Laser Power & Energy Measurement Laser Beam Analysis

2018

Table of contents

Ophir Power and Energy Meters – Versatility for Every Application

Ophir sensor, power meter and computer interface system means that virtually any sensor can work "plug and play" with any power meter or computer interface. Ophir has the widest range of sensors on the market with the highest performance so almost any measurement need can be accommodated. The measurement results can also be used in many ways - on the power meter screen, stored on board, sent to PC with results presented in many ways and on several platforms.

Pyroelectric Sensors
Energies pJ to Joules
Rep rates to 25kHz
(page 85)

Thermal Sensors
Powers mW to kW and
single shot energy
(page 38)

Photodiode Sensors
Powers pW to Watts
(page 24)

Computer Interfaces
with USB/Bluetooth/Ethernet

EA-1
Ethernet

Pulsar
1 ,2 ,4 channels

Power Meters
with USB/RS232

StarBright
added features

Vega
color

Nova II
general

Quasar
wireless

Juno
compact

StarLite
basic

Nova
rugged

Laser Star
2 channel

Software Solutions
StarLab, LabVIEW, StarCom &
COM Object

Calibration Capability at Ophir

Calibration is perhaps the most important of our products. In order to ensure the best possible calibration of your instruments, Ophir takes a number of extra steps not taken by other vendors.

Laser absorption varies with wavelength, so it is not enough to calibrate at one wavelength. If the variation is small, then the sensors are calibrated at several laser wavelengths and each laser covers a range of wavelengths. If the absorption variation with wavelength is considerable, the sensor is provided with an absorption correction curve activated by the wavelength of use. Going one step further, Ophir checks the curve at a number of NIST and PTB traceable wavelengths and corrects it if necessary. To do this, we have a complete line of calibration lasers so that we can always calibrate at or near the customer's wavelength. These lasers include powers up to 1000W and both CW and pulsed lasers. We also have a number of sensors calibrated at NIST and PTB used as calibration standards. Below is a list of the calibration wavelengths used at Ophir in calibrating our standard catalog sensors.

In addition to calibration variation with wavelength, there are other possible sources of calibration error such as nonlinearity, variation with position on the surface and for pyroelectric sensors, pulse frequency. All of these factors are taken into consideration in the calibration and accounted for. For a complete analysis of Ophir calibration accuracy and error budget, please see our website at:
www.ophiropt.com/calibration-procedure/tutorial

Special Calibration

In addition to standard calibration wavelengths shown below, customers can have their Ophir sensor calibrated at additional wavelengths for more accuracy. Please consult your Ophir agent for special requests.

Wavelengths of Calibration per Sensor Type

Wavelength	193	248	254	266	355	365	410	436	488	532	577	633	675	750	755	808	905	980	1014	1046	1064	1070	1310	1550	2100	2940	10600	Spectral Curve
Pulsed/Continuous	P	P	C	P	P	C	C	C	C	P,C	C	C	C	C	P	C	P	C	C	C	P,C	C	C	P,C	P	P	C	
Photodiode sensors																												
PD300						●		●	●		●	●							●	●								●
PD300-UV			●			●		●	●		●	●							●	●								●
PD300-IR																●		●						●				●
PD300-3W						●		●	●		●	●								●								●
PD300-IRG																●		●		●			●	●				●
IS-1, IS-1-2W						●		●			●									●								●
IS-6			●			●		●			●									●								●
3A-IS								●				●	●							●								●
Thermal sensors																												
Standard Broadband<1000W										●											●						●	
Standard Broadband 1-15kW																●						●					●	
Helios																						●						
30K-W																						●						
120K-W																						●						
LP1 type										●						●		●								●		●
LP2 type																						●						
Comet 10K																						●					●	
Comet 1K										●												●					●	
P type										●											●							
PF type		●								●											●						●	
PF with diffuser				●	●					●											●				●			
HE type										●											●				●	●		
HE with diffuser		●			●					●											●							
EX type		●								●																		
SV type	●																				●						●	
Pyroelectric sensors																												
PD10-C, PD10-pJ-C	●	●					●										●											●
PD10-IR-pJ-C, PD10-IR-C											●						●							●				
PE9-C	●				●																●			●				
PE9-ES-C					●																●			●				
PE10-C					●																●							
BB type																					●							
BF type	●	●			●					●											●					●		●
BF with diffuser		●			●					●											●				●	●		●
Metallic (standard)		●			●																●					●		●
PE50BB-DIF-C										●											●				●			
PE50-DIF-ER-C										●											●				●	●		
PE50-DIF-C	●	●								●											●				●	●		
PE100BF-DIF-C										●											●			●				

Sensors

Power Meters

2.0 Power Meters & Interfaces

Power Meter Finder

The table below lists the specs and features of Ophir Power Meters and PC Interfaces

Meters	StarBright	Vega	Nova II	StarLite	LaserStar Single & Dual Channel	Nova
Digital Display	Yes	Yes	Yes	Yes	Yes	Yes
Display Color	Color	Color	Monochrome	Monochrome	Monochrome	Monochrome
Analog Display	Yes	Yes	Yes	Yes	No	No
Rechargeable Battery	Yes	Yes	Yes	Yes	Yes	Yes
Detector Support (see compatibility table below)						
Thermal Sensors	Yes	Yes	Yes	Yes	Yes	Yes
Photodiode Sensors	Yes	Yes	Yes	Yes	Yes	Yes
Pyroelectric Sensors	Yes	Yes	Yes	Yes	Yes	Yes
BeamTrack Sensors	Yes	Yes	Yes	Yes	No	No
Measurement Options						
Average Power	Yes	Yes	Yes	Yes	Yes	Yes
Energy per Pulse (Pyro. Sensors)	Yes	Yes	Yes	Yes	Yes	Yes
Single Shot Energy (Thermal Sensors)	Yes	Yes	Yes	Yes	Yes	Yes
Statistics	Yes	Yes	Yes	No	Yes	Yes
Analog Out	1V,2V,5V,10V	1V,2V,5V,10V	1V,2V,5V,10V	1V	1V	1V
Trigger input & output	No	No	No	No	No	No
Real-Time Logging						
RS232	30Hz	30Hz	30Hz	N/A	30Hz	10Hz
GPIB	N/A	N/A	N/A	N/A	1500Hz	N/A
USB	5000Hz	2000Hz	2000Hz	20Hz*	N/A	N/A
Bluetooth	N/A	N/A	N/A	N/A	N/A	N/A
On-Board Data Storage	>10M**	250K	50K	No	50K	1K
Automation Interface	Yes for USB	Yes for USB	Yes for USB	Yes*	No	No
Labview VI's	Yes	Yes	Yes	Yes*	Yes	Yes
Part number	7Z01580	7Z01560	7Z01550	7Z01565	7Z01600/ 7Z01601	7Z01500
Page in the catalog	120	122	124	126	128	130

* With USB activation code (see page 127)

** Depends on size of USB Flash Drive

Compatibility Table

Meter / Interface / Sensor	StarBright	Vega/ Nova II	StarLite	LaserStar	Nova/ Orion	Juno	EA-1	Pulsar	USBI	Quasar
Standard Thermal sensors*	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
LP2 type Thermal sensors	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
LP1 type Thermal sensors	yes	yes	yes	Has discrete wavelengths only	Has discrete wavelengths only	yes	yes	yes	yes	yes
PF-DIF type Thermal sensors	yes	yes	yes	Has discrete wavelengths only	Has discrete wavelengths only	yes	yes	yes	yes	yes
BeamTrack Sensors	yes	yes	yes	Power/ energy only	Power/ energy only	yes	yes	Power/ energy only	Power/ energy only	Power/ energy only
Standard Photodiode sensors**	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
BC20 sensor	yes	yes	Measures static beams only	Has discrete wavelengths only	Has discrete wavelengths only	yes	no	Measures static beams only	Measures static beams only	Measures static beams only
PD300-CIE sensor	yes	yes	no	yes	yes	yes	no	no	no	no
PD300RM sensors	yes	no	yes	no	no	no	no	no	no	no
PE-C Pyroelectric sensors	yes	yes	yes	Limited functions. See catalog notes	Needs adaptor (P/N 7Z08272) Limited functions. See catalog notes	yes	yes	Limited. See notes in sensor page	Limited. See notes in sensor page	Limited. See notes in sensor page
Previous generation Pyroelectric Sensors (non PE-C)	no	yes	no	yes	yes	yes	no	yes	yes	yes
RP sensors	no	no	no	yes	no	no	no	no	yes (with RP-USB s/w)	no

* Meaning all thermal sensors not listed as exceptions in above table.

