Operation Manual

Thorlabs TXP Series

Laser Current and Temperature Controller

ITC5000

2004

THORLABS

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We aim to develop and produce the best solution for your application in the field of optical measurement technique. To help us to come up to your expectations and develop our products permanently we need your ideas and suggestions. Therefore, please let us know about possible criticism or ideas. We and our international partners are looking forward to hearing from you.

Thorlabs GmbH

This part of the instruction manual contains every specific information on how to handle and use a ITC5000 mainframe. A general description is followed by explanations of how to operate the unit remotely.

☝Attention☝

This manual contains "WARNINGS" and "ATTENTION" label in this form, to indicate dangers for persons or possible damage of equipment.

Please read these advises carefully!

1 General description

1.1 Safety

☝ Attention ☝

All statements regarding safety of operation and technical data in this instruction manual will only apply when the unit is operated correctly.

Laser modules or coding sockets may only be installed or removed with the corresponding diode controller switched off.

Modern electronics and laser diodes mostly are sensitive to electro-static discharges. Please take precaution to discharge your body before changing cards or lasers and apply the general rules for handling MOS devices!

This precision device is only dispatchable if duly packed into the complete original packaging including the plastic form parts. If necessary, ask for a replacement package.

☝ Attention ☝

Laser modules which you use with the ITC5000 can deliver up to several 100mW of (maybe) invisible laser radiation!

When operated incorrectly, this can cause severe damage to your eyes and health!

Be sure to pay strict attention to the safety recommendations of the appropriate laser safety class!
This laser safety class should be marked on your laser module.

1.2 Warranty

Thorlabs GmbH warrants material and production of the ITC5000 for a period of 24 months starting with the date of shipment. During this warranty period *Thorlabs GmbH* will see to defaults by repair or by exchange if these are entitled to warranty.
For warranty repairs or service the unit must be sent back to *Thorlabs GmbH (Germany)* or to a place determined by *Thorlabs GmbH* . The customer will carry the shipping costs to *Thorlabs GmbH ,* in case of warranty repairs *Thorlabs GmbH* will carry the shipping costs back to the customer.
If no warranty repair is applicable the customer also has to carry the costs for back shipment.
In case of shipment from outside EU duties, taxes etc. which should arise have to be carried by the customer.

Thorlabs GmbH warrants the hard- and software determined by *Thorlabs GmbH* for this unit to operate fault-free provided that they are handled according to our requirements. However, *Thorlabs GmbH* does not warrant a faulty free and uninterrupted operation of the unit, of the soft- or firmware for special applications nor this instruction manual to be error free. *Thorlabs GmbH* is not liable for consequential damages.

Restriction of warranty

The warranty mentioned before does not cover errors and defects being the result of improper treatment, software or interface not supplied by us, modification, misuse or operation outside the defined ambient conditions stated by us or unauthorized maintenance.

Further claims will not be consented to and will not be acknowledged. *Thorlabs GmbH* does explicitly not warrant the usability or the economical use for certain cases of application.

Thorlabs GmbH reserves the right to change this instruction manual or the technical data of the described unit at any time.

1.3 Features

1.3.1 Safety measures for the laser diode and the TEC element

To protect the connected laser diodes and the TEC elements the combi controller ITC5xxx contains the following protection circuits:

- **Softstart when switching on the laser diode current**
  Protection against capacitive and inductive parasitic elements (switching peaks).

- **Software limit for the injection current and the TEC element in all operating modes**
  Protection against thermal destruction of the devices.

- **Interruption control of the connection cable to the laser diode (interlock)**
  Protection against accidental operation.

- **Contact protection of the laser diode (open circuit)**
  Protection against cable damage or bad contact.

- **Electronic short-circuit switch for the laser diode**
  Protection against static discharge when touching the switched off laser.

- **Protection of the sensor**
  Protection against the use of an wrong temperature sensor / protection against line interruption to the temperature sensor.

- **Separate on and off function for each module**
  Protection against operating errors.

- **Separate over-temperature protection for each module**
  Protection against thermal failure of the module.

- **Control LED for the laser and/or TEC current active**

- **Mains filter**
  Protection against line transients and interferences.

- **Line failure protection**
  In case of line failure/line damage the combi module must explicitly be switched on anew since it cannot be taken for granted that all components of the measurement setup are still working faultlessly.

- **Action check**
  After power up the combi modules are in LASER OFF mode.

- **LabVIEW®- and LabWindows/CVI®-driver**
  For the TXP-series cards *Thorlabs* supplies LabVIEW®- and LabWindows/CVI®-drivers for MS Windows 32, MSVC and Borland-C.

  .Please refer to our homepage for the latest driver updates.
  http://www.thorlabs.com

1.3.2 Ordering Codes:

ITC5022	± 200 mA module with 15-pin D-Sub connector
ITC5052	± 500 mA module with 15-pin D-Sub connector
ITC5102	± 1 A module with 15-pin D-Sub connector

1.3.3 General functions

The combi modules ITC5xxx are bipolar current sources for laser diodes combined with a thermoelectric controller. The different module types operate the same way, they only differ in maximum current, resolution and accuracy.

The combi modules ITC5xxx contain a transimpedance amplifier input for the monitor diode (input impedance 0 Ω). Both polarities of the monitor diode are allowed. The monitor diode may be operated either photovoltaic (without bias voltage) or photoconductive, i.e. with bias voltage.

With the modules ITC5xxx, the laser diode current in constant current mode, the monitor diode current in constant power mode, and temperature or thermistor resistance are set with a resolution of 16 bit.

The limit values for the laser diode current (software limit), the monitor diode current (limiting the optical output power) and the limit value for the TEC current (software limit) are set with a resolution of 12 bit. The monitor diode current, the actual temperature and actual resistance are read back with 16 bit, the laser diode current, laser diode voltage, the limit for the laser diode current (hardware limit), the TEC current and TEC voltage with 15 bit plus sign.

The P-, I- and D-share of the analog control loop are set via three independent 12 bit D/A converters.

1.4 Technical data ITC5000 Series

(All technical data are valid at 23 ± 5°C and 45 ±15% humidity)

Common technical data:

Safety functions Laser Diode:

Softstart
Short Circuit when off
Laser current limit
Global interlock
Individual Interlock
Switch off when open
Overtemperature protection
Temperature window operation

Safety functions TEC:

Compliance voltage warning
TEC Current-limit
Switch off with no sensor

Laser-Voltage Measurement

Measurement Principle	4-Wire
Measurement Range	0 … 4 V
Resolution	0.15 mV
Accuracy	±5 mV

Laser Power Control

Photo Current control range	10 µA … 5 mA
Resolution	0.1 µA
Accuracy	±0.1 % (2 µA)

Temperature Control

Control Range	-1.5 A … +1.5 A
Compliance Voltage	> 3.5 V
Maximum Output Power	5.25 W
Measurement Resolution I_{TEC}	0.06 mA
Measurement Range U_{TEC}	- 4 … +4 V
Measurement Resolution U_{TEC}	0.15 mV
Noise and Ripple (typ.)	< 1 mA

TEC Current Limit	
Adjustment Range	0 … > 1.5 A
Resolution	0.5 mA
Accuracy	± 0.02 A
Thermistor Sensor	
Operating Range	0.2 … 40 kΩ
Resolution	0.8 Ω
Accuracy	± 10 Ω
Stability (60 min)	1 Ω
Control Loop	
Digitally controlled analog PID; setting resolution	12 Bit
Temperature Window	
Adjustment range	0.01 … 2 kΩ
Internal Modulation	
Waveform	Sine
	Square
	Triangle
Frequency	0.02 … 20 kHz
Card	
Operating temperature	0 … +40 °C
Width	1 Slot
Warm-up time	< 10 min
Storage temperature	- 40 … + 70 °C
Dimensions(W x H x D)	25 x 130 x 270 mm^3
Weight	675 g

1.4.1 Technical Data ITC5022

Laser Current Range	0 … > 200 mA
Compliance Voltage	> 2.5 V
Setting Resolution	4 µA
Accuracy	± 0.05 % (100 µA)
Noise	< 2µA
Ripple	< 0.5 µA
Transients (µP)	< 15 µA
Transients (other)	200 µA
Drift (15 sec)	< 1µA
Drift (60 min)	< 1.5 µA
Drift (24 h)	< 2 µA
Temperature Coefficient	< 50 ppm / °C
Current Limit Range	0 … > 200 mA
Resolution	50 µA
Accuracy	± 200 µA

