent control of the laser



# **XLR3 Wiring**

#### **Sensor Type:**

For use with all our Compact Sensor Units (CSU) and Standard Sensor Units (SSU)

#### **Cable Type:**

High quality, 1 Pair OFC audio cable; aluminium conductor 24AWG, 7 x 0.203. Shield: 100% Foil Coverage / Polyester tape. Drain wire: 24AWG. For example, Direct Cable Systems Part Number: <u>301-031HD</u> or a high quality Star Quad type cable can be used as well such as Direct Cable System part number <u>301-055</u> If using twisted pair cable (for example CAT5e, CAT6 or CAT7 cable) please ensure that 0v and the Sensor Output are one of the twisted pairs. It is recommended that the type and length of cable be tested prior to use.

The use of Neutrik NC3 connectors is recommended.

It is recommended to connect the shield to the XLR chassis in both the male and female connectors.

### **Connector Pin out:**

XLR3	Conductors
Pin 1: Shield / 0v	All Shields and drain wire.
Pin 2: Sensor Output	Pair 1 – <i>ve</i>
Pin 3: Sensor + <i>ve</i>	Pair 1 +ve
Table 2: XI	.R3 Pin Out



# XLR5 Wiring

#### **Sensor Type:**

For use with all our Compact Sensor Units (CSU) and Standard Sensor Units (SSU)

#### **Cable Type:**

High quality, 2 Pair OFC audio Multicore; aluminium conductor 24AWG, 7 x 0.203. Shield: 100% Foil Coverage / Polyester tape. Drain wire: 24AWG. For example, Direct Cable Systems Part Number: <u>300-002</u> or a high quality Star Quad type cable can be used as well such as Direct Cable System part number <u>301-055</u> If using twisted pair cable (for example CAT5e, CAT6 or CAT7 cable) please ensure that 0v and the Sensor Output are one of the twisted pairs. It is recommended that the type and length of cable be tested prior to use.

The use of Neutrik NC5 connectors is recommended.

It is recommended to connect the shield to the XLR chassis in both the male and female connectors.

### **Connector Pin out:**

XLR5	Conductors
Pin 1: Shield	All Shields and drain wire
Pin 2: 0v	Pair 1 − <i>ve</i>
Pin 3: Laser + <i>ve</i>	Pair 1 + <i>ve</i>
Pin 4: Sensor Output	Pair 2 – ve
Pin 5: Sensor + <i>ve</i>	Pair 2 + <i>ve</i>
Table 2. VI DE Din Out	

Table 3: XLR5 Pin Out



# **RJ45 Wiring**

#### **Sensor Type:**

For use with all our Compact Sensor Units (CSU) and Standard Sensor Units (SSU)

#### **Cable Type:**

Rugged/Tactical U/UPT or S/FTP CAT5e, CAT6 such as Belden <u>1305a</u> or Direct Cable Systems <u>301-192</u> wired to EIA 568 B standard. If using twisted pair cable (for example CAT5e, CAT6 or CAT7 cable) please ensure that 0v and the Sensor Output are one of the twisted pairs. It is recommended that the type and length of cable be tested prior to use.

The use of Neutrik EtherCON connectors is recommended.

It is recommended to connect the shield or drain-wire with the metal body of the connector both ends of the cable.

### **Connector Pin out:**

RJ45 etherCON	Conductor Colour
Pin 1: 0v	White / Orange
Pin 2: Sensor Output	Orange
Pin 3: OEM Reserved	White / Green
Pin 4: Laser + <i>ve</i>	Blue
Pin 5: Laser + <i>ve</i>	White / Blue
Pin 6: OEM Reserved	Green
Pin 7: 0v	White / Brown
Pin 8: Sensor + <i>ve</i>	Brown
Table 4. DIAE ather CON Din Out	

Table 4: RJ45 etherCON Pin Out



# **XLR6 Wiring**

#### **Sensor Type:**

For use with all our Dual Axis Inclinometer Units (DAD)

#### **Cable Type:**

Rugged/Tactical U/UPT or S/FTP CAT5e, CAT6 such as Belden <u>1305a</u> or Direct Cable Systems <u>301-192</u> wired to EIA 568 B standard. If using twisted pair cable (for example CAT5e, CAT6 or CAT7 cable) please ensure that 0v and the Sensor Output are one of the twisted pairs. It is recommended that the type and length of cable be tested prior to use.

The use of Neutrik NC6 connectors is recommended.

Connect all shields and drain wires together.

