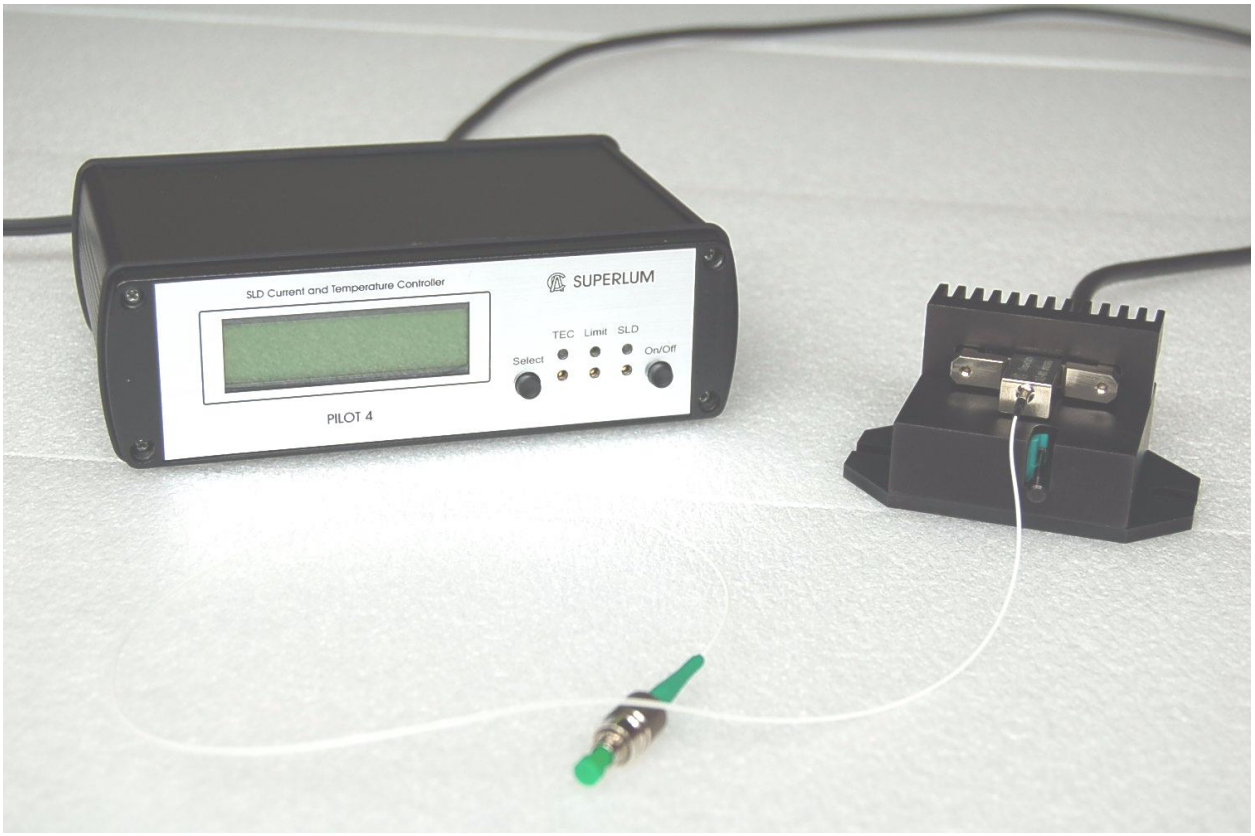
Instruction Manual

Superluminescent Diode Lightsource Set



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CHAPTER 1. General Information

1.1. Introduction

Important notice!
Before operating this equipment all users must read and understand this manual.

This SLD Lightsource Set consists of the following:

- SLD Module with internal TE Cooler;
- PILOT-4 driver unit;
- Mount for SLD module;
- Cable to connect mounts to PILOT-4 driver.
- Manual and other related documentation

SLDs emit non-coherent light at a specific center wavelength ranged from 650 nm to 1650 nm. Detailed performance data of every SLD module may be found on the Acceptance Test Report (ATR) enclosed with that module. Modules marked as SLD-XY1 etc are SM or PM fiber coupled. Modules marked as SLD-XY0 etc emit a free space beam with far field typically (10-20) x 35° FWHM. Fiber coupled modules have two different packages: DIL and Butterfly (DBUT). Free space modules are TOW2 packaged; in this case the module is already integrated into a TOW mount when shipped as a Lightsource set.

SUPERLUMs PILOT-4DC and PILOT-4AC drivers combine a temperature controller and an electric current source for driving the SLD emitter. The PILOT-4DC requires a stabilized +9 V/ 2 A DC supply while the PILOT-4AC is 220 V AC ready (PILOT-4AC-220) or 110 V AC ready (PILOT-4AC-110).

The PILOT-4AC allows remote on/off triggering of the SLD emitter and monitoring of the lightsource status. This remote control function is optional for the PILOT-4DC. The Remote control socket is mounted on the rear panel of the PILOT.

All Pilots conform to applicable safety standards and bear the CE sign; see “Declaration of Conformity” at the end of this manual.

Performance certificate

This set was tested according to existing procedures of Superlum Ireland. Test results are shown on the Acceptance Test Report (ATR) attached. Please note that changing of SLD drive current may result in spectral changes. Spectral parameters stated in the ATR are obtained at maximum SLD power.

Important

SLD modules emit invisible (except SLD-26) light equivalent to Class IIIB Laser products. Avoid direct exposure. Always switch off SLD current when the set is not in use.

1.2. Unpacking and handling precautions

Extreme care is required when taking Lightsource sets out of transportation boxes. SLD modules are fragile. Detailed unpacking instructions are attached to every SLD module shipped. These unpacking instructions should be read and carefully complied with.
Please take special care to ensure:

- ESD protection;
- Gentle module and fiber handling;
- Cleanliness of glass window of the free space module. It is AR coated.
- See chapters 2 and 3 for further information

DO NOT use the Lightsource set if you see damage of any kind to the SLD module, PILOT controller, cable or mount. In case of damage caused during transportation, please inform the carrier representative or Superlum Ireland or it’s representative at the earliest opportunity.

CHAPTER 2. SLD modules

2.1. Overview

Superluminescent Diodes (SLDs) are amplified spontaneous emission light sources based on traveling wave laser diode amplifiers. Their unique property is the combination of high output power and high, laser-like spatial brightness with very broad and flat optical spectrum.

Due to relatively strong dependence of SLD output power and spectrum on its temperature most SLD-based light source modules are temperature stabilised ("cooled"). An internal thermoelectric cooler and temperature sensor, (thermistor), are used to stabilise the SLD temperature inside "cooled" modules. Temperature controllers and electric current drivers are required to operate such devices.

Similar to laser diode (LD) modules, SLD modules are extremely drive sensitive.
In cooled SLD modules the SLD emitter temperature must be maintained at its nominal value. The standard nominal value of SLD emitter stabilisation temperature is 25°C in SLD modules emitting below 1100 nm and 20°C in SLD modules emitting above this wavelength. Note that in some particular modules SLD stabilisation temperature may be different from the standard values mentioned above. The correct stabilization temperature is always clearly indicated in the ATR which accompanies each SLD.

For cooled SLD modules it is strictly forbidden to apply current to the SLD emitter when its temperature is not stabilized at the value shown on the relevant ATR.

After the SLD temperature is stabilised, it is possible to apply driving current to the SLD emitter. SLDs are extremely sensitive to driving current instabilities like transient spikes/surges, etc. Due to the short turn-on time, typically 3 ns or less, brief spikes in the drive current, which are difficult to detect, can occur which may easily damage SLDs. Depending on how intensive and frequent these spikes are it will result in either fatal or so-called "latent" damage to the SLD emitter. In the case of fatal damage, SLD power drops by an order of magnitude immediately after the spike occurs. "Latent" damage, which is usually seen as MINOR change of the output power and/or the spectrum, decreases SLD lifetime to just a few hundred operating hours or even less.

There are two driving modes possible with LDs and SLDs: Constant Current (abbreviated as ACC or CC) and Constant Power (abbreviated as CP or APC). A back facet PD monitor is usually used for CP mode. In SLD Light source Sets equipped with PILOT-4 drivers CC driving mode is used.