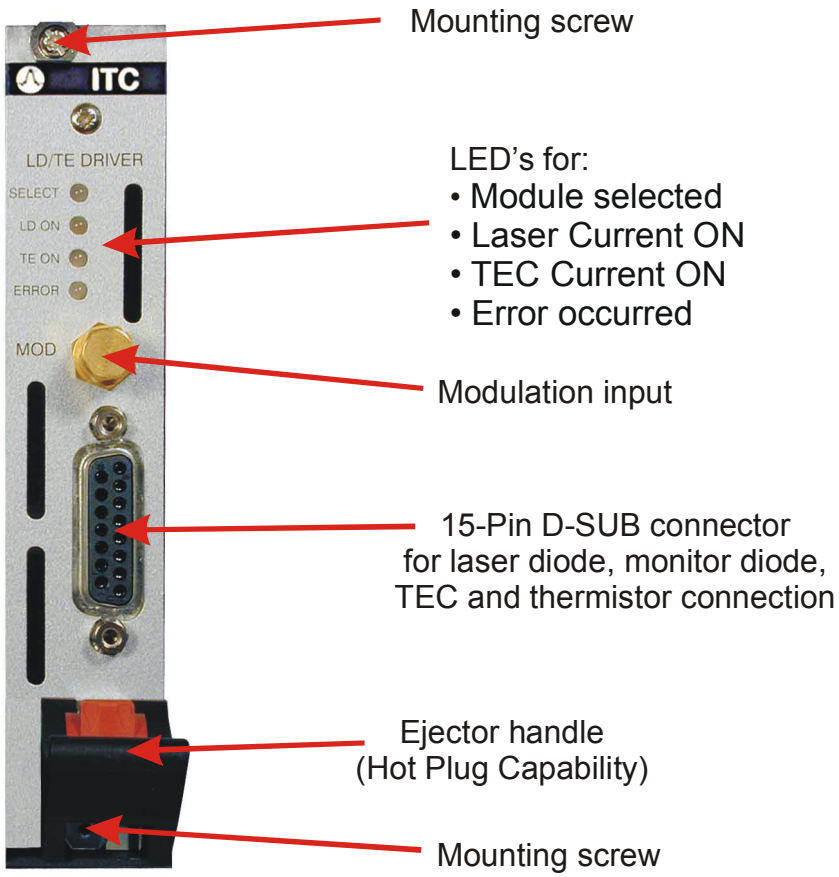
1.4.2 Technical Data ITC5052

Laser Current Range	0 … > 500 mA
Compliance Voltage	> 2.5 V
Setting Resolution	8 µA
Accuracy	±0.05 % (0.25 mA)
Noise	< 5 µA
Ripple	< 0.5 µA
Transients (µP)	< 30 µA
Transients (other)	500 µA
Drift (15 sec)	< 1 µA
Drift (60 min)	< 2 µA
Drift (24 h)	< 4 µA
Temperature Coefficient	< 50 ppm / °C
Current Limit Range	0 … >500 mA
Resolution	125 µA
Accuracy	±500 µA

1.4.3 Technical Data ITC5102

Laser Current Range	0 … > 1 A
Compliance Voltage	> 2.5 V
Setting Resolution	20 µA
Accuracy	±0.1 % (1 mA)
Noise	< 10 µA
Ripple	< 0.5 µA
Transients (µP)	< 50 µA
Transients (other)	1 mA
Drift (15 sec)	< 2 µA
Drift (60 min)	< 4 µA
Drift (24 h)	< 8 µA
Temperature Coefficient	< 50 ppm / °C
Current Limit Range	> 0 … 1 A
Resolution	250 µA
Accuracy	±2 mA

1.5 Operating elements at the front of the card



1.6 Installing and removing cards

The Thorlabs TXP series mainframes are 'Hot-Plug capable', that means you do not have to switch off the mainframe while exchanging cards:

- Loosen the two mounting screws on top and below the ejector handle
- Push the red button of the ejector handle and flip down the black ejector handle

This pulls out the card from its internal plug.
You can now remove the card. If you do not insert another card, please close the empty slot with a blind module to maintain a proper cooling air flow inside of the unit.
Re-tighten the two screws.

1.7 Connecting components

Mostly the following components are installed together with the laser:

- Laser diode
- Monitor diode
- TEC element for chip temperature control
- Temperature sensor (thermistor)

The laser diode and the TEC element are always sourced relative to ground by the combi module.
This is of considerable advantage regarding the safety of devices and stability of currents.

The monitor diode input is a trans-impedance amplifier input with virtual ground (input impedance 0Ω).

The monitor diode input can be operated without or with bias voltage (0 V...4 V). The polarity for the monitor diode must be set correspondingly.

A missing thermistor is detected by the ITC5xxx.

1.7.1 Pin assignment ITC5xxx

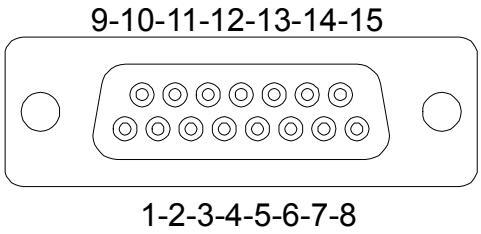


Figure 1 ITC5xxx-15pin D-SUB I/O jack (female)

PIN	Name	Function
8	TEC-	TEC minus (ground)
7	TEC +	TEC plus
6	UTEC +	TEC Voltage measurement +
13	UTEC -	TEC Voltage measurement -
14	TH-	Thermistor ground
15	TH+	Thermistor
11	LDA	Laser diode anode
3	LGND	Laser diode ground
10	LDK	Laser diode cathode
2	PD_GND	Monitor diode ground / Bias ground
4	PD_BIAS	Monitor diode anode or cathode, Bias out
9	ULD –	Laser diode voltage measurement
12	ULD +	Laser diode voltage measurement
1	LED_ILK	Interlock / Status LED
5	DGND	Interlock ground

We recommend to use separate lines drilled in pairs (twisted pair) in a common shield for laser diode current, monitor diode current, TEC voltage and laser voltage measurement. The shield has to be connected to ground (pin 3).

If an external monitor diode is used, it must be connected by a coaxial cable with the outer conductor (shield) to pin 2 and the inner conductor to pin 4.

NOTE

To operate the ITC5000 card, the global interlock at the rear panel of the TXP must be closed!

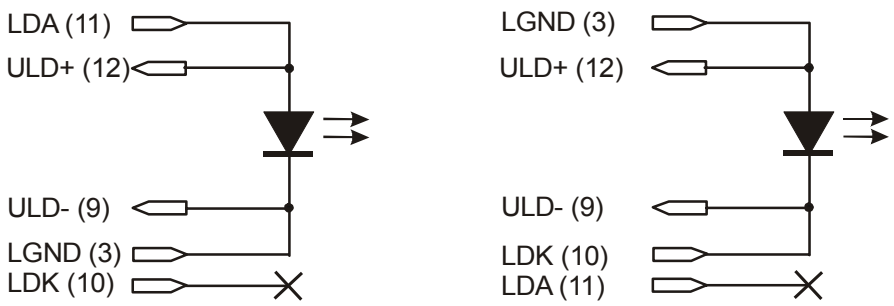
1.7.2 Connecting the Laser diode

Connect laser and monitor diode to the connector of the ITC5xxx.

The wires for voltage measurement of the laser diode (pin 12 and pin 9) should be connected as close as possible to the laser diode to avoid measurement errors.

The ground conductor of the monitor diode (pin 2) may be connected to the ground conductor of the laser diode (pin 3). If this is necessary (e.g. with laser diodes with integrated monitor diode and shared ground connector) the ground conductors should be connected as close as possible to the laser diode to avoid measurement errors when measuring the monitor diode current.

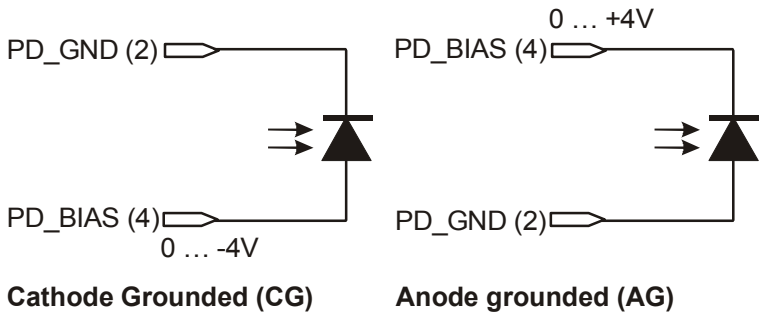
The following pin assignments of the output jack are possible:
(shown with voltage measurement)



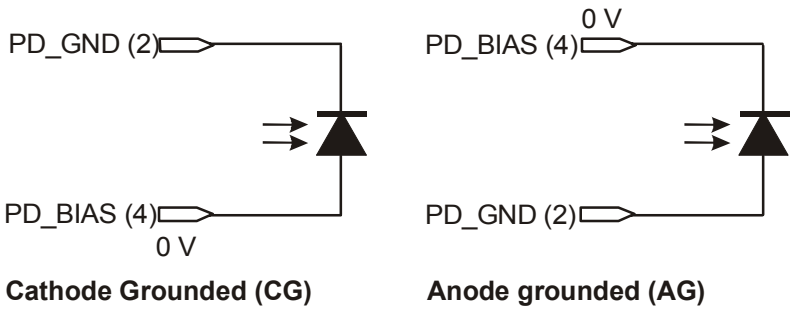
Cathode Grounded (CG) **Anode grounded (AG)**

Figure 2 Connecting the Laserdiode

1.7.3 Connecting the Monitor diode



Monitor Diode with Bias



Monitor Diode without Bias

Figure 3 Connecting the Monitor Diode

☝ Attention ☝

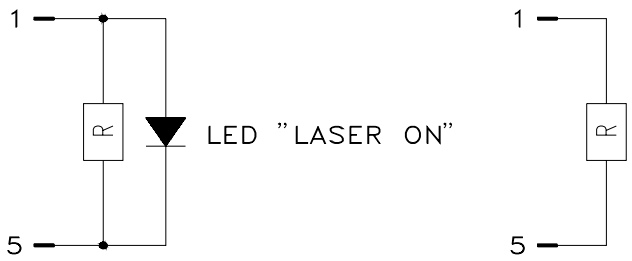
Check the polarity of your monitor diode before switching the bias voltage on!