#### **Connector Pin out:**

XLR6	Conductor Colour
Pin 1: Shield	Shield + drain wire
Pin 2 0v	White / Orange, White / Green & White / Brown & White
Pin 3: Laser + <b>ve</b>	White / Blue & Blue
Pin 4: Sensor Output X Axis	Orange
Pin 5: Sensor Output Y Axis	Green
Pin 6: Sensor + <i>ve</i>	Brown

Table 5: XLR6 Pin Out

# KSG sensors

# LK 48/6 Wiring

#### **Sensor Type:**

For use with all our Compact Sensor Units (CSU) and Standard Sensor Units (SSU)

#### **Cable Type:**

Rugged/Tactical multicore cable.  $48 \times 4mm^2 + 2 \times AES$  twisted pairs, such as <u>Eurocable</u> <u>48N440AD2</u>. It is recommended that the type and length of cable be tested prior to use.

The use of Neutrik EtherCON connectors is recommended.

Connect all shields and drain wires together.

Please note this is the revised and updated LK48/6 wiring as of November 2017

#### **Connector Pin out:**

LK 48/6	XLR3	XLR5	RJ45 etherCON
1 Shield: Shield / Ov	Pin 1	Pin 1	Pin 1 + Shield
2 Cold 1: Sensor Output	Pin 2	Pin 4	Pin 2
3 Hot 1: Sensor +ve	Pin 3	Pin 5	Pin 8
4 Shield: Shield		Pin 1	Shield
5 Cold 2: 0v		Pin 2	Pin 7
6 Hot 2: Laser + <i>ve</i>		Pin 3	Pin 4 + 5

Table 6: LK48/6 Pin Out



# **Sensor Element Wiring**

# **Sensor Type:**

For use with all our Sensor Elements (SEL), pictured here

### **Cable Type:**

High quality, 2 Pair OFC Audio Multicore; Aluminium conductor 24AWG, 7 x 0.203. Shield: 100% Foil Coverage / Polyester tape. Drain wire: 24AWG. For example, Direct Cable Systems Part Number: <u>300-002</u> or a high quality Star Quad type cable can be used as well such as Direct Cable System part number <u>301-055</u> If using twisted pair cable (for example CAT5e, CAT6 or CAT7 cable) please ensure that 0v and the Sensor Output are one of the twisted pairs.

The use of Neutrik connectors is recommended.

It is recommended to connect the shield to the connector chassis in both ends of the cable.

#### **Sensor Element Cable:**

Blue:	0v
Black:	Sensor Output
Brown:	Sensor + <i>ve</i>

# **Application example:**

In this example, we shall show the use of an XLR5 connector being used with our Sensor Element:

XLR3	Conductor
Pin 1: Shield + 0v	Blue + Shield + drain wire if fitted
Pin 2: Sensor Output	Black
Pin 3: Sensor + <i>ve</i>	Brown
Table 7: SEU XLR3 Pin Out	

XLR5	Conductor
Pin 1: Shield	Shield + drain wire if fitted
Pin 2 Ov	Blue
Pin 3: Laser + <i>ve</i>	N/C
Pin 4: Sensor Output	Black
Pin 5: Sensor + <i>ve</i>	Brown

Table 8: SEU XLR5 Pin Out



**Cable Wiring Information** 



# **Adaptor Cables**

# **Application:**

It is possible for all current RECLINE Sensors to use a variety of connectors. XLR3, XLR5 or RJ45 etherCON. Please choose the one that best suits your application, cabling infrastructure and functionality.

There are 3 colour codes associated with adaptor cables; black, red and green;

- Black boots indicate no change in functionality
- Red boots indicate that the sensor power bus powers both the inclinometer sensor and the laser
- Green boots indicate that the laser power bus powers the inclinometer sensor and the laser

Where possible when using XLR3 sensors with XLR5 or RJ45 displays, we recommend using the 'Green' adaptor cables. This gives some control over the laser so that it is not on constantly thereby reducing the exposure of users or bystanders to the laser.

The use of Neutrik connectors is recommended.

It is recommended to connect the shield to the connector chassis in both ends of the cable.



# **XLR3 Displays**

#### **XLR3 Display to XLR5 Sensor**

- Display sensor power (Pin 3), powers the inclinometer sensor and the laser
- Male XLR3 to Female XLR5
- Red boots
- Link pin 1 to chassis on both ends of the cable

Male XLR3	Female XLR5
Pin 1: Shield / Ov	Pin 1 & Pin 2
Pin 2: Sensor Output	Pin 4
Pin 3: Sensor + <i>ve</i>	Pin 3 & Pin 5
Table 9: XLR3 Display to XLR5 Sensor Adaptor Cable - RED	

#### **XLR3 Display to RJ45 Sensor**

- Display sensor power (Pin 3), powers the inclinometer sensor and the laser
- Male XLR3 to RJ45 etherCON
- RJ45 T568-B wiring
- Red boots
- Link pin 1 to chassis on both ends of the cable
- RJ45 conductors green and green/white are not connected in XLR. They can be removed / cut off