Another dangerous factor affecting the safe and stable SLD operation is optical feedback. Being an optical amplifier SLDs amplify any light that is within the optical gain spectrum of the active region, including light reflected back from the system. Optical gain is very high in SLDs. It is at least 20 dB in "MP" (Medium Power) -rated SLD modules and may exceed 30 dB in some of the most powerful "HP" (High Power) –rated SLD module of Superlum. Due to this, any back reflected light that reaches the back end of the SLD active region is strongly amplified.

The consequences of this occurrence are as follows:

- A strong decrease of output power and change of optical spectrum, especially if optical gain is strongly saturated;
- Possibility for Catastrophic Optical Damage (COD) to the back of the SLD crystal facet, (especially in SLDs emitting below 1100 nm). Materials of such SLDs have relatively low COD resistance compared to longer wavelength counterparts.

For all MP-rated Superlum diodes it is recommended never to allow optical feedback exceeding 4-5%. <u>For all HP-rated devices optical feedback must never exceed –30 dB</u>. Please note that the use of HP-rated Light source Sets/SLD modules without optical isolators is always at the user's own risk. The dangers of this practice have been clearly stated. Due to the very high risk for damage by any minor mistake resulting in feedback exceeding 1E-3 Superlum recommend NEVER USE HP3-rated SLDs without optical isolators even if your estimations show that there is no source for optical feedback. Data presented in ATRs are taken when optical feedback is below –50 dB. This is achieved either by FC/A(angled)PC termination of fiber pigtail or by 8° angle fiber cleave in modules with non-terminated fiber ends.

2.2. SLD handling and operating instructions

Please note that before opening the container of the SLD module you must read and observe all unpacking Instructions attached. We also recommend that all users read the leaflet "Superluminescent Diode operation principles and performance parameters" which accompanies this set for more detailed information about SLD modules.

When using SLD routinely, always observe the following precautions:

Important

SLD modules emit invisible (except SLD-26) light equivalent to Class IIIB Laser products. Avoid direct exposure. Always switch off SLD current when the set is not in use.

Always make sure that the SLD is not influenced by optical feedback. For modules equipped with a PD monitor it is recommended to set the PILOT display to show the value of PD monitor current. Sudden increases in PD monitor current or fluctuations over time with respect to stationary values of driving current are indications that the SLD is affected by optical feedback.

It is extremely hazardous to the SLD module, when used if:

C.I : SLD current exceeds maximum value shown on the Acceptance Test Report (ATR).
C.II: SLD power exceeds maximum value shown on the ATR.
C.III: Monitor current exceeds maximum value shown on ATR.

Ignoring this warning may result in the catastrophic degradation or so-called "latent damage" of SLD emitter which will limit the device's lifetime down to a few hundred hours and maybe even less.

For all HP-marked sets optical isolation of at least –30 Db is required. Ignoring this caution may result in permanent damage and/or a catastrophic device failure. The Use of HP-rated sets without appropriate optical isolators will be at the user's own risk. Failures occurring due to optical feedback are easily detectable by viewing the damage to the back of the SLD crystal facet. Please note that such damage is not covered by warranty. Contact Superlum prior to using the Light source Set if you need more details about SLD reaction to optical feedback.

Caution !

Handle fiber pigtailed devices with extreme care. Glass fiber is extremely fragile and subject to breakage. If mishandled permanent device damage may result. Unwind the fiber first before attempting to remove the module from it's box. Minimum bending radius is 6 cm unless otherwise specified.

Caution !

It is strictly forbidden to apply driving current to an SLD emitter in cooled (i.e. those with internal cooler and thermistor) modules if the SLD temperature is not stabilized at the nominal value which is shown on the relevant ATR.

Caution !

When driving an SLD emitter, **NEVER exceed the value of 'maximum SLD current' as shown on Acceptance Test Datasheet attached to each module** as this may lead to device failure.

Caution !

A One year warranty for the Lightsource Set is valid only if the SLD module is used with the original driver supplied by Superlum. In the event that any buyer intends to drive any particular SLD with any other driver then a separate warranty will be considered for SLD module and PILOT driver. This arrangement must be indicated by the buyer at the time of purchase. Any SLD damage due to improper driving will not be covered by Lightsource Set warranty.

Caution !

If, for any reason you use a driver other than that supplied with the SLD module as part of the Lightsource Set, it is vital that all precautions are taken to eliminate transient electrical current surges during switching on/off. Pre-set 'current limit' of the SLD emitter driving unit to the value of maximum SLD current before driving the SLD emitter! In case of any modulation superimposed on DC current, check that the driving current peak value IS ALWAYS LESS THAN THE MAXIMUM CURRENT VALUE AS SHOWN ON THE ATR!

Caution !

The Lightsource Set is sensitive to static electricity! Take all precautions to avoid electrical discharge to the pins of the SLD module.

Caution !

When soldering the SLD module pins, the maximum time and minimum distance from soldering point to the case must be 5 sec and 3 mm, respectively, for 260°C solder.

2.3. SLD protection features of PILOT-4 drivers

Superlum's PILOT-4 Current and Temperature Controllers protect SLD modules from damage due to improper driving by incorporating the following features

1. TEC current supply and SLD current supply switch off automatically if the connections to the thermistor are broken.

2. SLD current switches off automatically if the thermistor's real value differs from the SET value by more than 1 %.

3. The SLD current switches off automatically if the connections to SLD are broken.

4. * SLD current switches off automatically if it starts to change at a rate faster than 10 mA/ms

5. ** SLD current switches off automatically if the supply voltage changes by > 10% with a rate of > 250 mV/s.

6. Increasing of SLD current to a value greater than the set value of 'Current limit' is impossible.

7. In the case of events 2-5 above, the SLD current supply circuit shorts automatically; Current supply can only be reset manually by pushing the 'SLD- on' button twice.

* PILOT-4 Controllers are developed for CW operation of SLDs; this protection feature does not mean that SLD power modulation by means of driving current modulation is not possible with SLDs.

** This feature may be switched-off in some wall-plug units but works with controllers supplied by external DC voltage. Its task is to protect the SLD emitter from damage in case of instability of DC supply voltage.

2.4. SLD module ratings

Lightsource Sets are specified for ambient operating temperature range of 0° C…+40° C (no condensing) and storage temperature range of –30° C…+70° C. When driving an SLD module with any driver not supplied with that SLD, never exceed the absolute maximum ratings listed below. SLD package drawings may be found on Figs 1,2 & 3.

ABSOLUTE RATINGS ***

Parameter	min.	Max.
'Nominal' SLD emitter stabilisation temperature*, deg° SLD-2XY, SLD-3XY, SLD-4XY, SLD-52Y, SLD-53Y	+25	+25
'Nominal' SLD emitter stabilization temperature*, deg° SLD-56Y, SLD-57Y, SLD-66Y, SLD76Y	+20	+20
Thermistor value at 'nominal' emitter's stabilisation +25° C temperature, K Ohms	10.0 K Ohms	
Thermistor value at 'nominal' emitter's stabilisation +20° C temperature, K Ohms	12.5 K Ohms	
SLD emitter maximum current , mA		ATR Data Sheet*
TEC current, A		1.2
TEC voltage, V		3.5
Operating temperature, degC,	-55	>=+60**
Storage temperature	-55	+85
PD monitor supply voltage (if integrated), V		- 5.0

- * - contact us at any time for new datasheet copy
- ** - different for different SLD modules. Contact us for more details at any time.
- *** - all ratings for standard versions only (i.e. valid in absence of any other contract-related document with higher priority)

Attention !

The SLD spectrum depends on SLD drive current. This is especially so in models SLD-37, SLD-47 and SLD-52. Spectrum FWHM shown on ATR corresponds to that measured at maximum SLD current. Note that changing of SLD current results in changing of SLD spectrum. Please do not hesitate to contact us for more details if necessary.

CHAPTER 3. SLD Lightsource Set Operation.