A forward biased diode leads to a strong current in the diode which may destroy the unit!

1.7.4 Connecting interlock and status LED

Pin 1 and pin 5 of the connector jack serve as safety connectors to determine whether the current output for the laser diode may be switched on. A short-circuit or at least a low resistance (R<430 Ω) must be maintained between the two pins.
With the contacts open or resistance too high the current module cannot be switched on. Should the interlock contact open during operation the output will be switched off immediately.

Status display
It is also possible to use a LED with a 0.5 kΩ resistor in parallel between the two pins. The LED will light if the laser current output is switched on.
Here are the two possibilities for the pin assignment:



about 0.5 kΩ <430 Ω

NOTE

Using a resistor above 430 Ω- without LED (or if the LED is incorrectly poled) may lead to malfunction as the status of the interlock is then undefined.

1.7.5 Connecting the thermistor

The thermistor is connected between pin 14 and pin 15, no polarity is given.

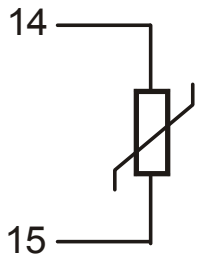


Figure 4 Connecting the thermistor

1.7.6 Connecting the TEC element

Connect the TEC element to pins 7 and 6 (**+**) and the pins 8 and 13 for (**-**).

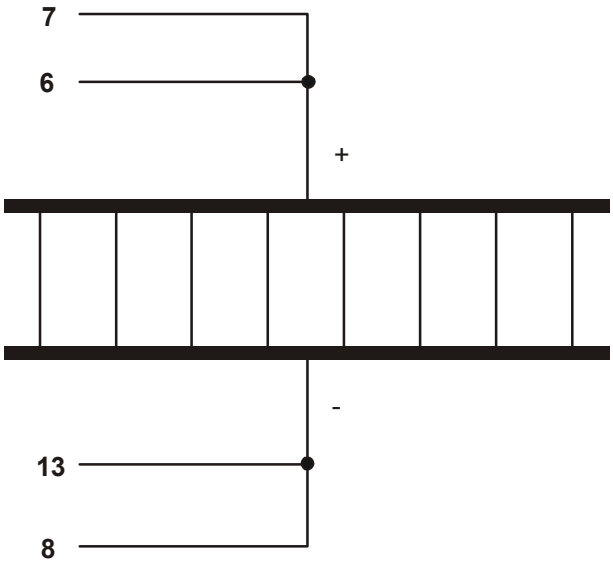


Figure 5 Connecting the TEC

Attention

An reverse poled TEC element may lead to thermal runaway and destruction of the connected components.

2 Getting Started

This section gives a quick introduction how to operate the ITC5000.

2.1 Preconditions

1. Precondition: you have installed and initialized the connection between the TXP and your PC according to the manual of the corresponding TXP mainframe.
2. You have installed the card specific software driver (is normally installed together with the TXP Administrator and TXP Explorer. If not, insert the CD-ROM delivered with the TXP / card into your CD-ROM drive. If the 'autorun' function is active on your PC, the installation program should start automatically. If not start the program 'TXP Suite.exe' on the CD. The installation wizard leads you through the installation process. When it comes to the type of installation, select 'custom'. Then mark the components for the ITC modules and finish the installation.
3. Insert the ITC5000 card in your TXP mainframe (see 1.6 Installing and removing cards).
4. Connect a laser diode or a laser diode mount to the ITC by means of the CAB430 or a self built cable according to chapter 1.7, 'Connecting components'.
5. Switch on the TXP

The TXP system is now ready for operation and you can start the card specific graphics user interface (GUI).

2.2 The Graphics User Interface (GUI)

2.2.1 Start the GUI

To start the graphics user interface you have two possibilities:

1. Use the TXP Explorer or
2. Directly start the program: TXP_ITC.exe (double-click on 

)

1) Start the TXP-Explorer and connect to the desired mainframe  . You will get a system overview of the selected TXP mainframe (all TXP-Explorer details are explained in the mainframe manual):

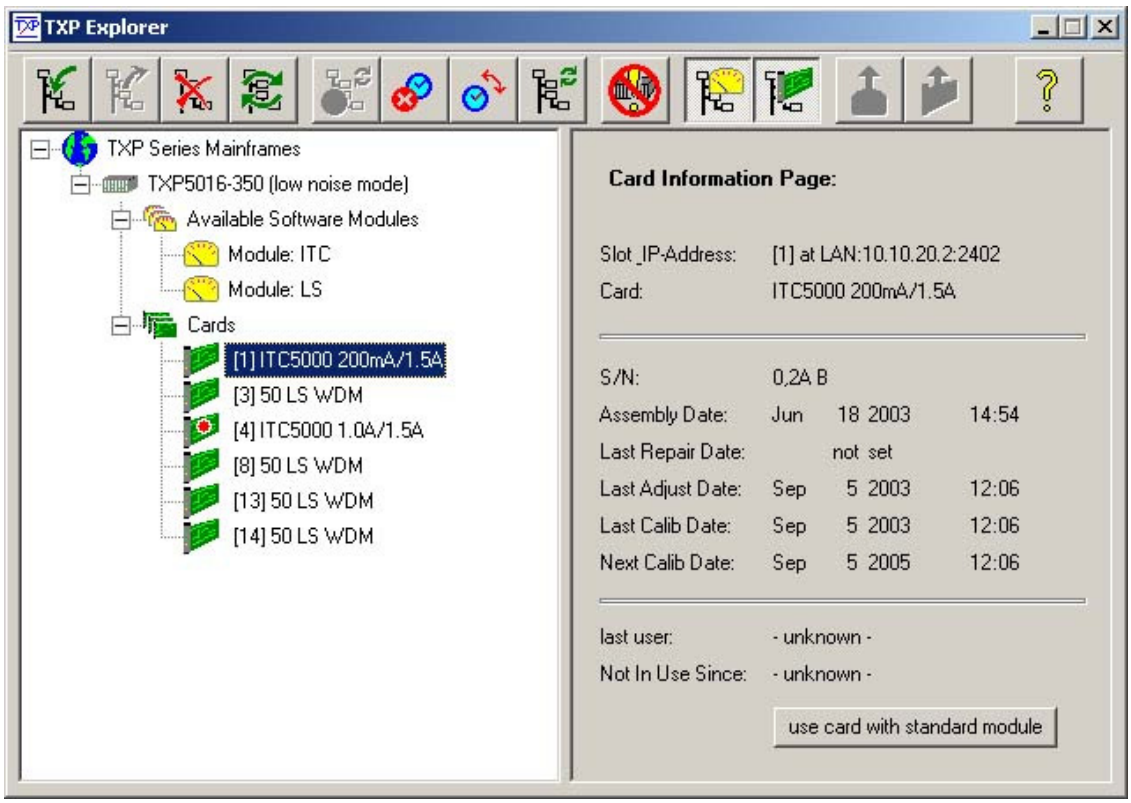


Figure 6 The TXP Explorer Window

Now select the module you want to control (here shown in slot [1]) and launch the ITC specific operating program by clicking the button 'Use card with standard module'.

Now the card specific operating software starts (TXP_ITC.exe):

