

Power Meter

Licel GmbH

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Chapter 1

Introduction

Monitoring every laser shot is the optimum approach to detect laser pulse energy fluctuations, SHG and THG efficiency changes and flashlamp degradation of your laser . A laser spot reflection can be measured using a photodiode or a laser power meter head.

Chapter 2

Components

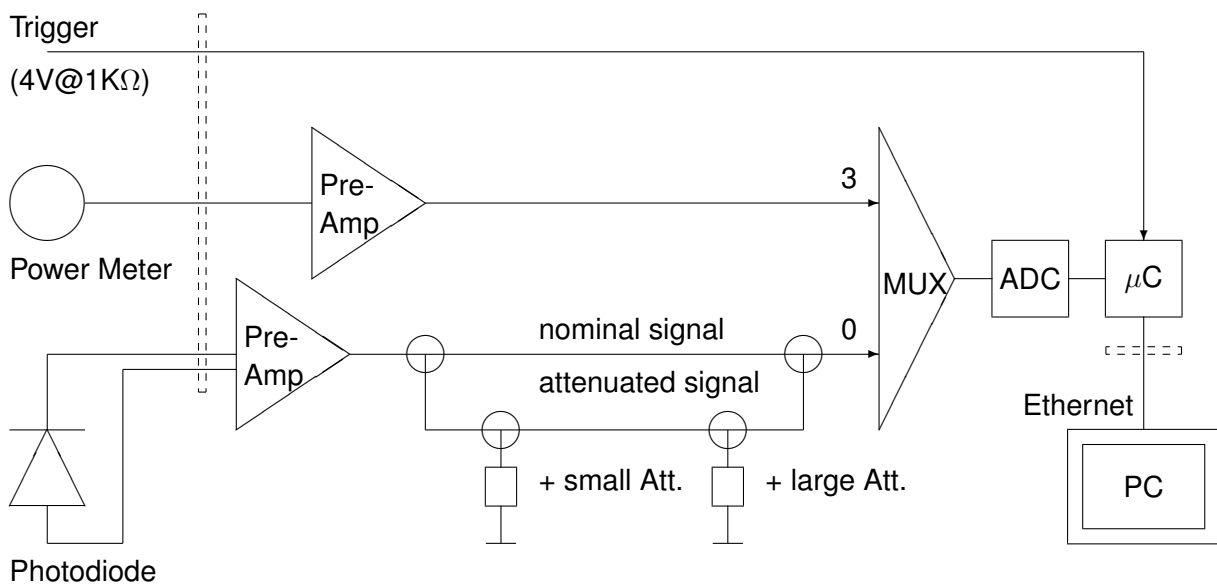
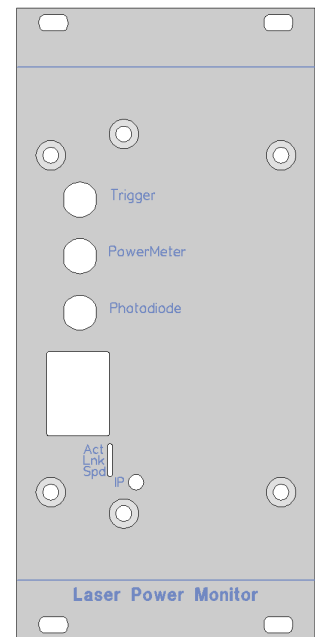
The power meter module has an Ethernet controller for communication with the PC. After the external trigger is received a short trace from either the photodiode or the power meter head will be analyzed.

The trigger pulse should be $4V @ 1k\Omega$ for more than 100ns.

The signal inputs have Lemo CAMAC connectors (mating connector: Lemo FFA.00.250.NTAC29). The photodiode signal connects to the ADC channel 0 and the power meter head to ADC channel 3.

The photodiode should not have a additional ground connection outside the power meter controller as this will certainly create unwanted ground loops.

For every trigger the light pulse is measured and the result together with a timestamp is sent to the PC over a Ethernet connection.