3.1. Installation and Precautions

- **Avoid electrostatic discharge, (ESD), through the tuning potentiometers on the PILOT-4 when adjusting the TEC, Current Limit or SLD Driving Current parameters. Wear a grounding wrist strap during this and similar procedures.**
- **Position the PILOT-4 horizontally, away from any heat source or appliances creating electric or magnetic fields.**
- **Ensure good air circulation at rear of PILOT-4.**
- **PILOT-4 frame must be grounded. For DC models, use ground terminal (earth Jack) located on rear panel. AC models are grounded using a 3 core mains cable (live, neutral and earth). The instrument is grounded via the mains earth cable when connected to the mains wall socket. Under no circumstances should this instrument be operated without an adequate cabinet ground connection. Note: For use in areas where no mains earth facility is available AC PILOTs are also equipped with an earth jack on the rear panel.**
- **Check supply polarity before switching on PILOT-4 as reverse polarity results in immediate catastrophic device failure.**
- **Use only Superlum cables to connect PILOT-4 to the SLD mounts.**
- **Do not remove PILOT-4 front or rear panels. There are no user serviceable parts inside.**
- **Always check set values of thermistor resistance, (i.e. SLD stabilisation temperature), SLD current limit and SLD driving current before switching on SLD emitter.**
- **NEVER disconnect cable connecting module mount and PILOT controller while SLD module is operating!**
- **Physically disconnect PILOT-4 from power supply when not in use.**

Important

SLD modules emit invisible (except SLD-26) light equivalent to Class IIIB Laser products. Avoid direct exposure. Always switch-off SLD current when the set is not in use.

3.2. Connection and Initial Setup

3.2.1. Install the mount in its position in your system (except TOW-packaged free space modules).

3.2.2. Connect the PILOT and mount using cable supplied and ensure correct connections (except TOW).

3.2.3. Connect the Pilot to a power supply. Ensure the Pilot you are connecting is the correct model for your Power supply

PILOT-4AC-110 requires 110-115 V AC +/-10%, 50-60 Hz, 40 W;

PILOT-4AC-220 requires 220-230 V AC +/-10%, 50-60 Hz, 40 W;

PILOT-4DC requires well-stabilized 9V DC supply with floating ground. Red connector must be connected to "+" of DC supply. It is forbidden to connect either "+" or "-" of DC supply to ground. Before switching on the PILOT-4DC, check that your DC supply provides 9V +10% with up to 2 A and less than 20 mV pulsations. *Recommended DC supply type : Agilent E3610 or analog.*

Note: For location of various LEDs, switches, potentiometers, etc, see Figs. 4-9.

3.2.4. Apply power to PILOT driver using switch 10 on rear. LEDs 2 and 6 must light red. Display should be illuminated.

3.2.5. Referring to the ATR Sheet supplied with the module, check SLD stabilisation T and SLD maximum current.

3.2.6. Press button 8 to select '**Thermistor**' on display. Display will show the pre-set value of thermistor in kΩ. Make sure that the set value of thermistor corresponds to the nominal SLD stabilisation temperature as indicated on ATR. If necessary, change the setting using potentiometer 1.

Resistance vs. Temperature (Celsius) dependence on 10K3CG2 type thermistor of BetaTherm Ltd. (standard used in Superlum modules).

T,°C	10	12	15	20	25	30
R, kΩ	19.90	18.09	15.71	12.49	10.00	8.06

DO NOT set stabilisation temperature to any value other than the STANDARD stabilisation temperature of the emitter as specified on the ATR without obtaining Superlum approval in writing.

3.2.7. Check pre-set value of SLD current limit. Push button 8 to indicate 'Limit' on display. Set the necessary value using potentiometer 3. SLD current limit must never exceed Maximum SLD current shown on the ATR.

3.2.8. Set up 'SLD current' to 10 mA. Push button 8 to indicate 'SLD Current' on the display. Display will show the preset value of SLD current. Use potentiometer 5 to set SLD current value.

3.2.9. Insert module into mount ensuring correct fit (or connect TOW optical head to cable). LED 2 should light 'Green' within a few seconds indicating that set value of thermistor is stabilised otherwise "switch off "PILOT-4 immediately and see 'Troubleshooting', items 1 and 3. LED 6 should be 'Red'

3.2.10. Push button 7 once. LED 6 will extinguish. If LED 6 remains 'Red' after pushing button 7 see 'Troubleshooting'. Push button 7 a second time. LED 6 will light 'Green' indicating that the set value of current is now applied to the SLD module. If, after pushing button 7 a second time, LED 6 does not light 'Green', check 'Troubleshooting'.

3.2.11. Push button 7 once to switch off SLD current. LED 6 should be 'OFF'.

3.2.12. Connect fiber to appropriate Optical Power Meter. In case of free space modules, put Sensor Head of Power Meter in front of SLD. Remember SLD power should be measured in 90°

cone in free space modules. Use only Power Meter designed for measurements at SLD wavelength.

Depending on whether your Lightsource set is MP or HP rated proceed as per appropriate instructions below.

MP-rated Lightsource Sets

- Refer to SLD module datasheet (ATR), see SLD current corresponding to half power at maximum current (Ihp);
- set SLD stabilisation T and SLD current limit as required;
- set SLD current to Ihp;
- apply current to SLD module;
- check output power and PD monitor photocurrent (if available);
- if output power and PD monitor current at Ihp are the same as on the Datasheet, start further increasing of SLD driving current by adjusting SLD potentiometer on front of PILOT. Increase current slowly, check SLD output power and PD monitor current constantly while increasing driving current. Stop increasing SLD current immediately if you see either different output power or PD monitor current with respect to ATR, find out the reason for differences;
- continue to increase current until reaching current limit (SLD maximum current);
- if you run SLD at current less than maximum, set SLD current limit to actual SLD driving current .

HP-rated Lightsource Sets

- ensure no evident sources of > 1E-3 optical feedback are present;
- Refer to SLD module datasheet (ATR), find SLD current corresponding to 1/10 of power at maximum current (Ip01);
- set SLD stabilisation T and SLD current limit as required;
- set SLD current to Ip01;
- apply current to SLD module;
- check output power and PD monitor photocurrent (if available);
- if output power and PD monitor current at Ip01 are the same as on the Datasheet, start further increasing of SLD driving current by adjusting SLD potentiometer on front of PILOT. Increase current slowly, check SLD output power and PD monitor current constantly while increasing driving current. Stop increasing SLD current immediately if you see either different output power or PD monitor current with respect to ATR, find out the reason for differences;
- continue to increase current until reaching current limit (SLD maximum current);
- if you run SLD at current less than maximum, set SLD current limit to actual SLD driving current .

3.3. Normal use of Lightsource Set.

Once you have successfully set up the driver-controller and started the SLD module in accordance with the instructions in chapter 3 **and any other procedures specified by Superlum**, steps 3.2.1 to 3.2.12 are not necessary for 'normal use'. You can thus operate Lightsource Set by applying power to PILOT-4, verifying that PILOT settings are correct and pushing SLD on/off button twice.

During normal operation of PILOT-4, NO LEDs should be 'Red'. When LED 4 is 'Yellow' and LED 6 is 'Green' this indicates that SLD driving current has reached the current limit.

For optimum performance of the emitter it is recommended that the SLD current is as close to the current limit as possible. If actual driving current is less than set value of current limit, it is recommended to decrease current limit to have it equal to actual value of driving current.

The SLD current may be switched off by a single push of button 7. SLD module temperature is then stabilised but current is not supplied to the SLD emitter. LED 6 will NOT be lit. Push button 7 again to re-apply the set current to the SLD.

Note: in normal operation of the PILOT-4, LED 6 lights 'Red' **only** after switch-on of 9V supply. When button 7 is pressed for the first time, LED 6 will extinguish indicating that the SLD is in 'stand-by' mode. If LED 6 remains 'Red', this indicates a fault, (see 'troubleshooting' for details). A second push of button 7 is required to activate the emitter. LED 6 will now light 'Green'.

DO NOT disconnect cable connecting module mount to PILOT controller while SLD module is operating !

3.4. Switching off Lightsource Set

Push button 7 once. The SLD current is now switched off and LED 6 will extinguish. **DO NOT switch off PILOT-4 while SLD is being supplied with current – i.e. If LED 6 is 'Green'.**

Switch off PILOT-4 supply using switch 10 on the rear panel.

CHAPTER 4. Troubleshooting

	Problem	Possible cause	Possible solutions
1	LEDs 2 and 6 Are both 'Red'.	- cable is not connected. - bad connection of module in mount. - DC supply is too high in PILOT-4DC	- Check cable Connection. - Ensure module is fitted properly in mount. - Check DC supply of PILOT-4DC.
2	Current can't be applied to SLD. LED 6 **does not** light 'Green' after button 7 is pushed twice.	- Bad/broken connections in cable or between module and mount	- Check cable wiring and connection. - Ensure module is fitted properly in the mount.
3	LED 2 is not lit for a long time, (>10sec), after starting PILOT-4	- ambient temperature is outside 0 to +40°C range. - Bad connection of cable or module.	- Check the mount temperature. - Check connections on cable and module
4	During operation, SLD suddenly switches off. LED 6 goes 'Red'.	- Instability, (e.g. surges, interference or other), in supply voltage. - Poor connections of cable or module.	- Eliminate supply instability. - Check connections on cable and module
5	During operation, LED 2 goes off, the SLD immediately switches off and LED 6 goes 'Red'.	- Bad thermal contact of SLD module to mount.	- Check that the module is fixed properly in the mount and that there is no reason for bad heat dissipation from the module.