** Meaning all photodiode sensors not listed as exceptions in above table.





PC Interfaces Juno	EA-1	Pulsar-1/2/4	USBI	Wireless Interface Quasar
N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A
Powered from USB	No	No	Powered from USB	Yes
Yes	Yes	Yes	Yes	Yes
Yes	Yes	Yes	Yes	Yes
Yes	Yes	Yes	Yes	Yes
Yes	Yes	No	No	No
Yes	Yes	Yes	Yes	Yes
Yes	N/A	Yes	Yes	Yes
Yes	Yes	Yes	Yes	Yes
Yes	Yes	Yes	Yes	Yes
No	No	No	1V	No
No	No	Yes	No	No
N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A
10,000Hz	N/A	25,000Hz	2000Hz	N/A
N/A	N/A	N/A	N/A	500Hz
No	N/A	No	No	No
Yes	Yes for Ethernet	Yes	Yes	No
Yes	No	Yes	Yes	No
7Z01250	7Z08296	7Z01203 / 7Z01202 / 7Z01201	7Z01200	7Z01300
134	135	136	136	137

Ophir power meters are true plug-and-play instruments. With all sensor information and calibration stored in the sensor plug, just plug in any one of over 150 Ophir sensors and the instrument is calibrated and configured to measure laser power and energy with that sensor.

Comparison of Hand Held Meters

Meter	StarBright	Vega	Nova II	StarLite	Nova
Supported Sensors					
Standard Thermopile, Photodiode, PyroC sensors	X	X	X	X	X (with adaptor)
BeamTrack	X	X	X	X	
BC20	X	X	X		X
PD300-CIE	X	X	X		X
PD300RM	X			X	
Measurement Capabilities					
Parameter Configuration	X	X	X	X	X
Power, Energy	X	X	X	X	X
Exposure with PyroC Sensor	X	X	X		X
Position and Size with BeamTrack Sensors	X	X	X	X	
Beam Stability with BeamTrack Sensors	X	X	X		
Pulsed Power with Thermopile Sensors	X				
Irradiance and Dosage	X			X	
Exposure with Photodiode Sensors	X				
Density	X	X	X		X
Scale Factor	X	X	X		X
Normalize	X	X	X		
Fixed Offset	X				
Mixing Functions Together	X				
Showing Function Results in Graphical Display	X				
Graphical Displays Available at All Times					
Bargraph	X	X	X	X	X
Simulated Analog Needle	X	X	X	X	
Pass/Fail	X	X	X		
Line Graph for Both Power and Energy	X				
Pulse Chart for Both Power and Energy	X				
Real Time Statistics (not just when logging)	X				
Screen Specs					
Screen Size	3.5"	3.5"	4"	3.5"	2"
Color Screen	X	X			
Logging					
Total Log Size (shared between all files)	Unlimited	250000	50000	0	1000
Max Number of Files	Unlimited	10	10	0	1
TimeStamp in Logged Data	X				
Logging of Math Function Results	X				
PC Communications					
StarLab Support	X	X	X	X	
RS232	X	X	X		X
USB	X	X	X	X	
LabVIEW Library	X	X	X	X	X
Max Real Time Delivery	5000	2000	2000	20	15
Other Features					
Analog Output (in Volts)	1,2,5,10	1,2,5,10	1,2,5,10	1	1
Calibration Reminder	X	X	X		
Japanese	X	X	X	X	
Russian and Chinese	X			X	
Built in Help	X	X	X		

Power Meters and PC Interfaces

Ophir power meters and PC interfaces work on the smart plug principle. This means that almost any Ophir power meter or PC interface can work – plug and play – with almost any of the wide range of Ophir sensors. Ophir power meters are also the most sensitive, lowest noise, most precisely calibrated units on the market thus giving the utmost performance from our smart sensors.
As for ease of use, only Ophir power meters have smart keys to give the easiest and most convenient user interface. The units also come with a versatile range of software to use seamlessly either with the Ophir software or the user's own.

Photodiode Sensors
Powers pW to Watts

Thermal Sensors
Powers mW to kW and single shot energy

Pyroelectric Sensors
Energies pJ to Joules
Rep rates to 25kHz

Power Meters
with USB/RS232

Computer Interfaces
with USB/Bluetooth/Ethernet

StarBright
added features

Vega
color

Nova II
general

EA-1
Ethernet

Pulsar
1 ,2 ,4 channels

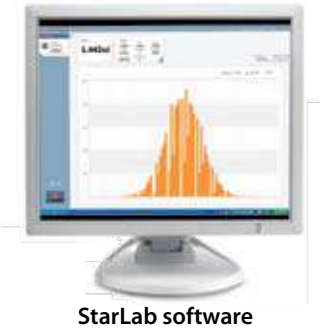
StarLite
basic

Nova
rugged

Laser Star
2 channel

Quasar
wireless

Juno
compact



StarLab software

Software Solutions
StarLab, LabVIEW, StarCom & COM Object

LabVIEW

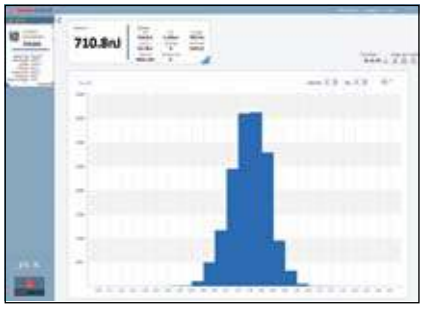
2.1 Power Meters

2.1.1 StarBright

Feature Rich Laser Power/Energy Meter

- Compatible only with all standard Ophir thermal, BeamTrack, pyroelectric (PE-C series only) and photodiode sensors
- Brilliant color large size TFT 320x240 display
- Choose between Digital with Bargraph, Analog Needle, Line Plot (for laser tuning), Pulse Chart, Pass/Fail, Position, Stability, Real Time Statistics displays
- Sophisticated power and energy logging, including logging every point at up to 5000Hz with Pyro sensors
- Math functions for advanced processing such as Density, Scale Factor, Normalize against base line, etc.
- Can mix functions together and display the results graphically. Function results can also be logged
- USB Flash Drive for nearly unlimited data storage
- USB and RS232 interfaces with StarLab PC applications and User Commands document
- LabVIEW driver and COM Object Interface
- New: Pulsed Power measurements with Thermopile detectors
- New: Exposure measurement (Energy Summing) with Photodiode detectors
- Select between English, Japanese, Russian, and Chinese interfaces
- Soft keys and menu driven functions with context sensitive help
- Compact handheld design with rubberized bumpers and optimized kickstand
- Backlighting and rechargeable battery
- Scalable Analog Output

StarBright is the most feature rich handheld laser power/energy meter on the market. Just plug in one of the many Ophir sensors and you have a whole measurement laboratory at your fingertips. The bright color display gives unparalleled legibility and ease of interpreting information. StarBright has many on board features such as laser tuning, data logging, graphing, normalize, power or energy density, attenuation scaling, max and min limits. StarBright can also display the power or energy as a high resolution simulated analog needle display.



StarBright can be either battery operated or from an AC source with the charger plugged in at all times. Its bright display and user-selectable color format enables ease of use in dark room conditions or when wearing protective glasses.

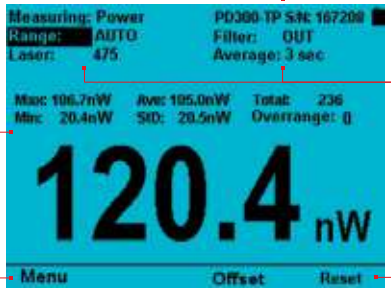
The built-in USB and RS232 interfaces and StarLab PC software allow display and processing of data either in real time or from previously stored data. Results are displayed graphically on a PC. To support PC interfacing, LabVIEW drivers, a COM Object Interface and demo source code are provided.

StarBright Screen Layout

StarBright screen ergonomics raise the user experience to new levels. The display is carefully designed to provide easy reading of the laser measurement, quick access to configuration parameters as well as the ability to set up for more advanced work.

Select measurement mode (power, energy, etc.)

Sensor name and serial number



Configuration parameters for laser measurement. These settings are sensor specific and saved in the sensor's memory.

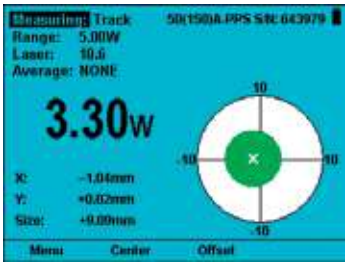
Measurement display area. User can select the display type. In this example, the user has chosen large numeric readout with real time statistics.

Softkeys for additional display functionality. In this example, press Offset to remove background noise from the measurement. Press Reset to clear the statistics and start over.

Press the Menu key to access additional StarBright functions including logging, pass/fail inspection and math processing.

Selected Screens

Analog needle display of power Persistence and min/max tracking.

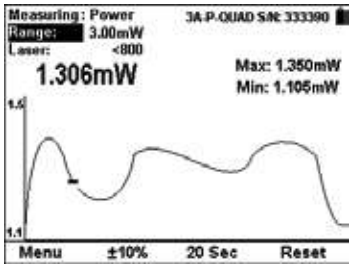


Power, Position, and Size measured with a BeamTrack sensor.