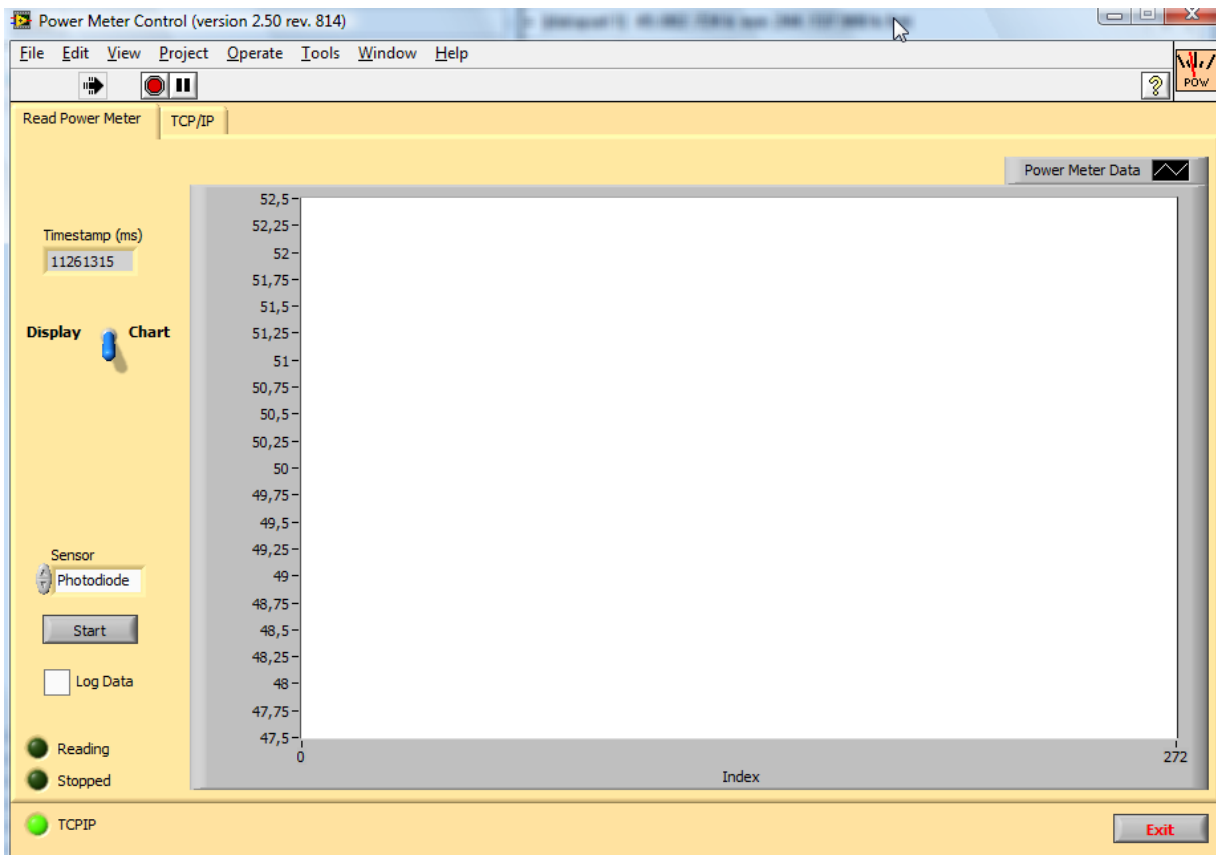
Principal scheme

Chapter 3

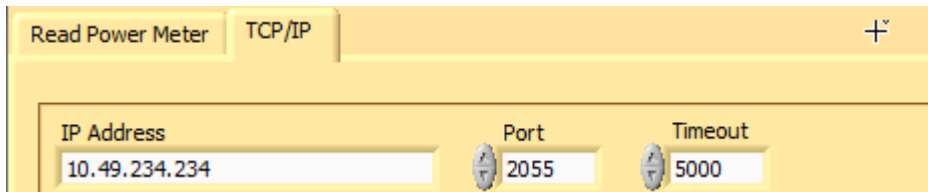
Software usage

To load the power meter control program, either double click on the `TCP/IP-Power Meter.llb` or open the file `Power Meter Control.vi` in the `Power Meter.llb`. If you installed the Windows applications please start the program by selecting the corresponding entry in the Licel section of the [Windows Start menu](#).

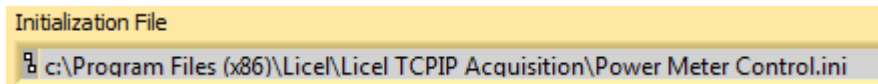
The front panel of the Power Meter Control software is seen in the next picture:



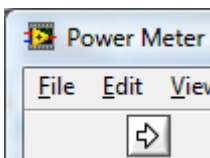
1. First of all the **IP Address** and **Port** have to be set. You should already have set these values for the Licel Ethernet Controller following the [network setup](#) section above.
 - Using the LabVIEW vi, just enter the required values on the *TCP/IP* page and [save them as defaults](#).