CHAPTER 5. Technical parameters

Optical parameters . See SLD module's ATR Datasheet attached

PILOT-4 supply voltage requirements

PILOT-4DC:
DC voltage……..……..9V to 10V
Supply voltage pulsations, ……20 mV max.
Maximum supply current……..2 A
9V DC connectors……4mm 'banana' type

PILOT-4AC-110:
110-115 V AC +/-10%, 50-60 Hz, 40 W;

PILOT-4AC-220:
220-230 V AC +/-10%, 50-60 Hz, 40 W;

PILOT-4 technical parameters

SLD current range…….....5mA to 400mA
Absolute setting accuracy……..+/-0.5 mA
Resolution, SLD current…….0.1mA

SLD current limit range……...5mA to 400mA
Absolute setting accuracy……+/- 1 mA
Resolution, SLD current limit……0.1mA

SLD voltage, maximum……..3V

PD monitor current range……...0 mA to 20 mA
Resolution, PD monitor current…….10µA

Thermistor range*…….....8.06 to 19.9kΩ
Thermistor setting tolerance**……5Ω
Cooler current maximum……..……1200mA

Operating temperature……,…..0°C to +40°C (no condensing)
Storage temperature…….-30°C to +70°C
Recommended warm-up time *……10 min
Warm-up time to rated accuracy**...…….1 hour

Size – PILOT4-DC……....171 x 55 x 125mm
Weight – PILOT-4AC..……..0.7kg

Size – PILOT-4AC……....171 x 55 x 220mm
Weight – PILOT-4AC..……..2 kg

* warm-up of PILOT-4 prior to connecting SLD module
** warm-up of PILOT-4 with SLD connected and driving current applied

* Thermistor type 10K3CG2 of BetaTherm Ltd. is used in SLD modules.
** corresponding to resolution of LCD display.

Typical stability of Lightsource Set output power after 1 hour warm-up ***

Short-term (15 min, T=+25 C $\pm$ 0.1 C)…<500 ppm
Long-term (3 h, T=+25 C $\pm$ 0.2 C)……<2500 ppm
*** measured at zero optical feedback. Depends on type of SLD module.

CHAPTER 6. Drawings for PILOT-4, SLDs & Mounts. Description of PILOT-4 controls & indicators.

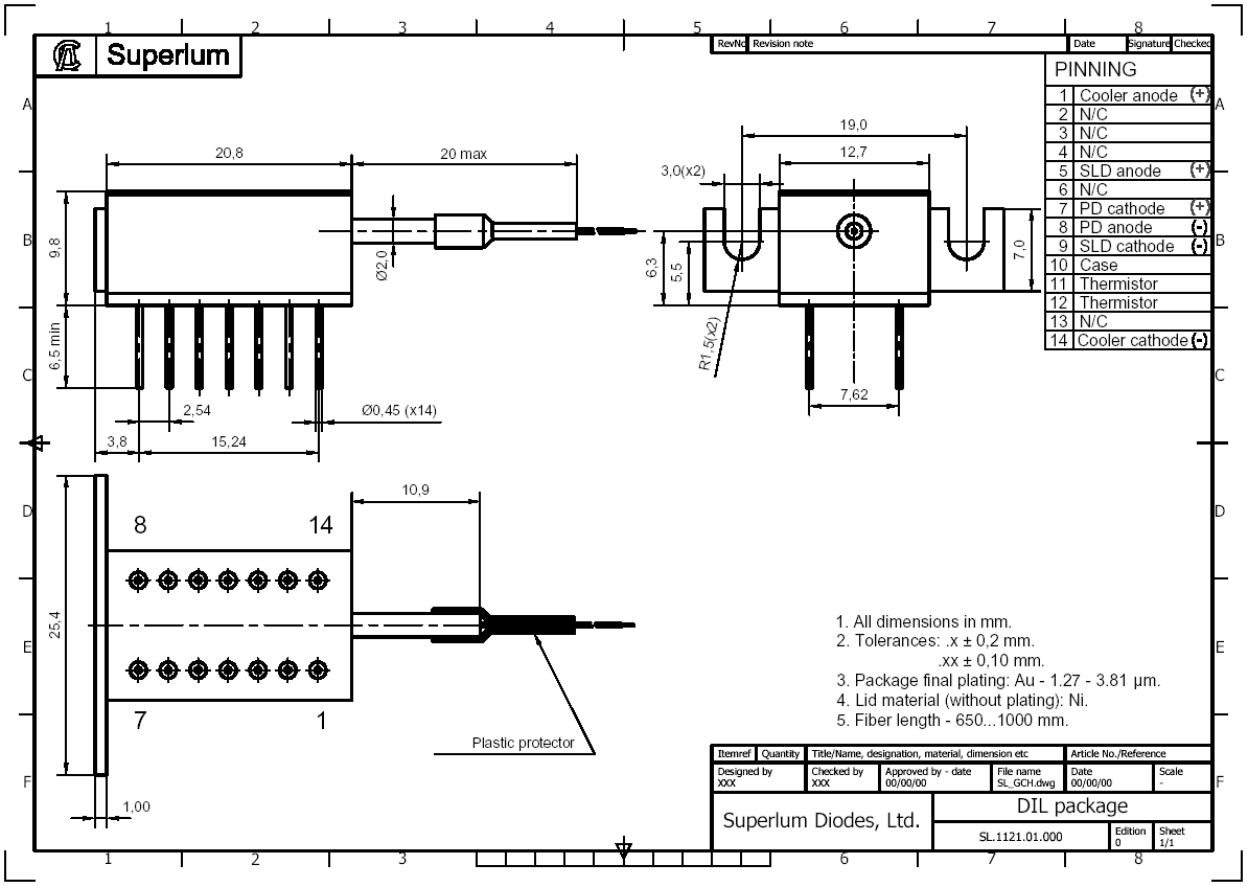


Fig.1. DIL packaged modules – outlines and pinning.