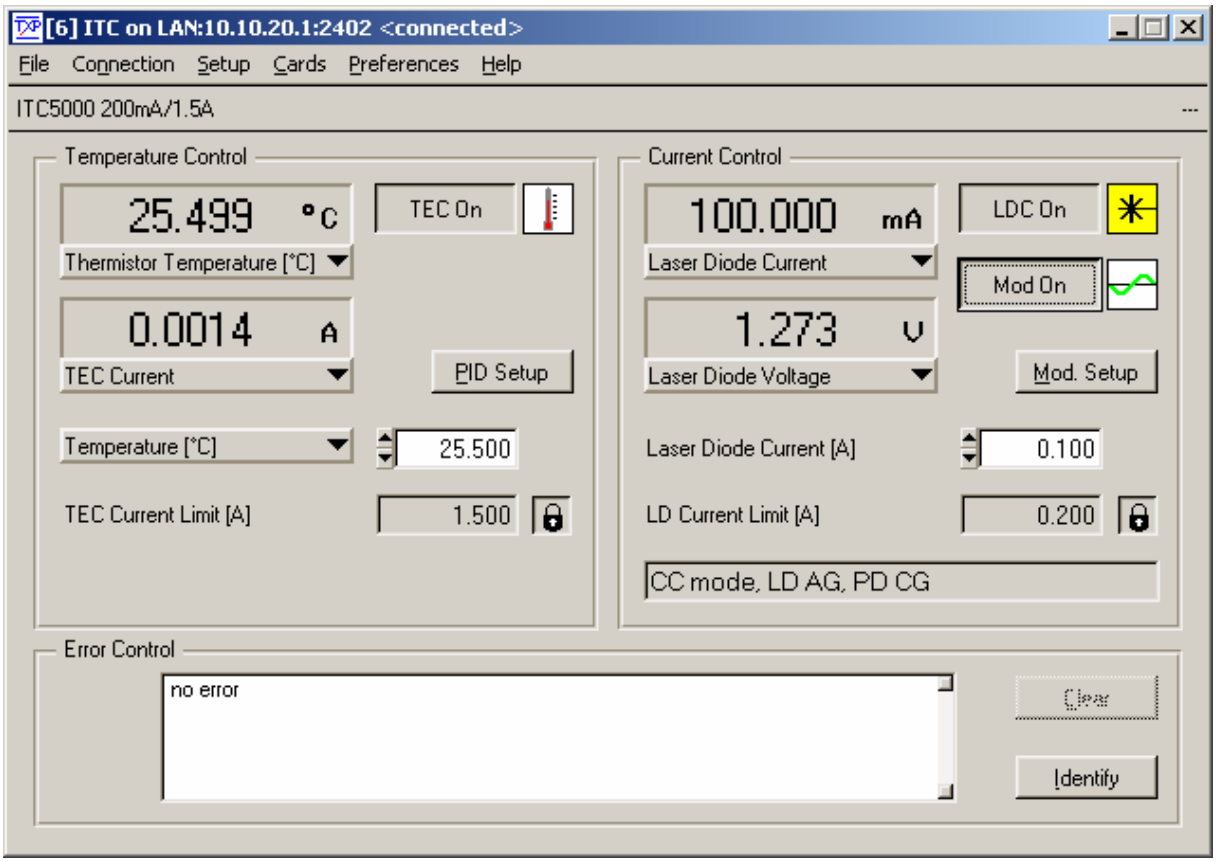


Figure 7 The ITC5000 GUI Surface

Alternatively:

2) Start TXP_ITC:exe directly.

In this case you must connect to the desired card in the corresponding mainframe through the 'Connection' menu. Clicking 'Connect' opens the selection window for the mainframe IP-address (see Figure 8). If necessary (ask your system administrator) also enter the port-number and a timeout-value in the 'advanced' section (see Figure 9).
Click 'OK' and the program will yield a selection of all possible ITC cards, which are accessible. Not shown are cards, which are in use by another program / operator.
(See Figure 10). Select the card you want to use and confirm with 'OK'. You are now connected to this specific card and can operate it in the main window (Figure 7).

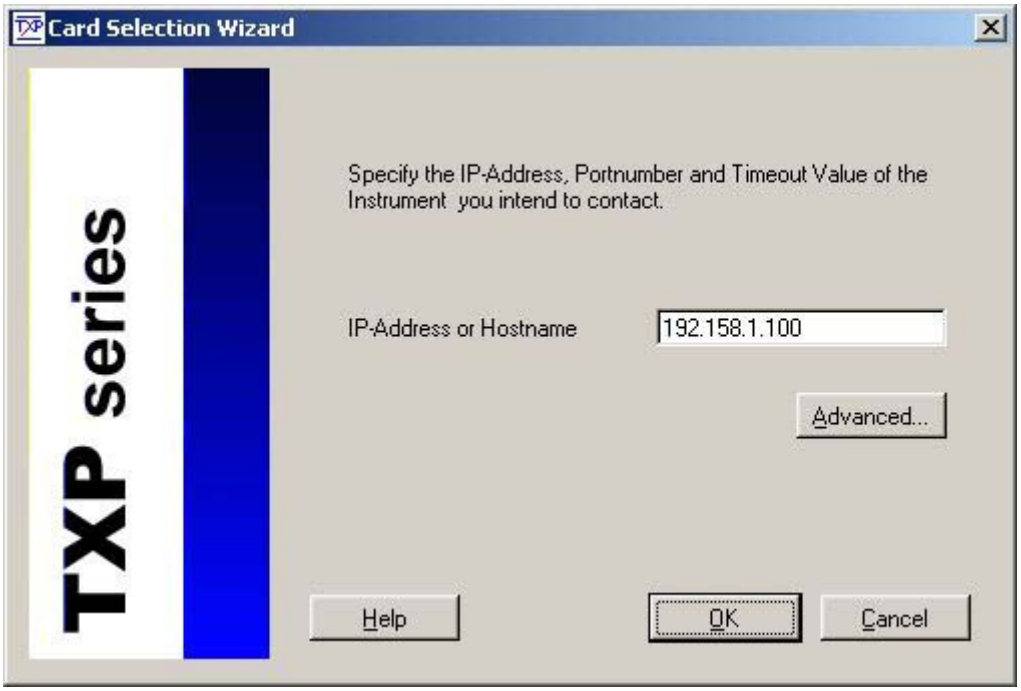


Figure 8 Select the IP-Address

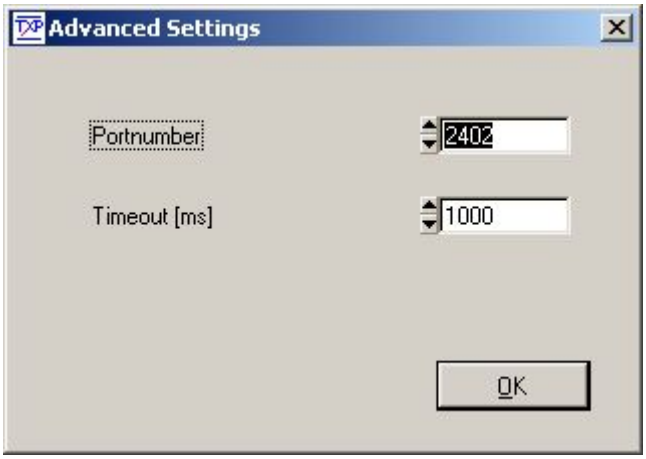


Figure 9 Select Port number and Timeout

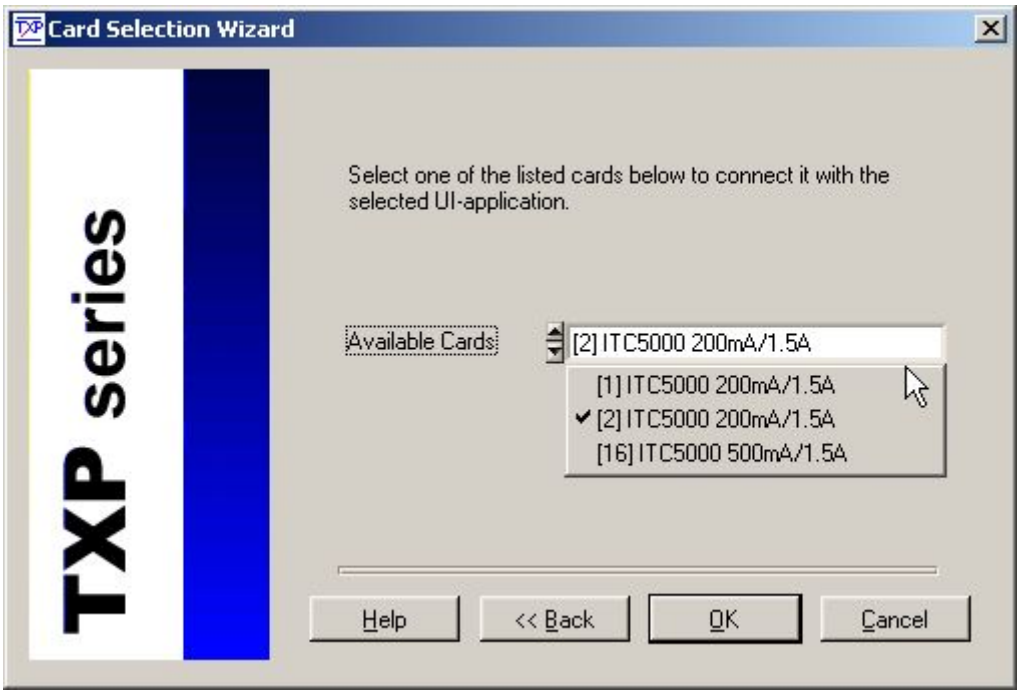


Figure 10 The card selection window

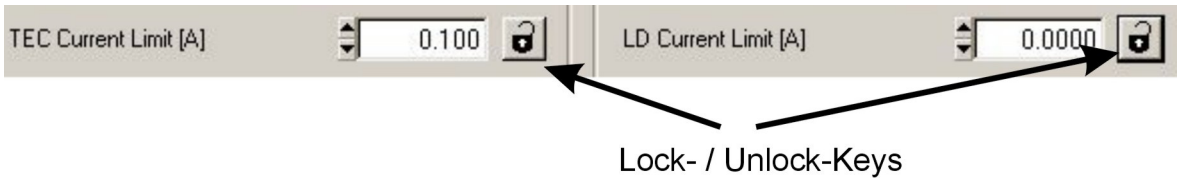
☝Attention☝

Before switching on any currents, you must properly configure your settings:
Current Limit values, Laser diode polarity, Operating mode, Photodiode polarity and a possible bias.

Wrong settings can destroy your Laser Diode!