- If you use the Windows application you must directly enter the correct values into the corresponding control fields on the *TCP/IP* page. On exit the values will be saved to the initialization file in the case that the TCP/IP connection is established. You may also set the values in the initialization file `Power Meter Control.ini`. You will see the full path of the file in a file path indicator on the *TCP/IP* page.

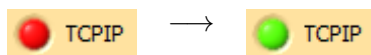


2. To start the program press the **Run** button at the top left of the screen.

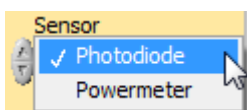


The Windows application will start automatically when called for the first time.

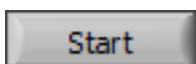
3. After a short time the **TCPIP** indicator should change its color from red to green indicating a successful connection with the Licel Ethernet Controller. If the indicator remains red and/or an error is indicated, please check the values for **address** and **Port**, change them (on the program's panel or in the initialization file) if necessary. Check if the Licel Ethernet Controller is running and that all network connections are correct. The LED of the transient recorder should be lit up.



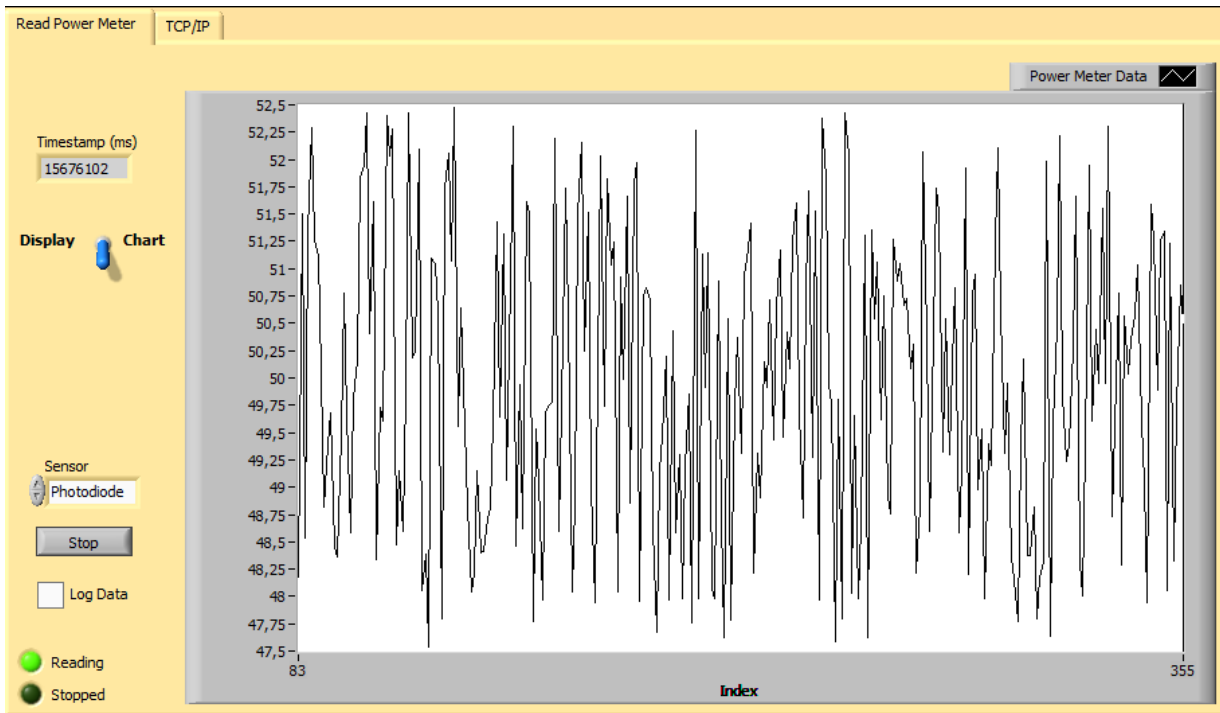
Once the TCP/IP connection is established the **Sensor** needs to be selected so that it corresponds to the external detector (*Photodiode* or *Power Meter*).



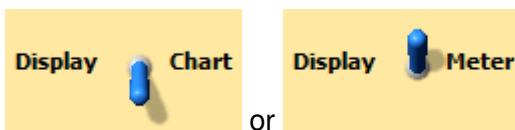
Press the start button to start acquiring data from the power meter controller.