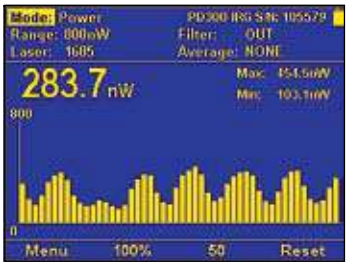
Bargraph display of energy. Colors set for work with protective glasses.

Power density measured after rescaling the power measurement.

Data logs filed to USB Flash Drive. Can be viewed in StarLab or Excel.

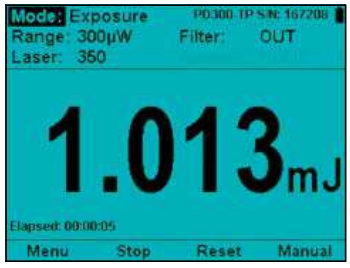


Line graph display of power. Wraps back to start for continuous display.



Pulse chart display of power.

Power measurement of laser pulse. For use with high-power pulsed lasers.



Exposure measurement (energy summing) with photodiode sensor.

Specifications

Power Meter	Brilliant color TFT 320 x 240 pixel graphics LCD. Large 16mm digits.
Features	Many screen features including power with multicolor bar graph, energy, average, exposure, frequency, graphs, scaling, special units, and more.
Outputs	USB, RS232 and user selectable 1, 2, 5 and 10 Volt full scale analog output.
Screen Refresh	15 times/sec
Case	Molded high impact plastic with optimized angle kickstand. Rubberized sides for easy grip and protection against damage.
Size	Folds to a compact 213mm L x 113mm W x 40mm H
Battery	Rechargeable Li-ion batteries with typically 8 hours between charges. The charger can be ordered from your local distributor. The charger also functions as an AC adapter.
Data Handling	Data can be viewed on board or transmitted to PC On Board: Data stored to USB Drive (Thumb Drive) at rates up to 5000 points/s. Transmitted to PC: Data transmission rate of ~500 points/s. RS232 baud rate of 38400.
Sensor Features	Works with Thermopile, BeamTrack, Pyroelectric (PE-C series) and Photodiode sensors. Automatic continuous background cancellation with PD300 sensors. Submicrojoule and multikilohertz capability with pulsed energy sensors. Works with our new PD300RM sensors.
Program Features	Preferred start up configuration can be set by user. User can recalibrate power, energy, response time and zero offset.

Ordering Information

Item	Description	Ophir P/N
StarBright	StarBright universal power meter for Thermal, BeamTrack, Pyroelectric and Photodiode sensors	7Z01580
Carrying Case	Carrying case 38x30x11 cm. For power meter and up to 3 sensors	1J02079
StarBright USB Cable	USB-A to MICRO-B cable for field upgrade support (1 unit supplied with StarBright)	7E01279
StarBright RS232 Cable	D9 to 3.5mm plug cable (1 unit supplied with StarBright)	7E01213
StarBright Battery Pack	Replacement battery pack for StarBright	7E14008
P Polarity Power Supply/Charger	Power Supply/Charger AC/DC 12V 2A P-1.35x3.5 (1unit supplied with StarBright)	7E05047
Standard Analog Output Connector	2.5mm mono jack (1unit supplied with StarBright)	7E02008

2.1.2 Vega

Color Screen Laser Power/Energy Meter

- Compatible with all standard Ophir thermal, BeamTrack, pyroelectric and photodiode sensors
- Brilliant color large size TFT 320x240 display
- Compact handheld design with rubberized bumpers and optimized 2 position kickstand
- Choice of digital or analog needle display
- Illuminated keys for working in the dark
- Analog output
- Log every point at up to 4000Hz with pyro sensors
- Non volatile data storage up to 250,000 points
- Laser tuning screen and power and energy log
- USB and RS232 interfaces with StarLab and StarCom PC applications, LabVIEW driver and COM Object Interface (see pages 139-145)
- Soft keys and menu driven functions with on line help
- Many software features such as density, min/max, scaling etc.

The Vega is the most versatile and sophisticated handheld laser power/energy meter on the market. Just plug in one of the many Ophir sensors and you have a whole measurement laboratory at your fingertips. The bright color display gives unparalleled legibility and ease of interpreting information. The Vega has many on board features such as laser tuning, data logging, graphing, normalize, power or energy density units, attenuation scaling, max and min limits. The Vega can also display the power or energy with a high resolution simulated analog needle display.

The Vega can be operated either by battery or from an AC source with the charger plugged in at all times. Its bright display and backlit keys allow easy use in dark room conditions or with laser glasses on.

The built-in USB and RS232 interfaces and StarLab and StarCom PC software allow on-line processing of data or processing previously stored data; results are displayed graphically on a PC. To support PC interfacing, LabVIEW drivers and COM Object Interface are provided.

StarLab Software

Selected Screens

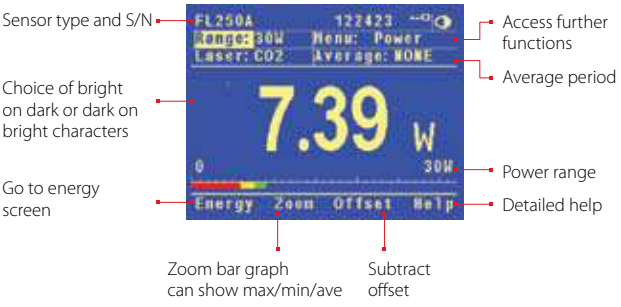
Digital Power Screen and Color Functions

- Choice of bright on dark or dark on bright characters
- Optimize colors for use with laser eye protection glasses
- Can average over selected period. Useful for unstable lasers
- Bar graph can show max / min / average in different colors

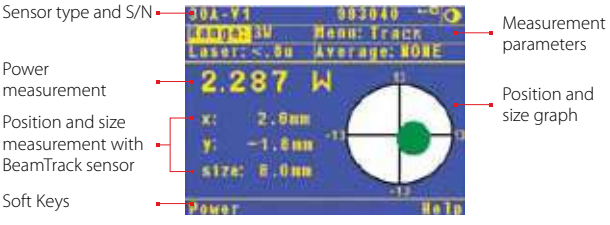
BeamTrack Power/Position/Size Screen

- Monitoring of laser beam size
- Accurate tracking of beam position to fractions of a mm
- Beam position and wander
- All the other features of standard power/energy meters

Standard Power Screen

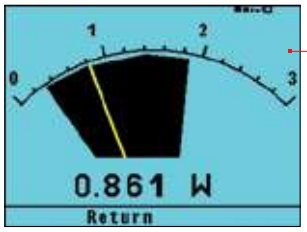


BeamTrack Power/Position/Size Screen



Analog Power Screen

- Perfect for adjusting and maximizing laser power
- Persistent graphical display allows tracking of minimum maximum values measured
- Large analog needle with small digital display as well



Choice of smaller display with range, menu, laser and average headers.

Energy/Limits Screen

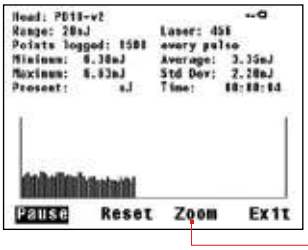
- Pulsed energy sensors (single or repetitive) and thermal sensors (single shot only).
- Frequency measurement with pulsed energy sensors.
- Limits screen with bright colored warning

Energy threshold

Energy range

Energy Logging Screen

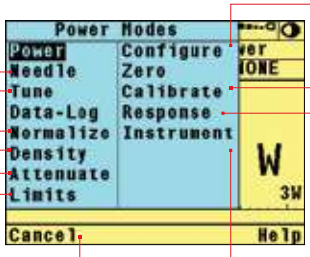
- Pyroelectric and thermal sensors
- Continuous scroll with up to 100 points on screen
- Full statistics
- Store data onboard and recall



Enlarge variation pulse to pulse

Additional Functions

- Press the menu choice on the main screen and many more options pop up as shown



Choose analog needle screen

Laser tune screen with continuous graph

Normalize so present reading is 1.00

Enter beam diameter and read in units of W/cm^2 or J/cm^2

Put in factor to read input power with attenuator or beam splitter

Set for alarm if preset min or max limits exceeded

Return to previous menu

Set startup configuration

Adjust sensor calibration

Adjust sensor response time

Adjust power meter parameters

Specifications

Power Meter	Brilliant color TFT 320 x 240 pixel graphics LCD. Large 16mm digits. High resolution analog needle also can be chosen.
Features	Many screen features including power with multicolor bar graph, energy, average, exposure, frequency, graphs, scaling, special units, and more. Complete on line context sensitive help screens.
Outputs	USB, RS232 and user selectable 1, 2, 5 and 10 Volt full scale analog output.
Screen Refresh	15 times/sec
Case	Molded high impact plastic with optimized angle two level kickstand. Rubberized sides for easy grip and protection against damage.
Size	Folds to a compact 208mm L x 117mm W x 40mm H
Battery	Rechargeable NiMH batteries with typically 18 hours between charges. The charger can be ordered from your local distributor. The charger also functions as an AC adapter.
Data Handling	Data can be viewed on board or transmitted to pc: On Board: Non volatile storage of up to 250,000 data points in up to 10 files. Max data logging rate 4000[(a)] points/s. Transmitted to PC: Data transmission rate of ~500 points/s. RS232 baud rate of 38400.
Sensor Features	Works with Thermopile, BeamTrack, Pyroelectric and Photodiode sensors. Automatic continuous background cancellation with PD300 sensors Submicrojoule and multikilohertz capability with pulsed energy sensors.
Program Features	Preferred start up configuration can be set by user. User can recalibrate power, energy, response time and zero offset.
Notes: (a)	The above refers to the rate of logging every single point in turbo mode. Above that rate, the instrument will sample points but not log every single point.