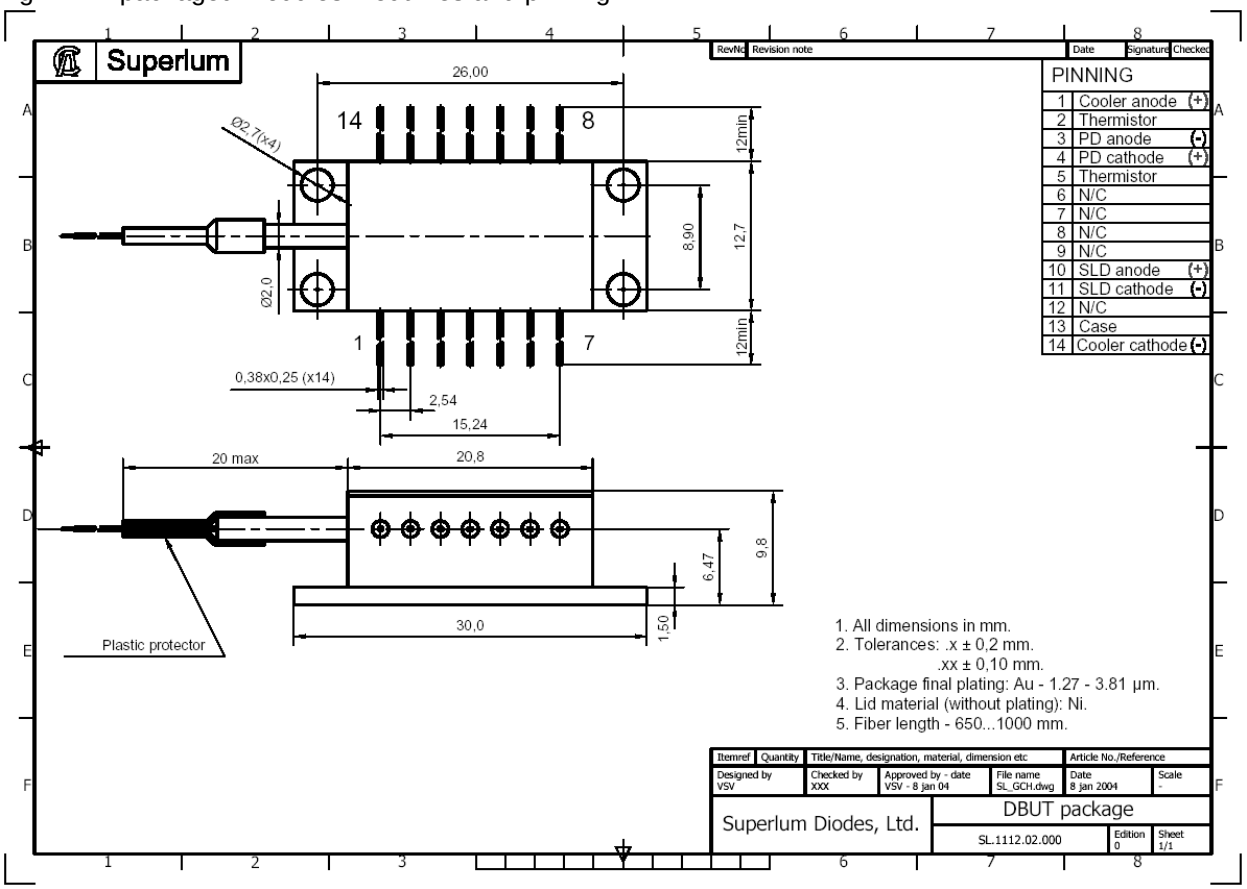


Fig.2. Butterfly (DBUT) package – outlines and pinning

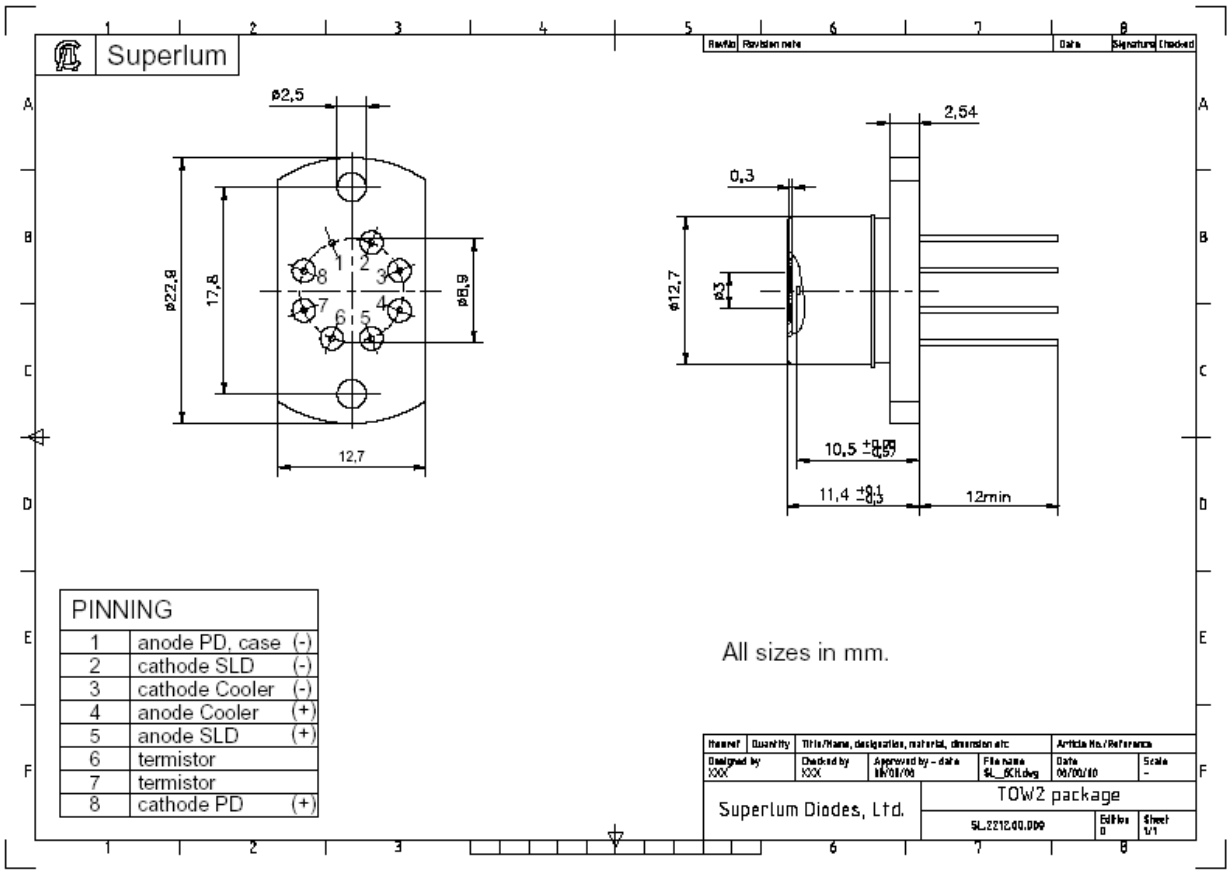


Fig.3. TOW2 package – outlines and pinning. Note that module is integrated into TOW mount (see fig.10) when shipped as part of a Lightsource Set.