2.2.2 Set limit values

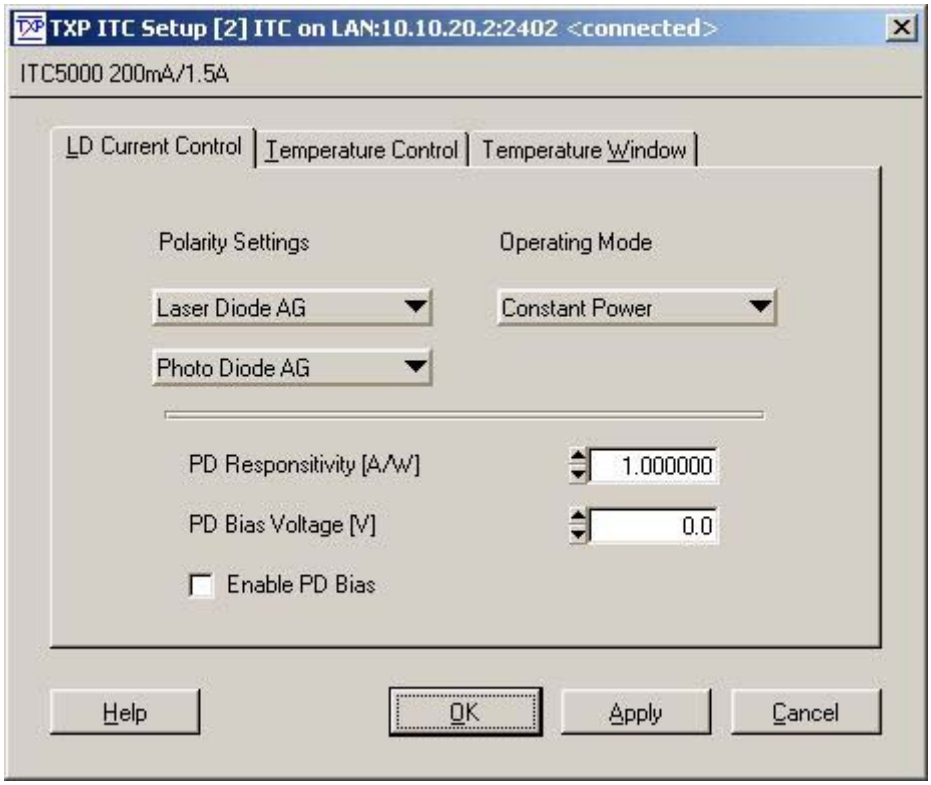
Before starting any further operation of the card, you should set the limit values to not endanger your laser diode!



Unlock the two fields for TEC Current limit and Laser Diode Current limit, and enter the maximum allowable values for both (please refer to the data sheet of your laser diode / laser diode mount). Do not forget to lock these fields again.

2.2.3 Set the Laser- and Photodiode polarities and the operating mode

In the drop-down menu ‘Setup’, select ‘LD Current Control’.

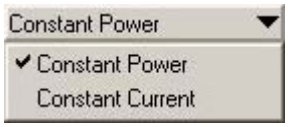


Select the correct polarity of your Laser- and Photodiode by selecting the corresponding field:

Do not forget to set your laser diode mount also to the desired polarity!
If your Photo Diode needs a bias voltage, checkmark the field ‘Enable PD Bias’ and enter the desired Bias voltage.

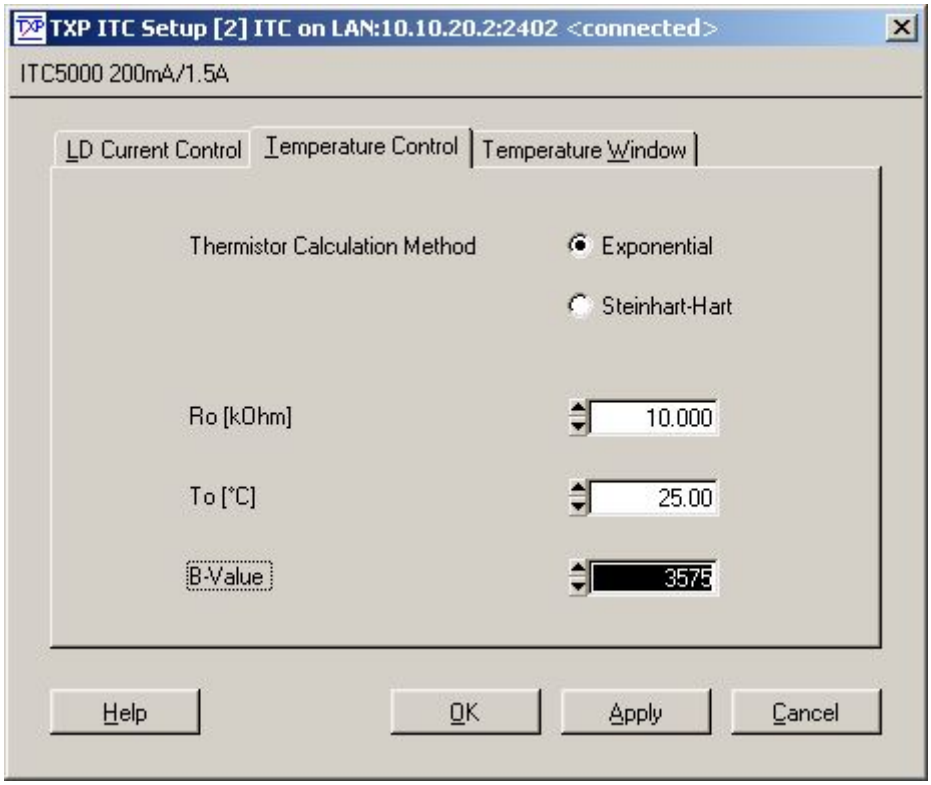
To obtain a correct power display, enter also the given calibration factor of the photo diode.

Now set the intended operating mode, Constant Power (CP) or constant Current (CC).



2.2.4 Change the temperature control Settings

In the drop-down menu ‘Setup’, select ‘Temperature Control’.

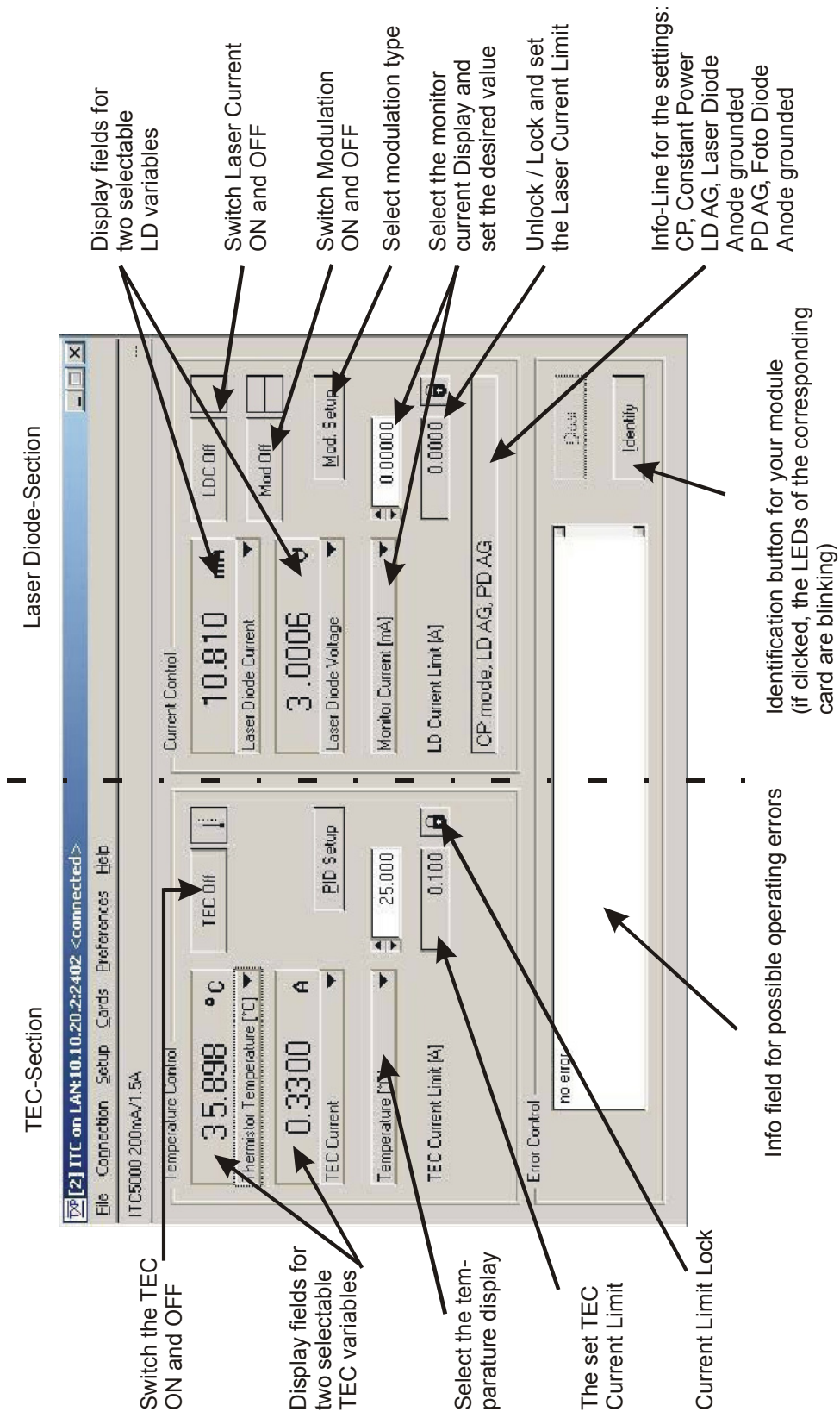


Depending on the thermistor used, the calibration coefficients are given in exponential form or as ‘Steinhart-Hart’-Parameters. Select the corresponding form and enter the calibration coefficients (given in the data sheet of the thermistor / Laser Diode).