Ordering Information

Item	Description	Ophir P/N
Vega	Vega color universal power meter for standard thermal, BeamTrack, pyroelectric and photodiode sensors	7Z01560
Carrying Case	Carrying case 38x30x11 cm. For power meter and up to 3 sensors	1J02079
USB Cable for Vega	USB to mini DIN cable (1 unit supplied with Vega)	7E01205
RS232 Cable for Vega	D9 to mini DIN cable (1 unit supplied with Vega)	7E01206
Battery Pack for Vega	Replacement battery pack for the Vega	7E14007
N Polarity Power Supply/Charger	Power Supply/Charger AC/DC 12V 2A N-2.1x5.5 (1 unit supplied with Vega)	7E05029
Standard Analog Output Connector	2.5mm mono jack (1 unit supplied with Vega)	7E02008

2.1.3 Nova II

Versatile Laser Power/Energy Meter

- Compatible with all standard Ophir thermal, BeamTrack, pyroelectric and photodiode sensors
- Large high definition LCD display
- Choice of digital or analog needle display
- 2 position kickstand
- Backlighting and rechargeable battery
- Analog output
- Log every point at up to 4000Hz with pyro sensors
- Non volatile data storage up to 59,400 points
- Laser tuning screen and power and energy log
- USB and RS232 interfaces with StarLab and StarCom PC applications, LabVIEW driver and COM Object Interface (see pages 139-145)
- Soft keys and menu driven functions with on-line help
- Many software features such and density, min/max, scaling etc.

The Nova II is the most versatile and sophisticated handheld laser power/energy meter on the market. Just plug in one of the many Ophir sensors and you have a whole measurement laboratory at your fingertips. The Nova II has many on-board features such as laser tuning, data logging, graphing, normalize, power or energy density units, attenuation scaling, max and min limits. The Nova II can also display the power or energy with a high resolution simulated analog needle display.

The Nova II can be operated either by battery or from an AC source with the charger plugged in at all times. Its backlight allows illumination of the power meter in low light conditions.

The built-in USB and RS232 interfaces and StarLab and StarCom PC software allow on-line processing of data or processing previously stored data; results are displayed graphically on a PC. To support PC interfacing, LabVIEW drivers and COM Object Interface are provided.

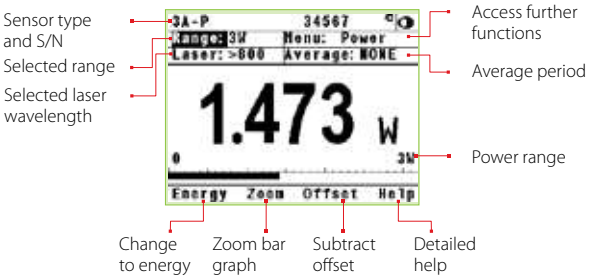
StarLab Software

Selected Screens

Digital Power Screen

- CW industrial, medical and scientific lasers
- pW to Multi kW with appropriate sensors
- Can average over selected period. Useful for unstable lasers
- Fast response bar graph

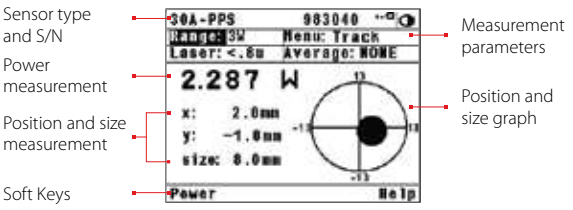
Standard Power Screen



BeamTrack Power/Position/Size Screen

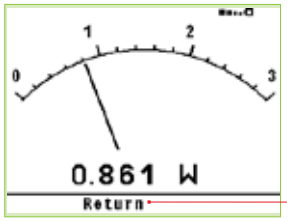
- Monitoring of laser beam size
- Accurate tracking of beam position to fractions of a mm
- Beam position and wander
- All the other features of standard power/energy meters

BeamTrack Power/Position/Size Screen



Analog Power Screen

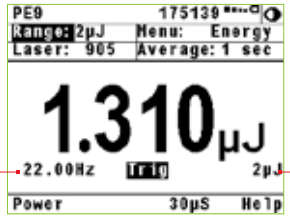
- Perfect for adjusting and maximizing laser power
- Large analog needle with small digital display as well



Choice of smaller ,display with range menu, laser and average headers

Energy Screen

- Pulsed energy sensors (single or repetitive) and thermal sensors (single shot only)
- Frequency measurement with pulsed energy sensors

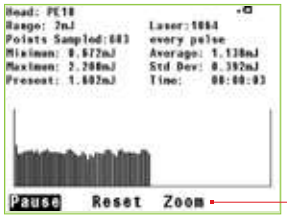


Frequency

Energy range

Energy Logging Screen

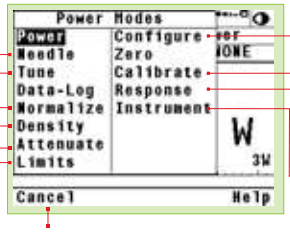
- Pyroelectric and thermal sensors
- Continuous scroll with up to 100 points on screen
- Full statistics
- Store data onboard and recall



Enlarge variation pulse to pulse

Additional Functions

- Press the menu choice on the main screen and many more options pop up as shown



Choose analog needle screen

Laser tune screen with continuous graph

Normalize so present reading is 1.00

Enter beam diameter and read in units of W/cm^2 or J/cm^2

Put in factor to read input power with attenuator or beam splitter

Set for alarm if preset min or max limits exceeded

Set startup configuration

Adjust sensor calibration

Adjust sensor response time

Adjust power meter parameters

Return to previous menu

Specifications

Power Meter	High legibility 320 x 240 pixel graphics LCD with switchable electroluminescent backlight. Large 18mm digits. High resolution analog needle also can be chosen.
Features	Many screen features including power with bar graph, energy, average, exposure, frequency, graphs, scaling, special units, and more. Complete on line context sensitive help screens.
Outputs	USB, RS232 and 1, 2, 5 and 10 volt full scale analog output.
Screen Refresh	15 times/sec
Case	Molded high impact plastic with two level kickstand.
Size	Folds to a compact 208mm Lx 117mm Wx 40mm H
Battery	Rechargeable NiMH batteries with typically 18 hours between charges. The charger can be ordered from your local distributor. The charger also functions as an AC adapter.
Data Handling	Data can be viewed on board or transmitted to PC: On Board: Non volatile storage of up to 54000 data points in up to 10 files. Max data logging rate 4000 [(a)] points/s. Transmitted to PC: Data transmission rate of ~500 points/s. RS232 baud rate of 38400.
Sensor Features	Works with Thermopile, BeamTrack, Pyroelectric and Photodiode sensors. Automatic continuous background cancellation with PD300 sensors. Submicrojoule and multikilohertz capability with pulsed energy sensors.
Program Features	Preferred startup configuration can be set by user. User can recalibrate power, energy, response time and zero offset.
Notes: (a)	The above refers to the rate of logging every single point in turbo mode. Above that rate, the instrument will sample points but not log every single point.

Ordering Information

Item	Description	Ophir P/N
Nova II	Nova II universal power meter for standard thermal, BeamTrack, pyroelectric and photodiode sensors	7Z01550
Carrying Case	Carrying case 38x30x11 cm. For power meter and up to three sensors	1J02079
Nova II USB Cable	USB to mini DIN cable (1 unit supplied with Nova II)	7E01205
Nova II RS232 Cable	D9 to mini DIN cable (1 unit supplied with Nova II)	7E01206
Battery Pack	Replacement battery pack for the Nova II	7E14007
N Polarity Power Supply/Charger	Power Supply/Charger AC/DC 12V 2A N-2.1x5.5 (1 unit supplied with Nova II)	7E05029
Standard Analog Output Connector	2.5mm mono jack (1 unit supplied with Nova II)	7E02008

2.1.4 StarLite

Low Cost Laser Power / Energy Meter

- Compatible with all standard Ophir Thermal, BeamTrack, Pyroelectric (PE-C series only) and Photodiode sensors
- Brilliant large size TFT 320x240 display
- Compact handheld design with rubberized bumpers and optimized kickstand
- Choice of digital or analog needle display
- Analog output
- Easy to use soft keys
- Easy measurement configuration with context sensitive help
- Backlighting and rechargeable battery
- Single shot energy measurement with thermal sensors
- Power averaging
- Resizable Screen graphics
- EMI rejection
- Optional software package for USB communication with our StarLab PC suite

StarLite is a low cost power / energy meter capable of measuring power or energy from pJ and pW to hundreds of Joules and thousands of Watts. It also supports position and size measurement with the BeamTrack family of sensors. StarLite can also display the power or energy with a high resolution simulated analog needle display.