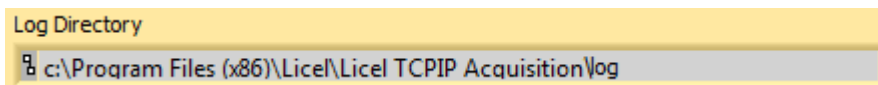
The button text will change to *Stop*. The **Reading** LED will turn to light green. The acquired data is displayed in the graphic indicator.



The display of the data can be in two modes, either history chart that shows the last 1024 readings or a power scale. The button text will change to *Stop*. Use the **Display** selection switch to change the display mode.



Check **Log Data** to write the acquired data to a file. Two tab-separated ASCII columns are written, the first column contains the millisecond timer value returned by the controller, and the second contains the sensor value. The files are written to the sub directory `log`. The file name is `YYYYmmdd.HH-MM-SS.uu.log` where `YYYYmmdd` is the date, and `HH-MM-SS` the 24 hour time. `uu` stands for the first decimal places of the seconds. The complete path of the log file directory can be inspected on the *TCP/IP* tab page:



An acquisition is stopped using the *Stop* button. After stopping the **Stopped** LED may turn to light green until all data already sent by the controller has been received.

3.1 Data Acquisition with TCP/IP Acquis

Licel's acquisition program *TCP/IP Acquis* is capable to communicate with the Power Meter Control software to start and stop power meter data acquisitions and to read the acquired data to store in the *TCP/IP Acquis* data files. For details please refer to the [Licel Ethernet Controller -- Installation and Reference Manual](#).

Chapter 4

Low Level TCPIP access

The general syntax of the commands is described in the [Licel Ethernet Controller – Installation and Reference Manual](#).

The power meter controller implements the general commands:

- *IDN?
- CAP?
- TCPIP
- LOGON
- WHITELIST
- MILLISEC?

The following command is unique for the controller:

- POW

It has several subcommands.

- POW CHANNEL
- POW START
- POW STOP
- POW TRACE

To run the system one needs to open to 2 sockets, one for the commands and another socket to get the data pushed from the controller to the PC.

4.1 Commands

POW CHANNEL <ADC >

POW CHANNEL 0

Selects the ADC channel 0 for the data acquisition. The ADC channel can be either be 0 (photodiode) or 2 (power meter head).

The controller response is:

POW CHANNEL executed

POW START

POW START

activates the data acquisition and data transmission over the previously opened push socket.

The controller response is:

POW START executed

For every received trigger one ASCII line will be sent over the push socket with the following format

<Milliseconds since controller start> <Pulse amplitude ><CRLF>

POW STOP

POW STOP

deactivates the data acquisition and stop the data transmission over the previously opened push socket.

The controller response is:

POW STOP executed

POW TRACE

POW TRACE

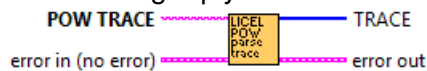
starts a single pulse acquisition and returns one pulse in the following ASCII format:

<Number of points:N > <Y₀ > <Y₁ >... <Y_{N-1} ><CRLF >.

4.2 LabVIEW TCPIP Power Meter VIs

Licel TCPIP POW Parse Trace.vi

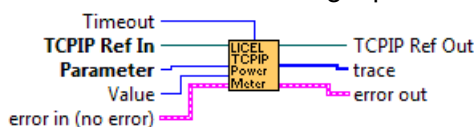
Parses the string reply of the **POW TRACE** command and returns the data as an array.



Licel TCPIP PowerMeter.vi

The vi sends the POW command with the **Parameter** (0: START, 1: STOP, 2: RESET) to the controller.

- START** causes the controller to send power meter data whenever receiving a trigger
- STOP** stops transferring data.
- CHANNEL** sets the ADC channel
- TRACE** starts a single pulse acquisition and returns the last trace of data points



An error is generated if the vi does not receive the appropriate reply (POW <Parameter>executed or for TRACE a sequence of decimal string numbers).

Chapter 5

Appendix – Ini File

The following settings are used in the initialization file `Power Meter Control.ini`.

```
[TCPIP]
UseValues = TRUE
Port = 2055
IPAddress = "10.49.234.234"
```

```
[Power Meter Control]
HideRootWindow = True
```

```
[Data]
CalibrationFactor = 1
UnitLabel = ""
Offset = 0
```

UseValues	Use TCPIP values from ini file (Only for Windows applications)
Port	TCPIP Port
IPAddress	TCPIP address
CalibrationFactor	Conversion from binary controller data to physical unit
UnitLabel	physical unit
Offset	Offset in physical units