Now you are ready to operate your laser diode.
Enter the desired values for laser current or power and for the operating temperature.
Then you can switch on the TEC and the laser diode.

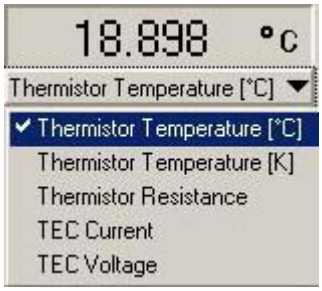
3 List of all Operating items

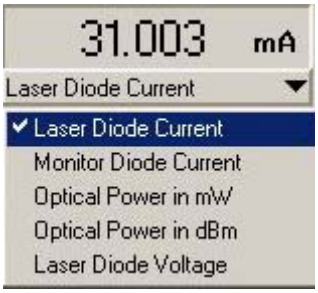
3.1 Operating elements in the main window



3.1.1 Select the Display Variables

In the TEC part of the main-screen as well as in the Laser Diode part, you can simultaneously select and watch two operating parameters.





For the TEC:

- The thermistor temperature in °C, recalculated from its resistance
- The thermistor temperature in K, recalculated from its resistance
- The thermistor resistance
- The measured TEC current
- The measured TEC voltage

For the Laser Diode:

- The measured Laser Diode current
- The measured monitor Diode current
- The calculated optical power in mW
- The calculated optical power in dBm
- The measured Laser Diode voltage

Just click on the black down arrow and select the desired value from the displayed field.

NOTE

To display correct calculated values like temperature in °C etc., you must have entered the correct calibration values in the 'Setup'-section!

A red display indicates an overflow condition!

For the set temperature:

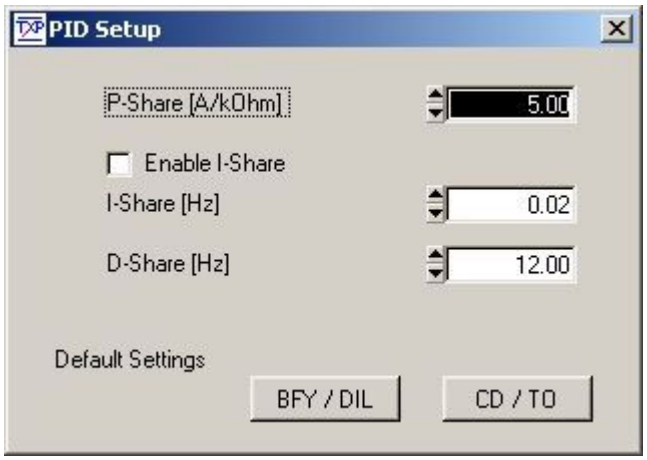
- Display and entry field in kΩ,
- Display and entry field in °C
- Display and entry field in K.

The values in °C and K are calculated from or recalculated to the 'real' variable, the resistance of the thermistor in kΩ.

3.1.2 Set the limit values

Unlock the two padlocks and enter your absolute limit values for the laser diode current and the TEC current. Enter the values numerically by placing the cursor in the field, erasing the old values and overwriting them with the new values. Or simply use the up- and down arrows for smaller changes.
Close the padlocks again after the settings.

3.1.3 PID Setup



PID adjustment

Temperature control loops are comparatively slow with control oscillations in the Hertz range.

The PID adjustment will optimize the dynamic behavior. With the ITC5000 the three parameters P, I and D can be set independently.
To ease the use of these items, two predefined settings are stored and can be recalled by a single click: standard settings for butterfly / DIL-lasers and settings for TO mounted laser diodes.

However, for all setups the PID values can be adjusted individually by the user.

Example of a PID adjustment

(Pre-conditions: All limit values have been set correctly, all polarities are correct, all relevant calibration values are entered).
Set the display refresh time (see 3.2.5, The 'Preferences' menu) to the lowest possible value (0.3 sec).

- Switch off the I-share (unmark the checkbox).

- Set the P-, I- and D-share to the lowest values (just enter 0).

- Switch on the output and observe the temperature.

P-share

- Change repeatedly between set temperatures of 18 °C and 22 °C while observing the settling behavior of the actual temperature.
  Increase the P-share gradually. Higher values will increase the settling speed, too high values make the system oscillate.
  The P-share has been set correctly when the actual temperature remains stable near the set temperature after only 2-3 overshoots.

D-share

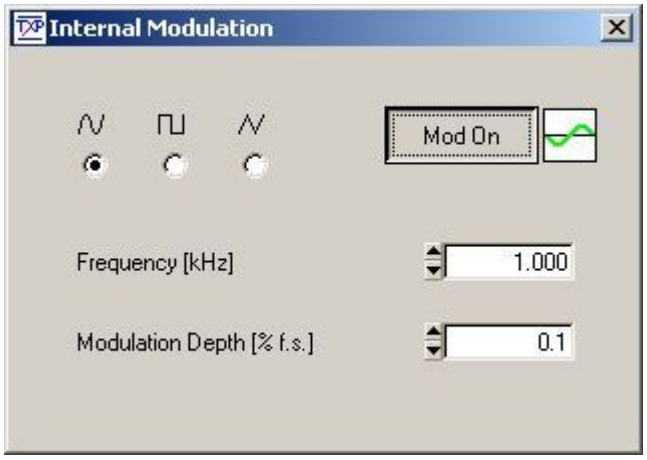
- Change repeatedly between set temperatures of 18 °C and 22 °C while observing again the settling behavior of the actual temperature.
  Increase the D-share gradually. Higher values will decrease the amplitude of the overshoots.
  The D-share is set correctly when the actual temperature remains stable near the set temperature after a minimum of overshoots.

I-share

- Turn on the I-share again.

- Again change repeatedly between set temperatures of 18 °C and 22 °C.
  Increase the I-share gradually. Higher values will accelerate the settling to the set temperature.
  The I-share is set correctly when the actual temperature reaches the set temperature in shortest time without overshoots.

3.1.4 Modulation setup



Three waveforms for the internal modulation are selectable: sine wave, square wave or triangular modulation.
The frequency can be set between 20 Hz and 20 kHz, the modulation depth between 0.1 % and 100 % full scale.

It must be reminded, that this scale depends on the absolute settings of laser diode current or power. 100% modulation means that neither the laser extinguishes, nor the set maximum value is overdriven. So 100% modulation depth is only reachable at about 60% f.s. power setting. With other settings of power or current the modulation setting is reduced to less than 100% or more than 0.1%.

3.1.5 Switching ON and OFF

Pressing the corresponding button will switch ON or OFF either the laser diode current, the TEC current or the modulation.
The writing on the buttons always shows the 'is now'-status.

3.1.6 The information field

The information field gives you a quick overview on the settings of your ITC card, e.g. here: Constant power mode, laser diode and photo diode operated with grounded anode.

CC mode: Constant current mode
CP mode: Constant power mode
LD AG: Laser polarity-Anode grounded
LD CG: Laser polarity-Cathode grounded
PD AG: Photo diode polarity-Anode grounded
PD CG: Photo diode polarity-Cathode grounded

3.1.7 The Status messages field

All unexpected events occurring during the operation are listed chronologically in the error field.

NOTE

Additional to these status messages you can get error messages. Error messages are shown, when certain conditions occur during the operation of the card which affect its function (e.g. switch the laser off). These messages come as 'pop-up' window, which must be acknowledged by clicking OK.
Together with the error message, an error number is given. Please refer to this error number when consulting the Thorlabs technical hotline!

Messages in red are more important than those in black.

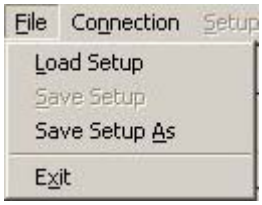
If the condition producing this status message has vanished, e.g. if the interlock has been closed in-between, the error message disappears. If e.g. you try to switch on your laser, while this condition 'Interlock open' is true, you will get an error message.

The button 'Identify' identifies the corresponding card by having the 'Select'-LED blink for a few seconds.

A list of possible errors is given in the appendix on page 47.

3.2 Menu items

3.2.1 The ‘File’ menu



- ‘Load Setup’: All settings you make with this ITC5000 card can be stored in a file and reloaded any time. If this file is loaded by another card as it was stored from, you will get a warning message or even an error message if the settings are physically impossible for this card.
- ‘Save Setup’: Save new settings under the filename you have opened before
- ‘Save Setup As’: Save Settings under a new filename.

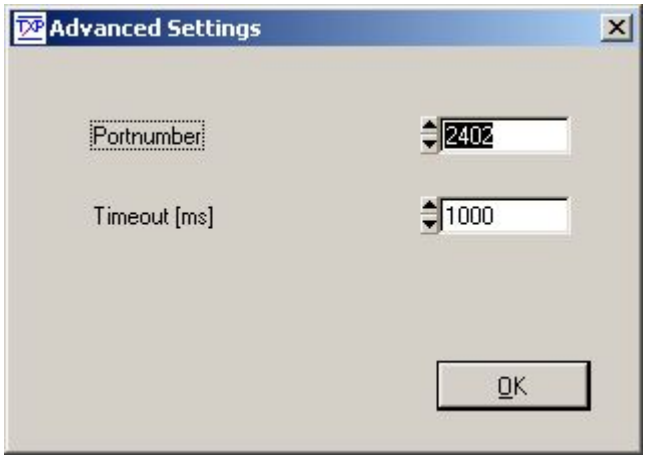
3.2.2 The ‘Connection’ menu

- ‘Connect’ will open the connection to a TXP mainframe
- ‘Disconnect’ interrupts this connection.