All StarLite measurement screens can be configured to either show the measurement parameters or to hide them in order to maximize the graphical and numeric displays.

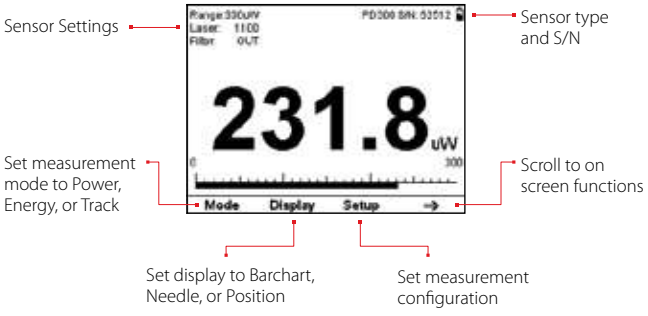
StarLite can be operated either by battery or from an AC source with the charger plugged in at all times. Its backlight allows illumination of the power meter in low light conditions.

Selected Screens

Digital Power Screen

- CW industrial, medical and scientific lasers
- pW to Multi kW with appropriate sensors
- Can average over selected period. Useful for unstable lasers.
- Fast response bar chart

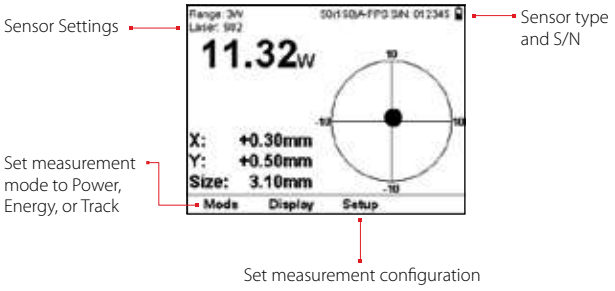
Barchart Display of Power Measurement



BeamTrack Power/Position/Size Screen

- Monitoring of laser beam size
- Accurate tracking of beam position to fractions of a mm
- Power measured at the same time

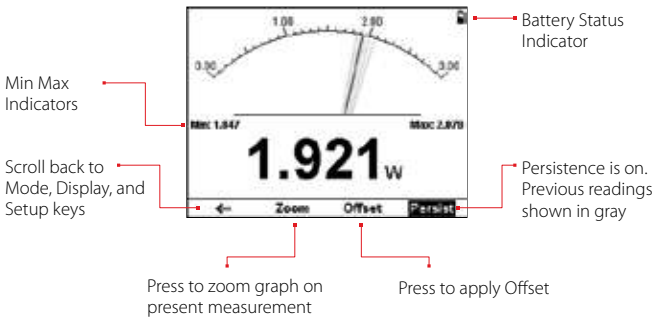
BeamTrack Position and Size Screen



Analog Needle Screen

- Perfect for adjusting and maximizing laser power or energy
- Persistent graphical display allows tracking of minimum maximum values measured
- Large analog needle with small digital display as well

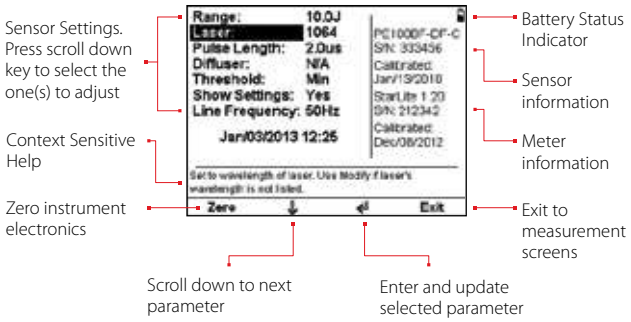
Large Analog Needle with Persistence



Configuration Screen

- Easy adjustment of all measurement configuration parameters
- Context sensitive help for selected parameter
- Sensor and meter information provided

Configuration Screen



Specifications

Power Meter	High legibility TFT 320 x 240 pixel graphics LCD. Large 16mm digits. High resolution analog needle also can be chosen.
Features	Power, single shot energy, energy and frequency of high rep rate lasers, position, and size.
Outputs	1V Full Scale analog output.
Screen Refresh	15 times/sec
Case	Molded high impact plastic with optimized angle kickstand. Rubberized sides for easy grip and protection against damage.
Size	Folds to a compact 213mm L x 113mm W x 40mm H
Battery	Rechargeable Li-ion batteries with typically 8 hours between charges. The charger can be ordered from your local distributor. The changer also functions as an AC adapter.
Sensor Features	Automatic continuous background cancellation with PD300 sensors. Submicrojoule and multikilohertz capability with pulsed energy sensors.
Sensor Compatibility	Works with standard Thermopile, BeamTrack, Photodiode and PE-C Pyroelectric sensors (does not support previous non C series Pyroelectric sensors).

Ordering Information

Item	Description	Ophir P/N
StarLite	StarLite universal power meter for Thermal, BeamTrack, Pyroelectric and Photodiode sensors	7Z01565
Carrying Case	Carrying case 38x30x11 cm. For power meter and up to 3 sensors	1J02079
StarLite USB Activation Code	Software Activation Code that enables the StarLite meter to communicate in USB with our StarLab software suite	7Z11049
USB Cable for StarLite	USB-A to MICRO-B cable for field upgrade support (1 unit supplied with StarLite)	7E01279
Battery Pack for StarLite	Replacement battery pack for the StarLite	7E14008
P Polarity Power Supply/Charger	Power Supply/Charger AC/DC 12V 2A P-1.35x3.5 (1 unit supplied with StarLite)	7E05047
Standard Analog Output Connector	2.5mm mono jack (1 unit supplied with StarLite)	7E02008

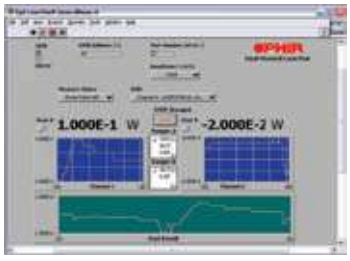
2.1.5 Laserstar

Versatile Laser Power/Energy Meter

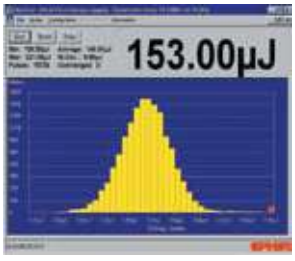
- Two models available: dual and single channel
- Single channel model can be upgraded to dual channel
- Compatible with all standard Ophir thermopile, pyroelectric, photodiode and RP sensors
- Large LCD display
- Backlighting and rechargeable battery
- Screen graphics and statistics (std dev. min, max)
- Analog output
- Built-in RS232 interface
- Log every data point at >1500Hz with pyroelectric sensors
- Non-volatile data storage up to 59,400 points
- Laser tuning screen and power log
- Audio sound for laser tuning and low battery
- RS232 interface with StarCom PC application software and LabVIEW driver (see pages 139-145)
- GPIB option (IEEE488.1)
- NIST traceable
- CE marked
- Soft keys, menu-driven

IEEE 488 GPIB Cable for LaserStar

The dual channel model enables user to simply plug in any of Ophir's thermal, pyroelectric, photodiode or RP sensors and measure two channels independently, or the ratio or difference between them in real time.
Up to 10 data files (54,000 points total) can be stored for onboard review or downloading to computer even if Laserstar has been switched off. The built-in RS232 interface and StarCom PC software allow on-line processing of data or processing previously stored data; results are displayed graphically on a PC. To support PC interfacing, LabVIEW drivers are provided.