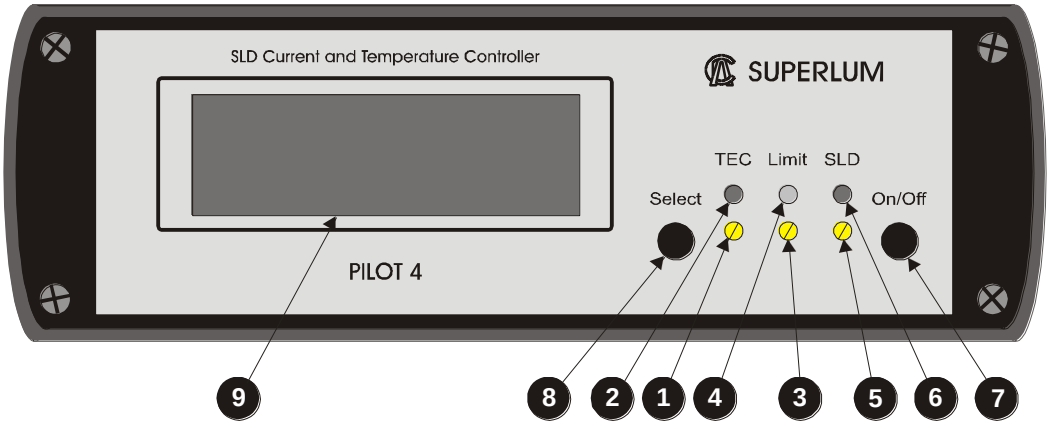


Fig.4. PILOT-4. Front panel

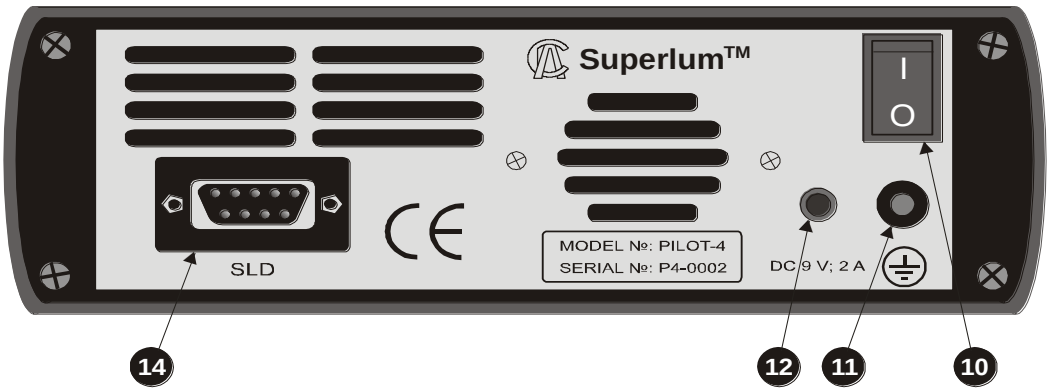


Fig.5. PILOT-4DC. Rear panel. Red connector must be connected to + of DC supply

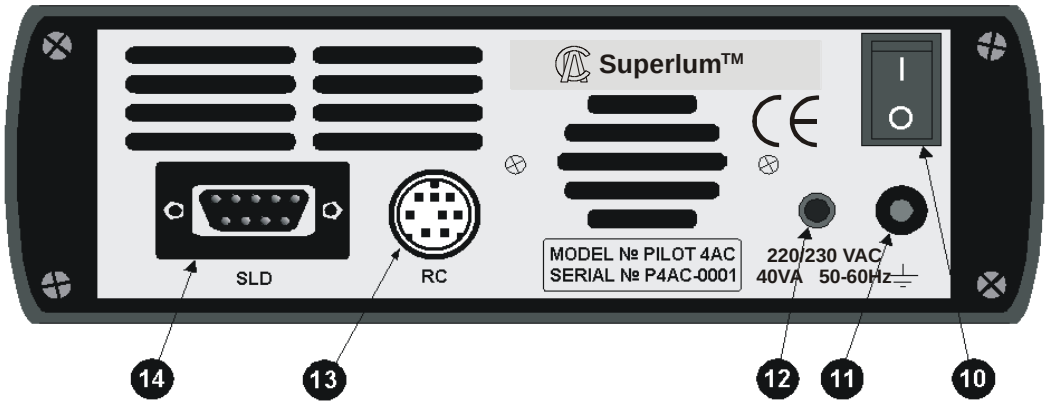


Fig.6. PILOT-4AC-220. Rear panel.

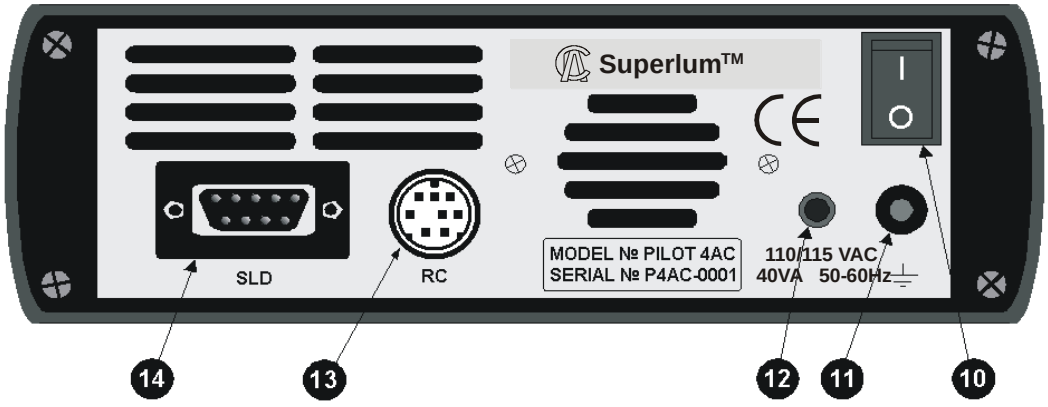


Fig.7. PILOT-4AC-110. Rear panel.

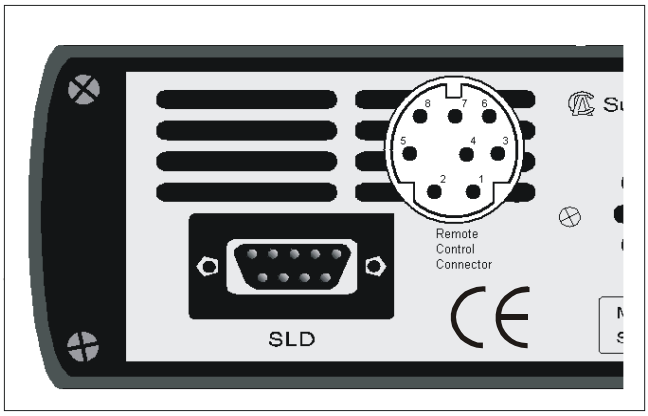


Fig.8. PILOT-4DC. Position of Remote Control Connector (optional).

Description of PILOT-4DC/AC controls & indicators shown in Figs.4-7

1 – Potentiometer to set thermistor value
2 – Temperature stabilization circuit, status LED
3 – Potentiometer to set SLD current limit
4 – SLD current limit indicating LED
5 – Potentiometer to set SLD driving current
6 – SLD emitter status LED
7 – SLD current ON/OFF button
8 – Button to select parameter to be displayed
9 – Liquid Crystal Display, (LCD)
10 – Main power ON/OFF switch (DC/AC)
11 – Protective grounding terminal
12 – Power cord
13 – RCU port (see Part VII for details)
14 – 9 pin port, (output to SLD module)

LEDs 2, 4 and 6 show system status as follows:

- LED 2 : Red – contacts to thermistor broken
  Green – temperature stabilized
  No Light – temperature is not stabilized
- LED 4 : No Light – SLD driving current is below limit
  Yellow – SLD driving current equal to current limit
- LED 6 : Red – SLD not ready
  No Light – SLD ready
  Green – SLD supplied with forward current

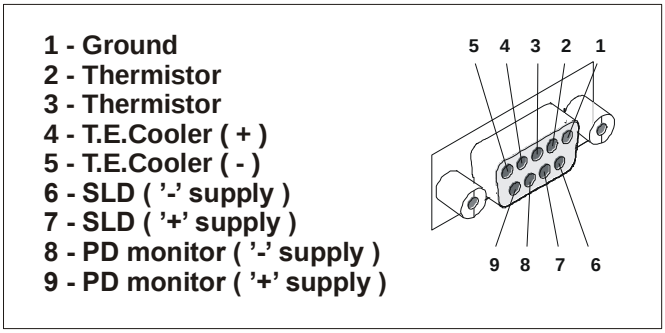


Fig.9. PILOT-4-DC and AC. Pinning of DSUB connector on back panel.

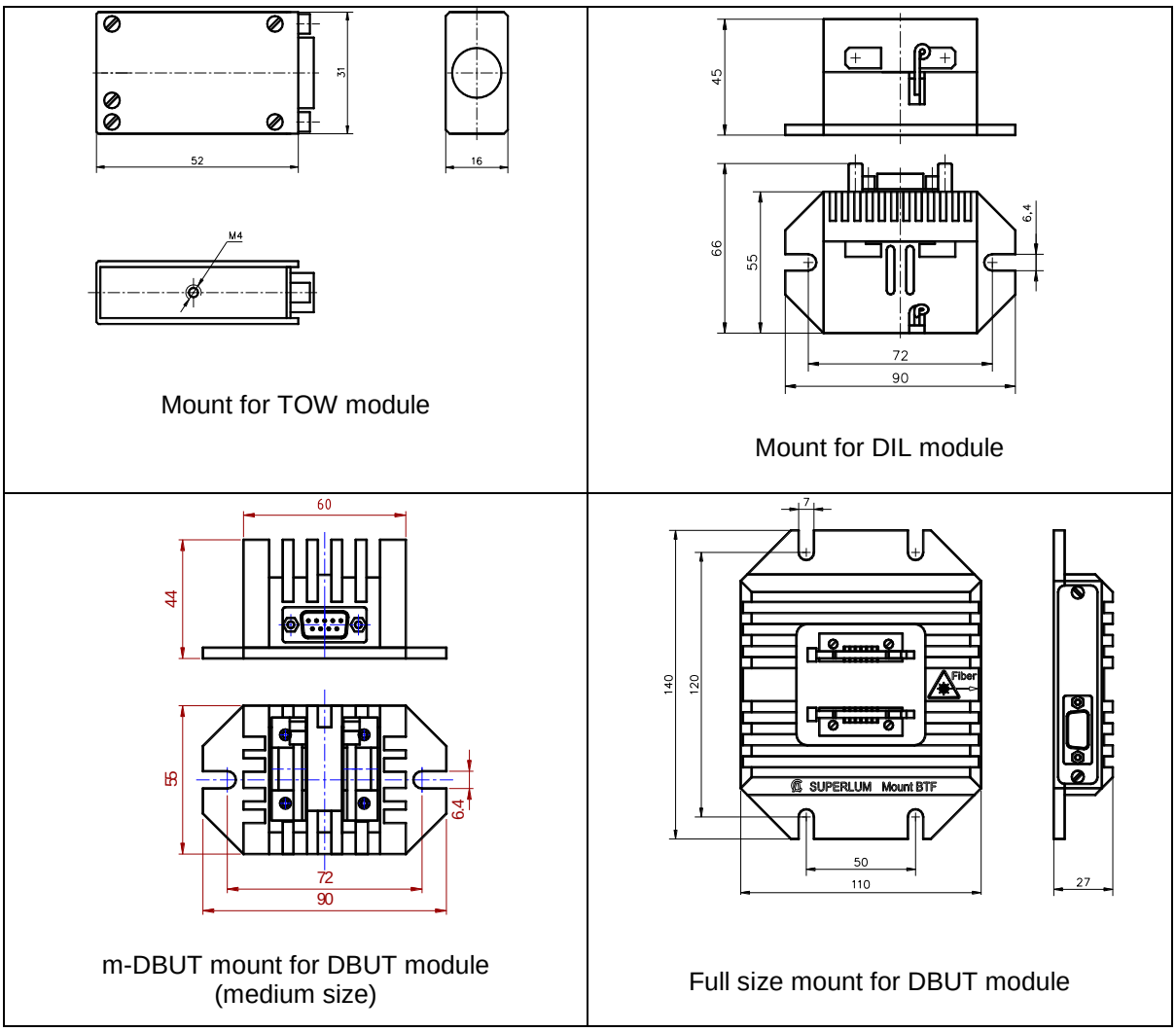
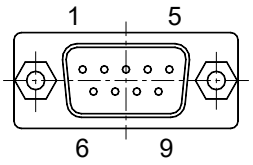