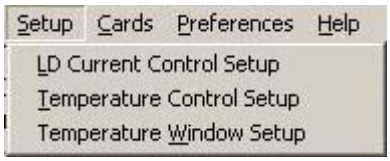
After clicking ‘Connect’, the following screen opens:

Enter the IP Address of your TXP mainframe (this address is given to the TXP in the initialization process with the TXP-Administrator program) and if necessary (ask your system operator) also the port number and a timeout value under ‘Advanced’:

The timeout value is the wait-time after which the program card yields a connection error if the ITC does not respond.



3.2.3 The ‘Setup’ menu



- LD Current Control Setup: Set the diode polarities, operating mode, calibration values and bias voltage
- Temperature Control Setup: Enter your thermistor calibration data
- Temperature Window Setup: Enable and set a temperature window

3.2.3.1 LD Current Control Setup

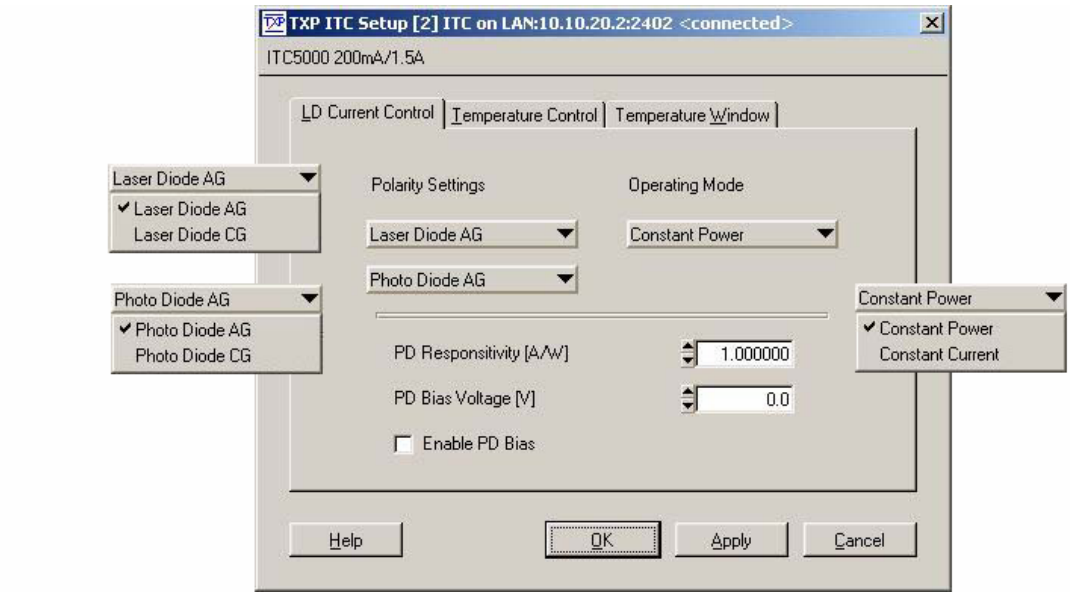


Figure 11 Laser Diode Setup Menu

Select the laser diode polarity between AG (Anode Grounded) or CG (cathode Grounded).
Select the photo diode polarity between AG (Anode Grounded) or CG (cathode Grounded).
Select the operating mode between Constant Power and Constant Current mode.

To get a precisely calibrated display of the laser power in the main screen, you must set the corresponding photo diode responsivity (A/W) in the corresponding field. You can use the up- and down-arrows or enter the value numerically.

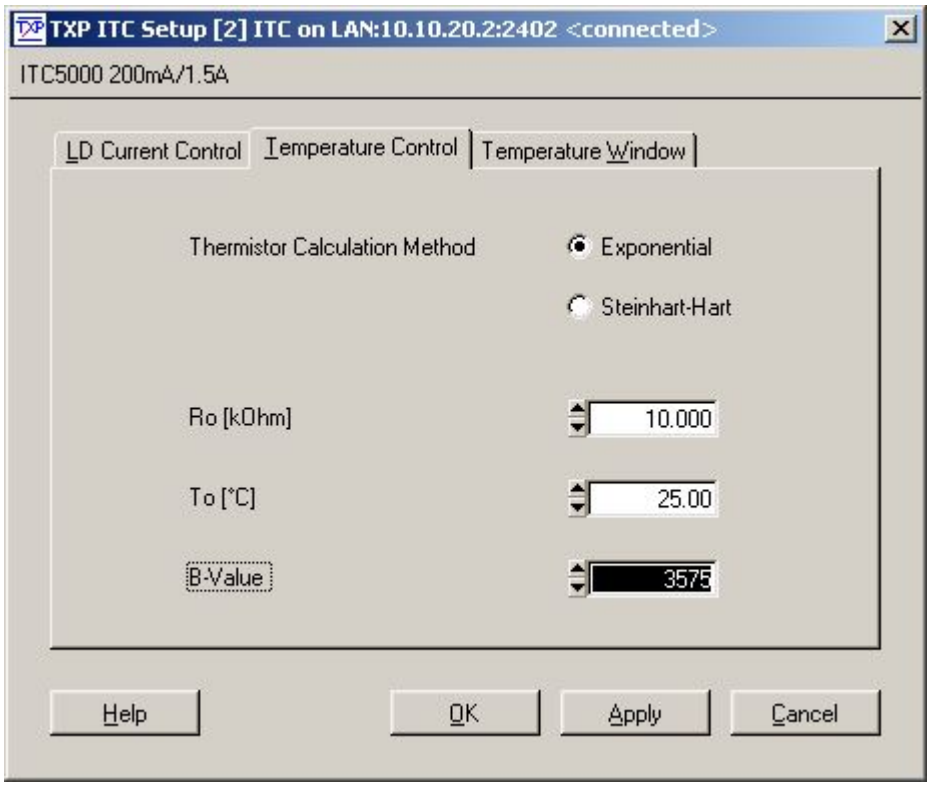
If you want to run your photo diode with a bias voltage, enter the corresponding bias voltage and enable the bias by marking the checkbox ‘Enable PD bias’.

Clicking ‘Apply’ sends the new settings to the TXP.

NOTE

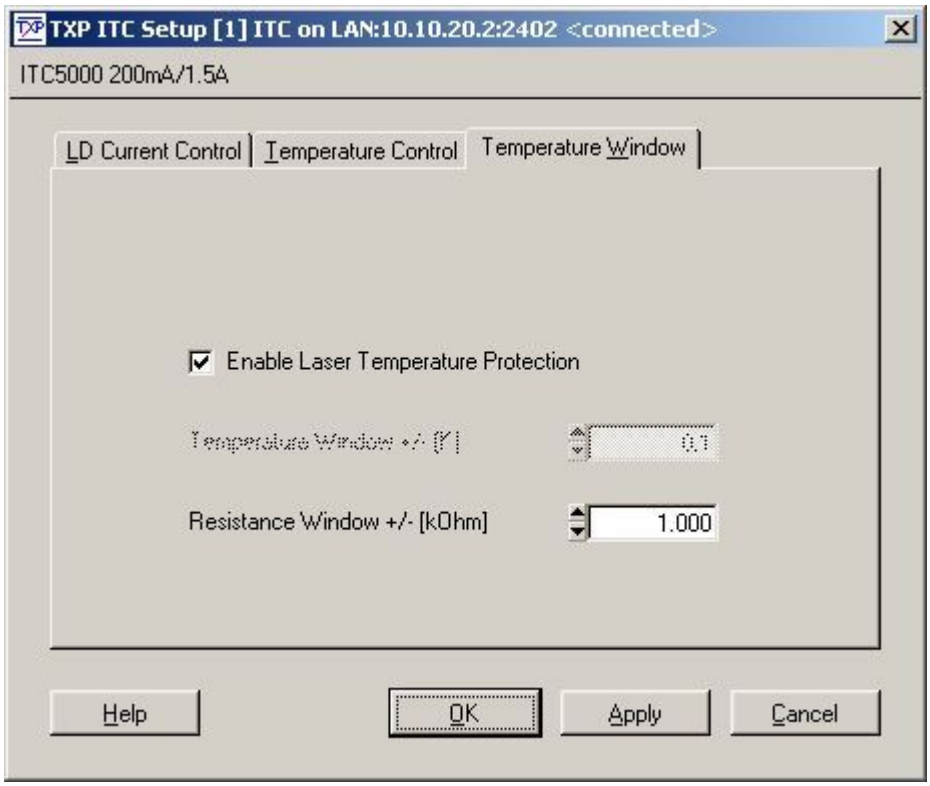
You can not make these changes if the laser current or the TEC current are switched on. All entry fields are inactive then.

3.2.3.2 Temperature Control Setup



Depending on the thermistor used, the calibration coefficients are given in exponential form or as 'Steinhart-Hart'-Parameters. Select the corresponding form and enter the calibration coefficients (given in the data sheet of the thermistor / Laser Diode).
The calibration values are necessary for a correct temperature display on the main screen.