LabVIEW

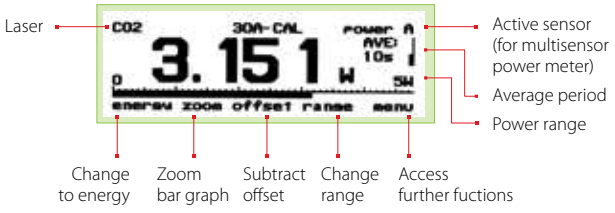


StarCom Software

Selected Screens

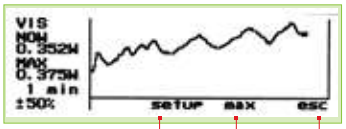
Digital Power Screen

- CW industrial, medical and scientific lasers
- pW to multi kW with appropriate sensors
- Can average over selected period. Useful for unstable lasers
- Fast response bar graph



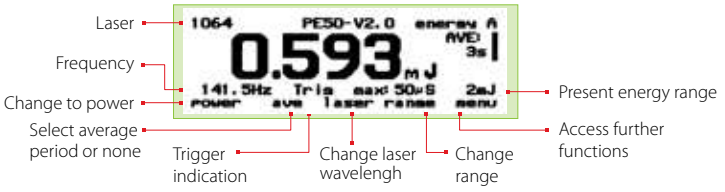
Laser Tuning Screen or Power Log Screen (not shown)

- Maximizing laser power
- User selected time period and zoom
- Option of audio tune tone for maximizing laser power



Energy Measurement Screen

- Pyroelectric and thermal sensors - single pulse
- Pyroelectric frequency measurement

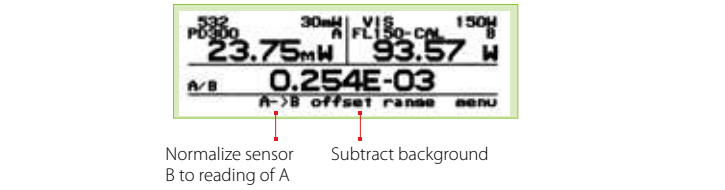


Energy Log Screen

- Pulsed energy sensors
- Thermal sensors - successive single pulses
- Continuous scroll
- Energy statistics

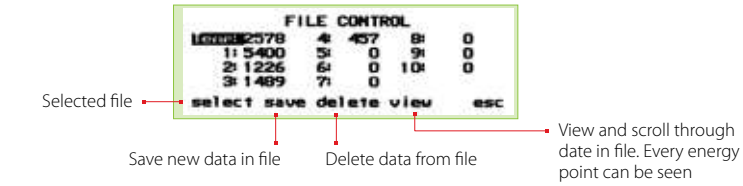
Ratio Screen

- Two independent sensors
- Measure ratio, sum, difference
- Normalize one sensor to the other



Data Storage and Transmission

- Non-volatile storage of power and energy logging data
- Store in up to 10 files and transmit to PC
- PC using StarCom Windows program provided



Specifications

Power Meter	High legibility 64 x 240 pixel graphics supertwist LCD with switchable, electroluminescent backlight which operates from charger or battery. Large 17mm digits. Screen refresh 15Hz.
Features	Many screen features including: power with bargraph, energy, average, exposure, frequency, graphs and more.
Outputs	RS232 and analog output 1V f.s.
Screen Refresh	15 times /sec
Case	Molded high-impact plastic with swivel display and EMI conductive shielding, to allow use even in proximity to pulsed lasers.
Size	Folds to a compact 228mm W x 195mm L x 54mm H.
Battery	Rechargeable 18 hours between charges. The charger can be ordered from your local distributor. The charger also functions as AC adapter.
Multisensor Option	Two sensors can be connected and measure independently, or the ration, sum or difference of the two can be displayed.
Data Handling	Data can be viewed on board or transmitted to PC: On Board: Non volatile storage of up to 54,000 data points in up to 10 files. Max data logging rate >1500 points/s. Transmitted to PC: Data transmission rate of ~500 points/s. RS232 baud rate of 38400.
Sensor Features	Works with standard thermal, pyroelectric, photodiode and RP sensors. Automatic, continuous, background cancellation with PD300 sensors. Submicrojoule and multikilohertz capability with pulsed energy sensors.
Program Features	Preferred startup configuration can be set by user. User can recalibrate power, energy, response time and zero offset.

Ordering Information

Item	Description	Ophir P/N
Laserstar	Laserstar single channel universal power meter for thermal, pyroelectric, photodiode and RP sensors	7Z01600
Laserstar 2 Channel	Laserstar with dual channel capability including ratio and difference measurement	7Z01601
RS232 Cable for Laserstar	Cable RS232 D9 - D25 (1 unit supplied with Laserstar)	7E01121
Laserstar Battery Pack	Laserstar NiMH Battery update Kit	7Z14006A
Laserstar IEEE Option	IEEE GPIB adapter for Laserstar (see page 132)	7Y78300 [a]
N Polarity Power Supply/Charger	Power Supply/Charger AC/DC 12V 2A N-2.1x5.5 (1 unit supplied with LaserStar)	7E05029
LaserStar Analog Output Connector	Analog Output plug for LaserStar (1 unit supplied with LaserStar)	7Z11004
Note: (a)	P/N 7Y78300 replaces P/N 78300	

2.1.6 NOVA

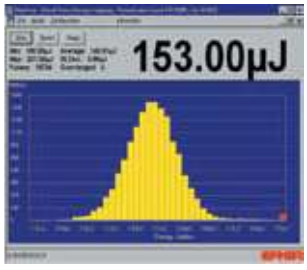
Compact and Durable Power / Energy Meter

- Compact and durable
- Compatible with all standard Ophir sensors: thermal, pyroelectric* and photodiode
- Single shot energy measurement with thermal sensors
- Optional RS232 interface with StarCom PC application and LabVIEW driver (see pages 139-145)
- Power and energy logging with graphical display and statistics
- Power averaging
- Easy to use soft keys, menu-driven
- Screen graphics
- Backlight and rechargeable battery
- Analog output
- EMI rejection

RS232 cable for Nova

Compatible with the complete range of Ophir thermal (power and energy), pyroelectric and photodiode sensors, Nova is truly versatile:measuring power or energy from pJ and pW to hundreds of Joules and thousands of Watts. With the optional scope adapter, you can connect your pyro sensor to an oscilloscope and see every pulse up to the maximum frequency permitted by the sensor.
Smart connector sensors automatically configure and calibrate Nova when plugged in. Soft keys guide you through the screen graphics. Finished working? Your configuration can be saved for future use.
Nova's exclusive autoranging tune screen displays laser power graphically and displays maximum power. Zoom and time scale can be adjusted by user.

The optional RS232 interface and StarCom PC software allow on-line processing of data or processing previously stored data; results are displayed graphically on a PC. To support PC interfacing, LabVIEW drivers are provided.



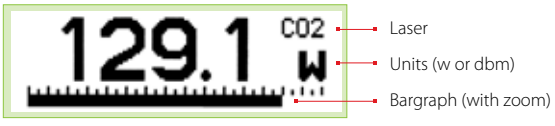
StarCom Software

LabVIEW

Selected Screens

Digital Power Screen

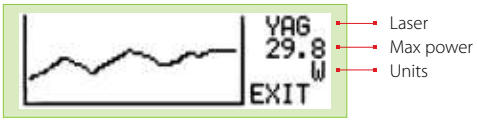
- CW industrial, medical and scientific lasers
- pW to multi kW with appropriate sensors



Press Menu button or soft keys to make legends visible (not shown).

Laser Tuning Screen or Power Log Screen (not shown)

- Maximizing laser power
- User selected time period and zoom

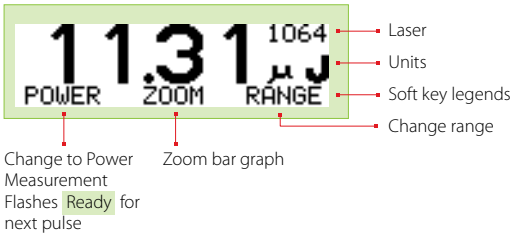


Press Menu button or soft keys to make legends visible.

* PE-C series of pyroelectric sensors are compatible with Nova, when used with an additional adapter (P/N 7Z08272) – see page 100.

Energy Measurement Screen

- Pyroelectric and thermopile sensors-single pulse
- Pyroelectric frequency measurement (not shown)



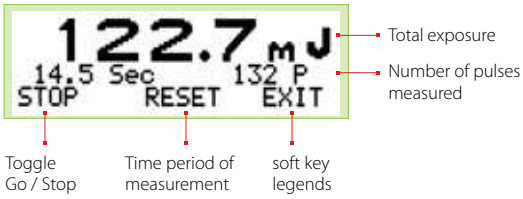
Energy Log Screen

- Pyroelectric sensors
- Thermopile sensors-successive single pulses
- Continuous scroll
- Energy statistics

Press Menu button or soft keys to make legends visible (not shown)

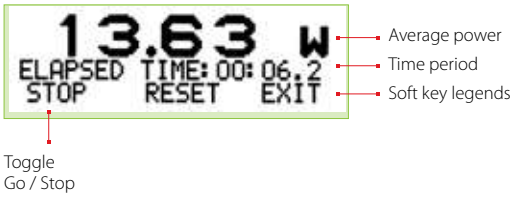
Pyroelectric Exposure Screen

- Sum or average energies over user selected time period / number of pulses
- Medicine, photolithography



Average Screen

- Thermopile, photodiode and pyroelectric sensors (Does not operate with PE-C series of pyroelectric sensors)
- Periodic (1/3 sec to 30 sec) or continuous (10 sec to 1 hour) average for fast-changing or slow-changing laser



Specifications

Power Meter	High legibility 32 x 122 pixel graphics supertwist LCD with switchable electroluminescent backlight. Large 12mm digits.
Features	Many screen features: including power with bar graph, energy, average, exposure, frequency, graphs, and more.
Outputs	RS232 and analog output 1V f.s. (optional)
Screen Refresh	15 times / sec.
Case	Molded high-impact plastic with kickstand and EMI conductive shielding, to allow use even in proximity to pulsed lasers.
Size	Very compact: 205 x 95 x 39mm.
Battery	Rechargeable 12 volts. 22 hours use between charges. The charger can be ordered from your local distributor. The charder also functions as AC adapter.
Data Handling	Data can be viewed on board or transmitted to PC: On Board: Max data logging rate >10 points/s Transmitted to PC: Data transmission rate of ~50 points/s. RS232 baud rate of 19200
Sensor features	Works with thermopile, pyroelectric, and photodiode sensors. Automatic, continuous, background cancellation with PD300 sensors. Submicrojoule and multikilohertz capability with model PE sensors. All sensors use smart connector containing configuration information.
Program features	Preferred startup configuration can be set by user. User can recalibrate power or energy. Response time. Zero offset.