Male XLR3	RJ45 etherCON
Pin 1: Shield / 0v	Pin 1 & Pin 7 (Orange/White & Brown/White)
Pin 2: Sensor Output	Pin 2 (Orange)
Pin 3: Sensor + <i>ve</i>	Pin 4, Pin 5 & Pin 8 (Blue, Blue/White & Brown)
Table 10: XLR3 Display to R[45 Sensor Adaptor Cable - RED	



# **XLR5 Displays**

#### **XLR5 Display to XLR3 Sensor**

- Display sensor power (Pin 5), powers the inclinometer sensor and the laser
- Male XLR5 to Female XLR3
- Red boots
- Link pin 1 to chassis on both ends of the cable

Male XLR5	Female XLR3
Pin 1: Shield	Pin 1
Pin 2: 0v	Pin 1
Pin 3: Laser + <i>ve</i>	N/C
Pin 4: Sensor Output	Pin 2
Pin 5: Sensor + <i>ve</i>	Pin 3

Table 11: XLR5 Display to XLR3 Sensor Adaptor Cable - RED

#### **XLR5 Display to XLR3 Sensor**

- Display laser power (Pin 3), powers the inclinometer sensor and the laser
- Male XLR5 to Female XLR3
- Green boots
- Link pin 1 to chassis on both ends of the cable

Male XLR5	Female XLR3
Pin 1: Shield	Pin 1
Pin 2: 0v	Pin 1
Pin 3: Laser + <i>ve</i>	Pin 3
Pin 4: Sensor Output	Pin 2
Pin 5: Sensor + <i>ve</i>	N/C

Table 12: XLR5 Display to XLR3 Sensor Adaptor Cable - GREEN

#### **XLR5 Display to RJ45 Sensor**

- Normal functionality
- Male XLR5 to RJ45 etherCON
- RJ45 T568-B wiring
- Black boots
- Link pin 1 to chassis on both ends of the cable
- RJ45 conductors green and green/white are not connected in XLR. They can be removed / cut off

Male XLR5	RJ45 etherCON
Pin 1: Shield	Pin 1 (Orange / White)
Pin 2: 0v	Pin 7 (Brown / White)
Pin 3: Laser + <i>ve</i>	Pin 4 + 5 (Blue / White + Blue)
Pin 4: Sensor Output	Pin 2 (Orange)
Pin 5: Sensor + <i>ve</i>	Pin 8 (Brown)

Table 13: XLR5 Display to RJ45 etherCON Sensor Adaptor Cable

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# **RJ45 etherCON Displays**

#### **RJ45 Display to XLR3 Sensor**

- Display sensor power (Pin 8), powers the inclinometer sensor and the laser
- RJ45 etherCON to Female XLR3
- Red boots
- RJ45 T568-B wiring
- Link pin 1 (0v) to chassis on both ends of the cable
- RJ45 conductors blue/white, blue, green and green/white are not connected in XLR. They can be removed / cut off

RJ45 etherCON T568-B	Female XLR3
Pin 1: 0v (Orange / White)	Pin 1
Pin 2: Sensor Output (Orange)	Pin 2
Pin 3: OEM reserved (Green / White)	N/C
Pin 4: Laser + <i>ve</i> (Blue / White)	N/C
Pin 5: Laser + <i>ve</i> (Blue)	N/C
Pin 6: OEM reserved (Green)	N/C
Pin 7: 0v (Brown / White)	Pin 1
Pin 8: Sensor +ve (Brown)	Pin 3

Table 14: RJ45 Display to XLR3 Sensor Adaptor Cable - RED

#### **RJ45 Display to XLR3 Sensor**

- Display laser power (Pin 4+5), powers the inclinometer sensor and the laser
- RJ45 etherCON to Female XLR3
- Green boots
- RJ45 T568-B wiring
- Link pin 1 (0v) to chassis on both ends of the cable
- RJ45 conductors brown, green and green/white are not connected in XLR. They can be removed / cut off

RJ45 etherCON T568-B	Female XLR3
Pin 1: 0v (Orange / White)	Pin 1
Pin 2: Sensor Output (Orange)	Pin 2
Pin 3: OEM reserved (Green / White)	N/C
Pin 4: Laser + <i>ve</i> (Blue / White)	Pin 3
Pin 5: Laser + <i>ve</i> (Blue)	Pin 3
Pin 6: OEM reserved (Green)	N/C
Pin 7: 0v (Brown / White)	Pin 1
Pin 8: Sensor +ve (Brown)	N/C

Table 15: RJ45 etherCON Display to XLR3 Sensor Adaptor Cable - GREEN

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# **RJ45 etherCON Displays continued**