3.2.3.3 Temperature Window Setup

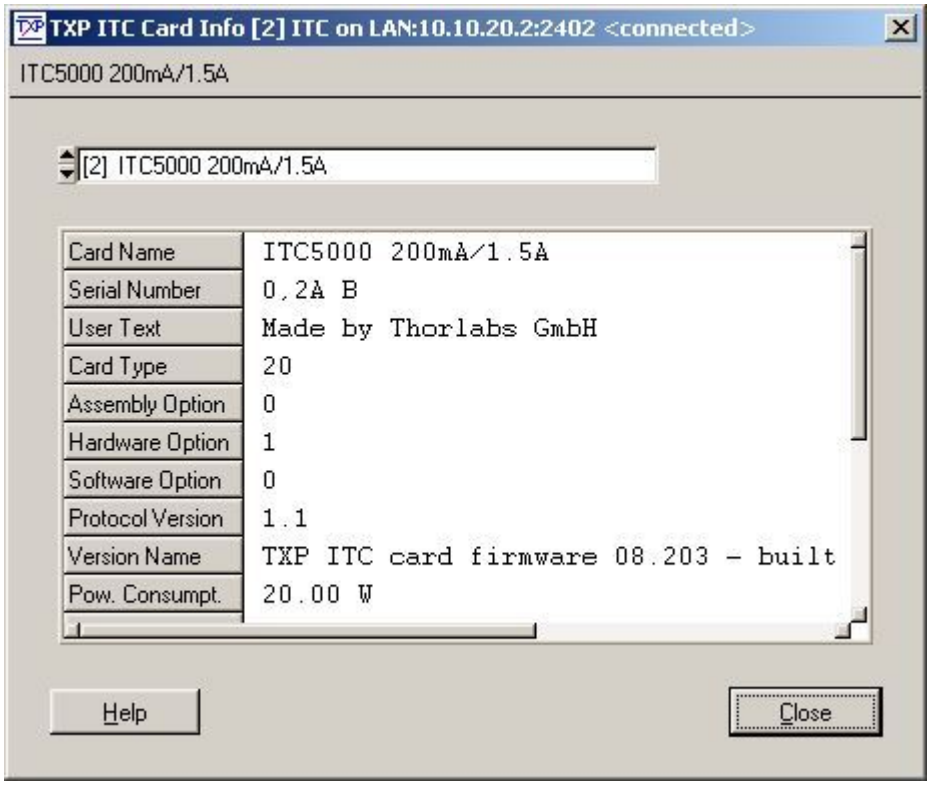


The ITC5000 allows you to set a temperature protection window. This function switches off your laser diode current, if the temperature leaves this predefined window.
To enter new settings and activate the window function both laser current and TEC current must be switched off.

If your temperature setting field on the main screen is set for temperature reading, also the window must be set in K. If the setting window is for resistance, you must also enter the window temperature in kΩ.

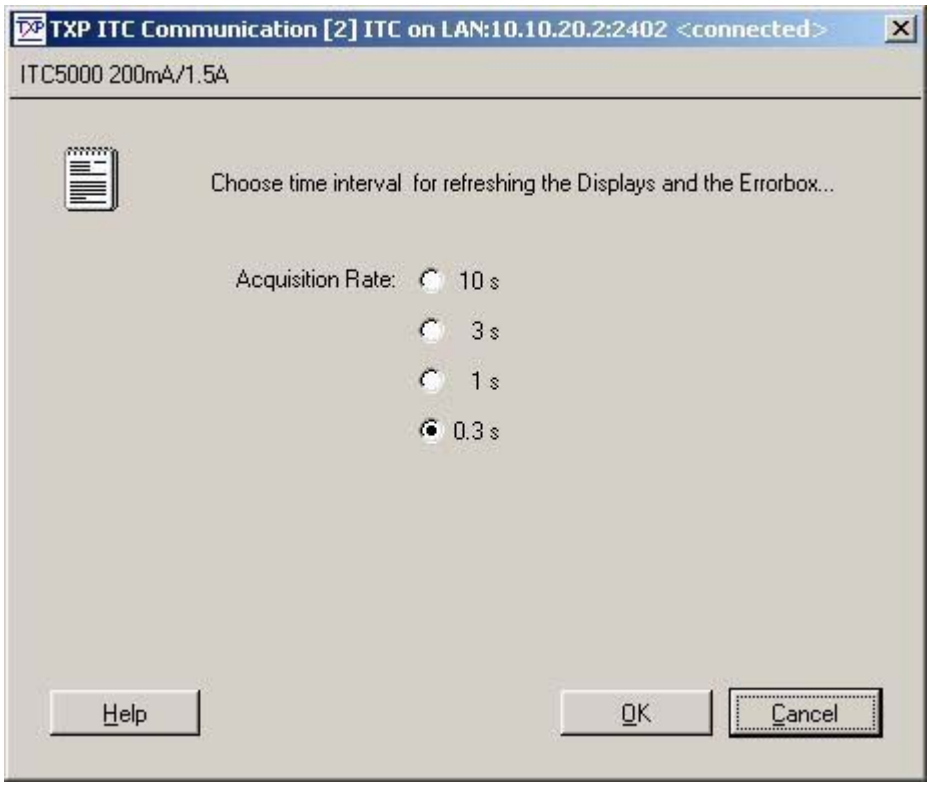
3.2.4 The cards menu

The only item in this menu is to give you some more detailed information about the corresponding card.



3.2.5 The ‘Preferences’ menu

The ‘preferences’ menu contains one item: ‘Communication’, which allows to define the refreshing rate of all information retrieved from the card.



Depending on the bandwidth and reliability of your connection between TXP and PC, you can select update rates from 10 seconds down to 0.3 s.

4 Service and Maintenance

4.1 Troubleshooting

◆ Card does not work at all :

- ➢ Look if the Card is inserted properly into the TXP mainframe and the ejector handle has snapped into its position.
- ➢ Look if the mainframe is powered up (does any LED light up)
- ➢ Try to insert the card in another slot. Maybe the internal fuse of the slot has opened (refer to the mainframe manual for changing the fuses).

◆ You don't get the desired laser output power

- ➢ Is the local interlock closed?

  Control the resistance between the interlock pins of the connector jack not to be more than 430 Ω.
- ➢ Is the global interlock closed?

  If you do not use the global interlock, put the short circuit plug delivered with the TXP on the D-SUB connector at the rear panel of the TXP.

◆ You can not switch on your laser diode

- ➢ Is the local or global interlock closed?
- ➢ Do you have activated the Temperature window with the temperature outside of this window?
- ➢ Is the connection to the laser diode closed?

◆ The laser temperature is instable

- ➢ Select the corresponding PID pre-setting or adjust the PID loop carefully (see 3.1.3, PID Setup)

4.2 Service

In normal operation the ITC5000 card does not need any service. If highest precision of the measurements is vital for you, you should have recalibrated the ITC5000 every two years. You can see the due date of calibration in the card info-menu of the card driver (refer to 3.2.4, “The cards menu”).

5 Listings

5.1 List of Acronyms

The following acronyms and abbreviations are used in this manual:

ADC	Analog to Digital Converter
ASCII	American Standard Code for Information Interchange
CLR	CLeaR
CR	Carriage Return
DAC	Digital to Analog Converter
D-Share	Differential share
IEEE	Institute for Electrical and Electronic Engineering
I-Share	Integral share
LDC	Laser Diode Controller
LED	Light Emitting Diode
PC	Personal Computer
PID	Proportional, Integral and Differential Control Loop
P-Share	Proportional share
RS232	Standard Serial Communications Protocol
SEL	SELect
SW	Soft Ware
TCP/IP	Transmission Control Protocol / Internet Protocol
TEC	ThermoElectric Cooler (Peltier Element)

5.2 List of figures

5.3 List of possible status messages

“Card Missing”	This status message shows if you have established a connection between the corresponding software module and a card and then remove the card from the TXP.
“Critical Card Temperature reached”	Informs about the temperature of the card reaching its limit
“Supply Voltage Failed”	Internal error, please contact Thorlabs GmbH
“Global Interlock Open”	Close the global interlock line or put the short circuit plug on the D-SUB jack at the rear panel
“Local Interlock Open”	The card interlock is open
“Laser Connection failed”	Connection to the laser diode is interrupted or missing
“Laser Current Limit”	You have reached the set laser current limit
“Check Temperature Sensor”	The card did not find a temperature sensor
“Check TEC element”	Connection to the TEC interrupted
“Temperature not Stabilized”	Temperature not yet within the set window

5.4 Addresses

For technical support or sales inquiries, please visit us at www.thorlabs.com/contact for our most up-to-date contact information.

USA, Canada, and South America
Thorlabs, Inc.
sales@thorlabs.com
techsupport@thorlabs.com

UK and Ireland
Thorlabs Ltd.
sales.uk@thorlabs.com
techsupport.uk@thorlabs.com

Europe
Thorlabs GmbH
europe@thorlabs.com

Scandinavia
Thorlabs Sweden AB
scandinavia@thorlabs.com

France
Thorlabs SAS
sales.fr@thorlabs.com

Brazil
Thorlabs Vendas de Fotônicos Ltda.
brasil@thorlabs.com

Japan
Thorlabs Japan, Inc.
sales@thorlabs.jp

China
Thorlabs China
chinasales@thorlabs.com