Ordering Information

Item	Description	Ophir P/N
Nova	Nova universal power meter for standard thermal, pyroelectric and photodiode sensors	7Z01500
Nova PE-C Adapter	Adapter to allow Nova to operate with PE-C series pyroelectric sensors. Plugs between Nova D15 socket and PE-C D15 plug	7Z08272
Carrying Case	Carrying case 38x30x11cm. For display and up to three sensors	1J02079
Nova RS232 assemblies - allow Nova power meter to communicate with PC and be controlled by PC		
Nova RS232 Assembly	RS232 adapter with standard 2 meter cable (including software) (see page 132)	7Y78105 [a]
Nova RS232 Assembly	RS232 adapter with 5 meter cable (including software)	7Y71052 [b]
Nova RS232 Assembly	RS232 adapter with 8 meter cable (including software)	7Y71051 [c]
Battery Pack	Replacement battery pack for Nova	7Z11200
N Polarity Power Supply/Charger	Power Supply/Charger AC/DC 12V 2A N-2.1x5.5 (1 unit supplied with Nova)	7E05029
Standard Analog Output Connector	2.5mm mono jack (1 unit supplied with Nova)	7E02008
Note: (a)	P/N 7Y78105 replaces P/N 78105	
Note: (b)	P/N 7Y71052 replaces P/N 781052	
Note: (c)	P/N 7Y71051 replaces P/N 781051	

2.1.7 Accessories

Power Supply/Charger

Negative Polarity Power Supply/Charger for Vega, Nova II, Laserstar, Nova, EA-1, Pulsar and Quasar
Positive Polarity Power Supply/Charger for StarBright and StarLite.

Analog Output Connectors

Replacement standard analog output plug for most Ophir meters.
Replacement analog output plug for Laserstar.

Standard Analog Output Connector

Laserstar Analog Output Connector

StarLite USB Activation Code

Software Activation Code that enables the StarLite meter to communicate in USB with our StarLab software suite.

RS232 Module for Nova

Plug in module allows transfer of power and energy data to PC and remote control of power meters from PC. Includes manual and StarCom application program (refer to page 144).

IEEE488 GPIB for Laserstar

Option available with Laserstar power meter allowing Laserstar to operate with GPIB protocol.
The option comes with StarCom software and also LabVIEW VIs to build LabVIEW applications.

Carrying Cases

Carrying case for StarBright, StarLite, Vega, Nova II or Nova power meters and up to 3 sensors.

Ordering Information

Item	Description	Ophir P/N
N Polarity Power Supply/Charger	Power Supply/Charger AC/DC 12V 2A N-2.1x5.5	7E05029
P Polarity Power Supply/Charger	Power Supply/Charger AC/DC 12V 2A P-1.35x3.5	7E05047
Standard Analog Output Connector	2.5mm mono jack	7E02008
Laserstar Analog Output Connector	Analog Output plug for Laserstar	7Z11004
StarLite USB Activation Code	Software Activation Code that enables the StarLite meter to communicate in USB with our StarLab software suite	7Z11049
Nova RS232 Assembly	RS232 adapter with standard 2 meter cable (including software)	7Y78105 (a)
Nova RS232 Assembly	RS232 adapter with 5 meter cable (including software)	7Y71052 (b)
Nova RS232 Assembly	RS232 adapter with 8 meter cable (including software)	7Y71051 (c)
Laserstar IEEE Option	IEEE GPIB adapter for Laserstar	7Y78300 (d)
Carrying Case for StarBright, StarLite, Vega, Nova II and Nova	Carrying case 38x30x11 cm. For power meter and up to three sensors	1J02079
Note: (a)	P/N 7Y78105 replaces P/N 78105	
Note: (b)	P/N 7Y71052 replaces P/N 781052	
Note: (c)	P/N 7Y71051 replaces P/N 781051	
Note: (d)	P/N 7Y78300 replaces P/N 78300	

2.2 PC Interfaces

2.2.1 PC Connectivity Options for Power/Energy Measurement

Ophir Pyroelectric, Thermal and Photodiode sensors measure at up to 25,000 points per second

Sample data with Ophir power meter at up to 4000 points per second

Ophir power meter capable of on board storage of data of up to 250,000 points and data storage rate of up to 4000 points per second

Ophir sensor to USB interfaces with up to 4 channel connectivity

Ophir EA-1 interface with Ethernet connectivity

Ophir Quasar interface with wireless connectivity

Transmit real time data to PC at 500 points per second via Bluetooth

Transmit real time data to PC at up to >25,000 points/s (sensor limited) via Ethernet

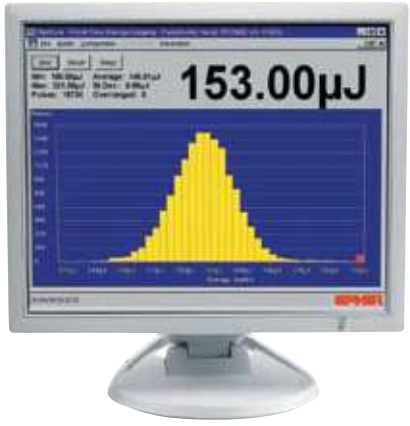
Transmit real time data to PC at up to 25,000 points/s per channel (sensor limited) via USB

Transmit stored data or real time data to PC via USB or RS232

StarLab software (data transmitted via USB, Ethernet or Bluetooth)

StarCom software (data transmitted via RS232)

StarLab software



StarCom software

2.2.2 Compact Juno USB Interface

Convert your laptop or desktop PC into an Ophir sensor power/energy meter

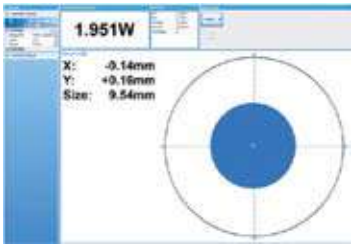
- From sensor to interface to PC - no power source needed
- Plug and play with all standard Ophir smart sensors
- Position & size measurement with BeamTrack sensors
- Record every energy pulse at up to 10kHz
- Log power and energy, average, statistics, histograms and more with included StarLab application
- LabVIEW VIs and COM Object interface
- Very compact - is just an extension of the smart plug

Smart Sensor to Juno to PC

Ophir's basic smart compact Juno module turns your PC or laptop into a full fledged Ophir laser power/energy meter.
Just install the software, plug the sensor into the Juno module and connect the Juno with a standard USB cable to the PC USB port.
Using the Juno, you can connect several sensors to the PC by using one Juno module for each sensor and, if necessary, a USB hub.

LabVIEW

Juno operating with StarLab software



Juno with BeamTrack sensor and StarLab showing beam power, position and size

Specifications

Power Measurement	
Power log period	5s to 500hr.
Energy Measurement	
Max real time data logging to PC	10,000Hz (a)
Trigger input and output	N.A.
Timing	Supports time stamp for each pulse - resolution 10µs
General	
Number of sensors supported	One sensor per unit. Can combine several units with software for display of up to 8 sensors on one PC
Compatible sensors	Supports all standard Ophir pyroelectric, thermal, BeamTrack and photodiode sensors (b)
Power supply	Powered from USB
Dimensions	76 x 55 x 22mm
Notes:	(a) This is the data logging rate for every single point in turbo mode. Above that rate, the instrument will sample points but not log every single point (b) Not including RP and PD300-CIE

Ordering Information

Item	Description	Ophir P/N
Juno	Compact module to operate one Ophir sensor from your PC USB port. Comes with software. Max repetition rate for every pulse 10kHz. Powered from PC USB port	7Z01250
Juno USB cable	USB-A to MINI-B Cable (1 unit supplied with Juno)	7E01217