Fig.10. Mounts for SLD modules



DSUB connector pin-outs	
1	Case
2	Thermistor
3	Thermistor
4	Anode Cooler (+)
5	Cathode Cooler (-)
6	Cathode SLD (-)
7	Anode SLD (+)
8	Anode PD (-)
9	Cathode PD(+)

Fig. 11. Mount DSUB Connector pin-outs.

CHAPTER 7. Remote control unit (RCU)

7.1. Introduction

The RCU port provides remote SLD ON/OFF switching and SLD status readout. This port is fitted to all PILOT-4AC drivers and is optional for PILOT-4DC drivers. It is located at the rear of the PILOT.
Remote output and input structure schematics are shown in Fig 13. All outputs are “open collector” type. The maximum current thru output transistors is 20 mA. Maximum collector-emitter voltage is 30 Volts. The input is the LED of a high-speed optocoupler with additional 1 Kohm resistor (R16, see Fig.13).

7.2. RCU port specifications and schematics

Outputs
Outputs type……open-collector
Maximum voltage……30V
Maximum current……20 mA

Input
Input type……LED
Input current, typ……3 – 5 mA
Input current, max……10 mA

Max. cable length for ‘remote’ operation….10metres

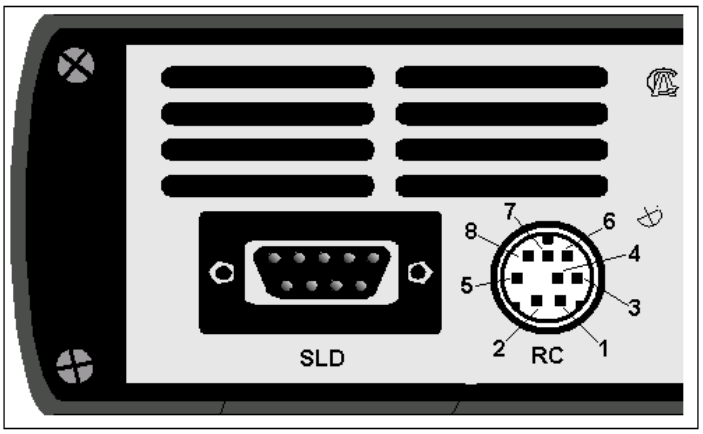


Fig.12**.** PILOT-4 RCU connector pin-outs.

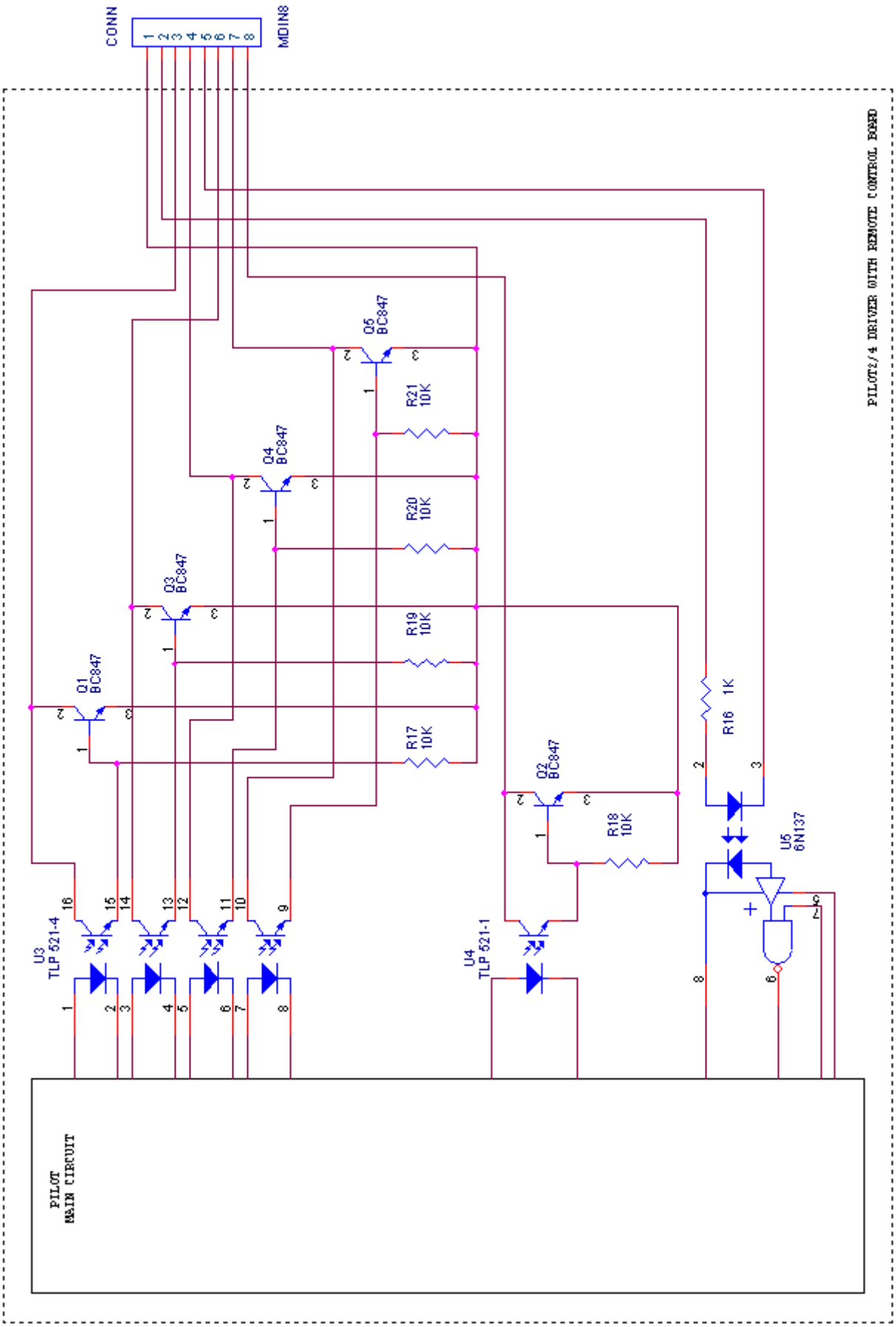
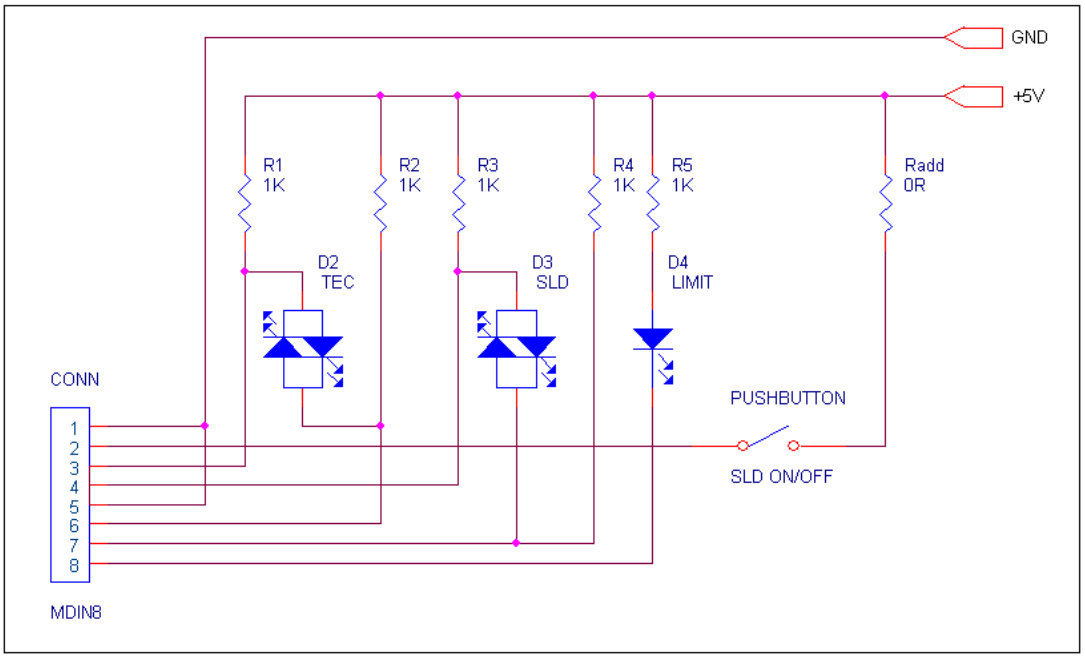