#### **RJ45 Display to XLR5 Sensor**

- Normal functionality
- RJ45 etherCON to Female XLR5
- Black boots
- RJ45 T568-B wiring
- Link pin 1 (0v) to chassis on both ends of the cable
- RJ45 conductors green and green/white are not connected in XLR. They can be removed / cut off

RJ45 etherCON T568-B	Female XLR5
Pin 1: 0v (Orange / White)	Pin 1
Pin 2: Sensor Output (Orange)	Pin 4
Pin 3: OEM reserved (Green / White)	N/C
Pin 4: Laser + <i>ve</i> (Blue / White)	Pin 3
Pin 5: Laser + <i>ve</i> (Blue)	Pin 3
Pin 6: OEM reserved (Green)	N/C
Pin 7: 0v (Brown / White)	Pin 2
Pin 8: Sensor + <i>ve</i> (Brown)	Pin 5

Table 16: RJ45 etherCON to XLR5 Adaptor Cable



# **Maximum Cable Length**

The tables below give the user some guidance as to how a sensor will perform with a given display over a certain length of cable. While solid core / conductor cable is preferred, stranded cable can be used such as star quad, audio multicore, DMX or other industrial control cable but with less desirable results. F/UTP cable can be used with both XLR and RJ45 connectors. The two-pair audio cable has been shown as a comparison to the CAT6 cable.

Mk6 or earlier Sensor Unit (Mechanical Calibration)	Single Input Display Mk2 or earlier. 1 Line LCD Screen	Single & Dual Input Display with 2 x 9v battery & colour TFT Screen	Single and Dual Input Display (SID & DID) with internal rechargeable battery	Rack Mounted Display (RMD)
100m (328ft) CAT6	ОК	ОК	ОК	ОК
200m (656ft) CAT6	ОК	ОК	ОК	ОК
300m (984ft) CAT6	OK <sup>3</sup>	OK <sup>3</sup>	OK <sup>3</sup>	ОК
100m (328ft) XLR5	ОК	ОК	ОК	ОК
150m (429ft) XLR5	OK 1,3	OK 1, 3	ОК	ОК
200m (656ft) XLR5	OK 1, 3	OK 1, 3	OK 1, 3	ОК
250m (820ft) XLR5	OK 1, 3	OK 1, 3	OK 1, 3	ОК
300m (984ft) XLR5	OK 1, 3	OK 1, 3	OK 1, 3	OK

Table 17: Early Sensor Maximum Cable Length

**Cable Wiring Information** 



Mk7 Sensor Unit (SSU) (Electronic Calibration)	Single Input Display Mk2 or earlier. 1 Line LCD Screen	Single & Dual Input Display with 2 x 9v battery & colour TFT Screen	Single and Dual Input Display (SID & DID) with internal rechargeable battery	Rack Mounted Display (RMD)
100m (328ft) CAT6	ОК	ОК	ОК	ОК
200m (656ft) CAT6	No	ОК	ОК	ОК
300m (984ft) CAT6	No	OK <sup>3</sup>	OK <sup>3</sup>	ОК
75m (246ft) XLR5	ОК	ОК	ОК	ОК
100m (328ft) XLR5	OK 1, 3	ОК	ОК	ОК
150m (429ft) XLR5	No	ОК	ОК	ОК
200m (656ft) XLR5	No	OK 1, 3	ОК	ОК
250m (820ft) XLR5	No	OK 1, 3	OK 1, 3	ОК
300m (984ft) XLR5	No	OK 1, 2, 3	OK 1, 2, 3	ОК

Table 18: Current Sensor Maximum Cable Length

Remote Display (REM)	Single Input Display Mk2 or earlier. 1 Line LCD Screen	Single & Dual Input Display with 2 x 9v battery & colour TFT Screen	Single and Dual Input Display (SID & DID) with internal rechargeable battery	Rack Mounted Display (RMD)
100m (328ft) CAT6	N/A	N/A	N/A	ОК
200m (656ft) CAT6	N/A	N/A	N/A	ОК
300m (984ft) CAT6	N/A	N/A	N/A	ОК

Table 19: RMD and REM Maximum Cable Length

<sup>1</sup> Angle measurement OK, dim or no laser visible. <sup>2</sup> Reduced accuracy - +/- 0.2deg. <sup>3</sup> Use external Power Supply.

Cable used: CAT6: 23AWG F/UTP solid core cable with Neutrik etherCON connectors

XLR5: Evolution XPC OFC pre-jacketed multi audio multicore 300-002 with Neutrik NC5 connectors

Please note, all cable lengths tested were single pieces of cable. For example, a 100m cable was not made from 2 x 50m cables joined together.

#### **Cable Wiring Information**

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