Figure 13. PILOT-4 RCU. Outputs and inputs structure.

RCU outputs states

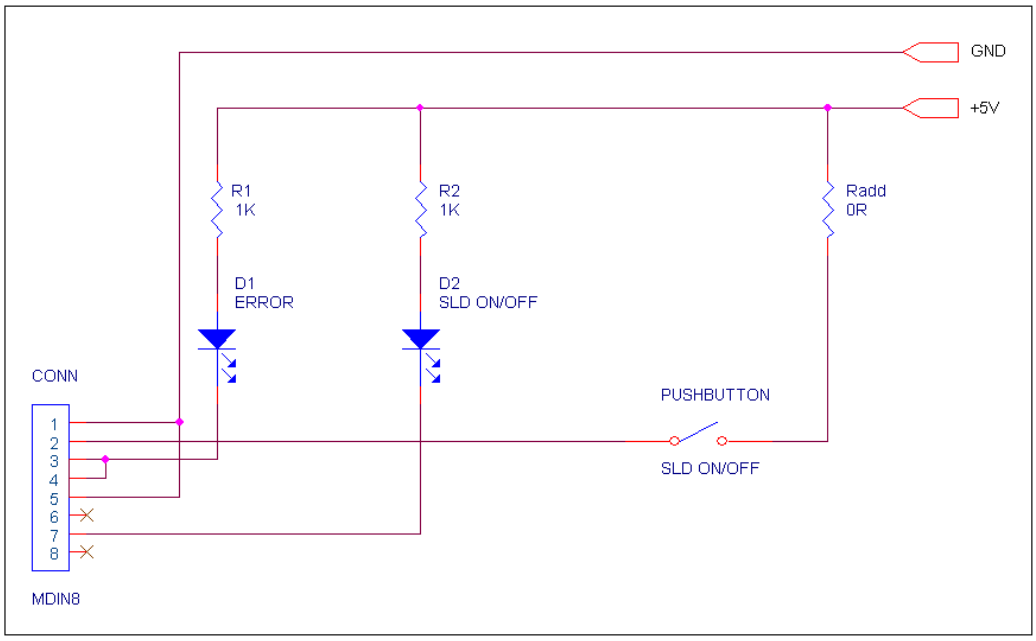
RCU output transistors state	PILOT-4 front panel state
Q1 open, Q3 closed	'TEC' led is red
Q2 open	'LIMIT' led is yellow
Q3 open, Q1 closed	'TEC' led is green
Q4 open, Q5 closed	'SLD' led is red
Q5 open, Q4 closed	'SLD' led is green

Connections example #1



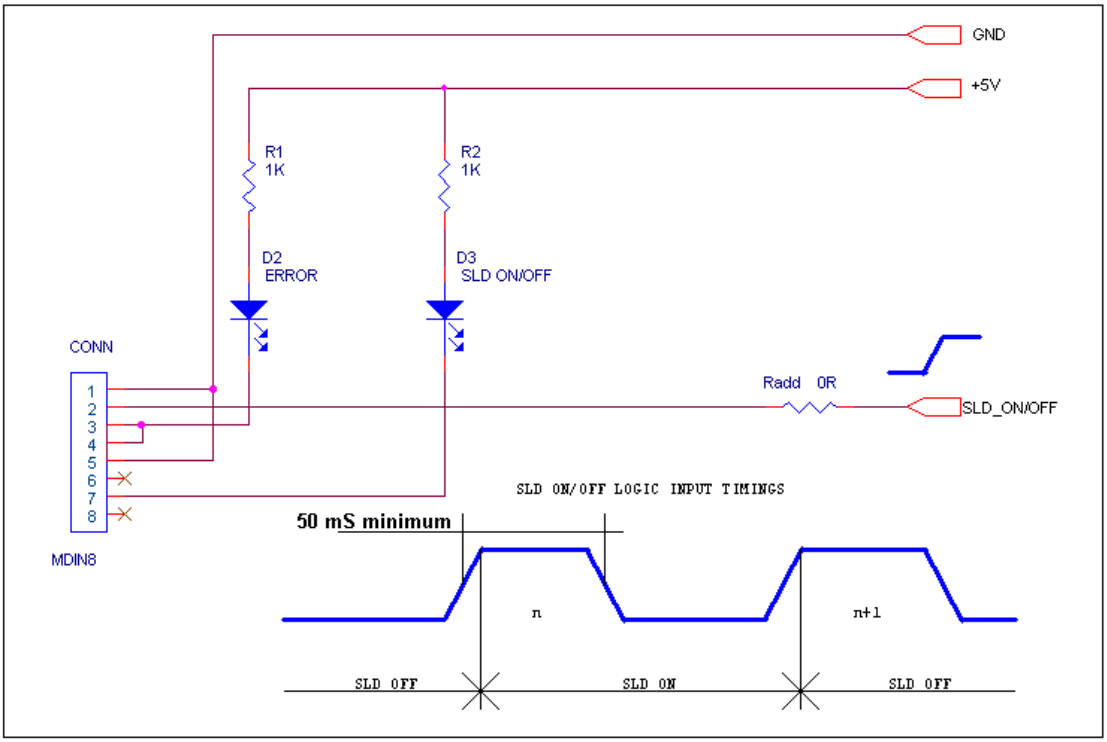
This circuit fully emulates the PILOT-4AC front panel controls and indicating LEDs.
Note: If supply voltage is higher than 5V; increase value of resistors R1-R5 and Radd.

Connection example #2



This circuit provides minimal hardware requirements for using PILOT-4's RCU
Note: If supply voltage is higher than 5V, increase value of resistors R1, R2 and Radd**.**

Connection example #3



This circuit provides SLD ON/OFF function via an external logic-level signal between common ground and "SLD_ON/OFF" input.

CERTIFICATE OF CONFORMITY

Purchase Order:		**dated**
	Your PO: 2016000200	29/01/2016

Description	Quantity	Device number(s)
Superluminescent Diode Lightsource		
Pilot-4-AC-220V	1	P42266
SLD-371-HP2-DBUT-SM-PD	1	220842
DBUT Mount + connecting cable	1	n/a

CERTIFICATE

It is certified that the products listed on this document are in conformity with specifications listed in the purchase order.

WARRANTY

All products sold by Superlum are guaranteed for a period of one year from date of delivery, against any faults caused by manufacturing errors or proven intrinsic material faults as long as the products have NOT been transformed, incorrectly installed, wrongly used or repaired by the buyer/user. Superlum will conduct analysis of the failures and undertake to repair or replace any product failing under the above mentioned conditions. Notification of any Claim under this warranty must be submitted in writing within 1 week from discovery to Superlum giving specific details of the fault. The product must be returned to Superlum not later than the expiry date of the warranty. Shipping costs incurred, are not covered by this warranty. Failure Root Cause analysis is carried out free-of-charge after warranty expiry date, shipping costs NOT included

INSTRUCTIONS & MANUALS

All Instructions and Manuals necessary for safe unpacking, installation and operation of these products are packed with the products.

February 28, 2017