2.2.3 EA-1 Compact Ethernet Adapter

Connects your Ophir sensor to an Ethernet bus

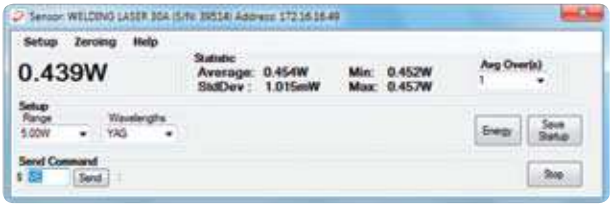
- From sensor direct to Ethernet with no PC connection
- Powers directly from the Ethernet bus or 12V power supply
- Supports thermal and photodiode smart sensors
- Software support via StarLab application or 'Ophir Ethernet App' PC application software package, both included
- Allows remote monitoring via Telnet, HTTP or UDP protocols

DB15 connector

Mini-USB connector;
Ethernet RJ45 connector;
12V power connector

Smart Sensor to EA-1 to Ethernet to PC

The EA-1 is suitable for OEM customers who desire Ethernet connectivity and want to remotely monitor and control the sensor via their own custom software or the Ophir provided PC application. The EA-1 is designed to connect an Ophir smart sensor to your Ethernet. Standard thermopile, pyroelectric and photodiode sensors are supported. The unit is powered directly from the Ethernet bus if Power Over Ethernet (PoE) is available, or from a standard Ophir 12V power supply if not. The sensor can be monitored remotely over the Ethernet bus, allowing remote connections from distances far in excess of those allowed via RS232 or USB. The device is suitable for industrial or other environments where the bus of choice is Ethernet. Telnet, HTTP and UDP protocols are supported.
Installation and choosing an IP address are simplified via the simple Ophir Ethernet App PC application supplied with the unit. The PC application allows setup and basic functionality such as monitoring power and energy and changing measurement scales or wavelengths. Configuration of the IP address is via the Ethernet or a separate USB connection. The PC operating screen is shown below measuring power and energy.



PC application power screen

PC application energy screen

Additional features such as logging power or energy graphically are provided by the StarLab PC application which also supports the EA-1device.

Specifications

Model	EA-1 Ethernet Adapter
Use	Monitoring Ophir Sensors via Ethernet
Measurement Parameters	As defined by sensor
Supported Sensors	Thermal [a], Photodiode and Pyroelectric
Number of Sensors Supported	One sensor per unit
Data Logging	Thermophile and Photodiode sensors: logging of power at 15Hz into log file Pyroelectric and PD-C sensors: via Ophir Ethernet App – logging of energy at up to ~400Hz into log file via StarLab or direct Ethernet connection – logging of energy at up to ~40kHz
Instruction Set	Supports entire Ophir instruction set for controlling and monitoring sensor
Power Supply	Power over Ethernet or separate 12V power supply
Dimensions	73mm W x 93mm L x 29mm H
Weight kg	0.1
Notes: (a)	BeamTrack functions are only supported via user commands but not with the PC application

Ordering Information

Item	Description	Ophir P/N
EA-1	Compact module to operate Ophir sensors over the Ethernet. Comes with basic PC software	7Z08296
EA-1 USB Cable	USB-A to MINI-B Cable (1 unit supplied with EA-1)	7E01217
EA-1 Ethernet Cable	Ethernet Cross Cable (1 unit supplied with EA-1)	7E01192
N polarity Power Supply/Charger	Power Supply/Charger AC/DC 12V 2A N-2.1x5.5 (1 unit supplied with EA-1)	7E05029

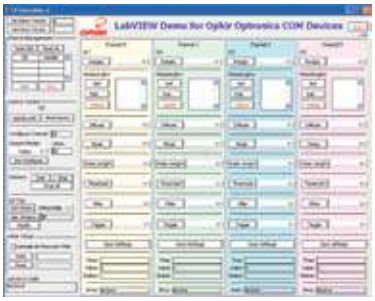
2.2.4 Pulsar Multichannel and Triggered USB Interfaces

Convert your laptop or desktop PC into a multichannel power/energy meter

- From sensor to interface to PC
- 1,2 and 4 channel models
- Plug and play with most Ophir sensors
- Record every energy pulse at up to 25kHz
- Measure missing pulses & trigger output with external trigger
- Log power and energy, average, statistics, histograms and more with included StarLab application
- LabVIEW VIs and COM Object Interface included

Smart Sensor to Pulsar to PC

Ophir's 1-4 channel Pulsar interface turns your PC or laptop into a full fledged Ophir multi-channel laser power/energy meter. Just install the software, plug the sensor into the Pulsar and the USB cable from the Pulsar to the PC USB port. With the Pulsar series, you can connect up to 4 sensors to each module, monitor each pulse at up to 25kHz and utilize external trigger.



LabVIEW

Pulsar-4 operating with StarLab software

Specifications

Power Measurement	
Power log period	5s to 500hr.
Energy Measurement	
Max real time data logging to PC	25,000Hz [a]
Trigger input and output	BNC trigger input to enable measurement of missing pulses or to select specific pulses. Can also be configured to give trigger output
Timing	Supports time stamp for each pulse - resolution 1µs
General	
Number of sensors supported	4 / 2 / 1 sensors per unit. Can combine several units with software for display of up to 8 sensors on one PC
Compatible sensors	Supports all standard Ophir pyroelectric, thermal and photodiode sensors [b]
Power supply	12V wall cube power supply plugs into jack on rear. The power supply can be ordered from your local distributor.
Dimensions	189 x 103 x 33mm
Notes:	(a) Limited by the maximum repetition rate of the sensor. (b) Not including RP, PD300-CIE and BC20 sensors

Ordering Information

Item	Description	Ophir P/N
Pulsar-4	Module to operate up to 4 Ophir sensors from your PC USB port. Comes with software. Max repetition rate for every pulse 25kHz. Has external trigger capability. Powered from wall cube power supply (can be ordered from your local distributor)	7Z01201
Pulsar-2	Same as above but for 2 channels only	7Z01202
Pulsar-1	Same as above but for 1 channel only	7Z01203
Pulsar USB Cable	USB-A to B cable (1 unit supplied with Pulsar)	7E01202
N Polarity Power Supply/Charger	Power Supply/Charger AC/DC 12V 2A N-2.1x5.5 (1 unit supplied with Pulsar)	7E05029
USB Interface (USBI) legacy	Legacy smart sensor to USB interface with similar performance to Juno but larger size (155 x 90 x 34mm). Has analog output. See pages 116 & 117 for more information. See full USBI product page in the Ophir website.	7Z01200

2.2.5 Quasar Wireless Bluetooth Interface

Straight from your measuring sensor to your laptop or PC with no cables

- Quasar wireless interface connects to any Ophir sensor and broadcasts to your PC
- Wireless range of 10-30 meters depending on surroundings
- Operates from rechargeable battery with typically >40 hours lifetime
- Powerful USB interface with StarLab PC application software included
- Converts your PC into a complete laser power/energy meter
- Log power and energy, average, statistics, histograms and more
- Monitor up to 7 Quasars simultaneously on one PC

Quasar Bluetooth Wireless Sensor to PC Interface

Quasar module connects to any Ophir sensor, thermal, pyroelectric or photodiode

Any PC or laptop connects to Quasar module via Bluetooth adapter and operates as a power/energy meter/data logger

Specification

Sensor Compatibility	All Ophir standard sensors, thermal, photodiode and pyroelectric [a]
Number of Sensors on One PC	Up to 7 Quasars can operate simultaneously and be displayed at the same time on one PC
Operating Range	10-30 meters depending on surroundings when used with built in laptop Bluetooth or Ophir recommended adapter
Power	Powered by rechargeable NiMH battery. Battery life typical 40 hours, 20 hours for pyro sensors. Automatically goes into sleep mode when not connected to PC. Low batt indication. Charges from 12VDC either polarity. The charger can be ordered from your local distributor.
LED Indicator	LED indicator indicates whether connected, in standby or off
Bluetooth Standard	Bluetooth class 1. Connection to PC is transparent to user. Will work with built in laptop Bluetooth and most add on USB to Bluetooth adapters. Ophir recommended USB to Bluetooth adapter Ophir P/N 7E10039 (see table below)
Data Transfer Rate for Pyro Sensors	500Hz
Dimensions	96mm W x 95mm D x 36mm H not including antenna
Connections	15 pin D type sensor connector standard Ophir 12V charger input
Notes:	(a) Not including RP, PD300-CIE and BC20 sensors

Ordering Information

Item	Description	Ophir P/N
Quasar Bluetooth Interface	Module to operate one Ophir sensor from your PC via Bluetooth wireless interface. Comes with software. Max repetition rate for every pulse 500Hz. Powered from built in rechargeable battery. Comes with power supply. Bluetooth adapter required when not available on PC. See next line	7Z01300
USB to Bluetooth adapter	Adapter for PC or Laptop not equipped with built in Bluetooth. This adapter works with Quasar on Windows 7/8/10 - not on XP. Quasar is not guaranteed to work with all other adapters on the market	7E10039
Battery Pack for Quasar	Replacement battery pack for Quasar	7E14007
N Polarity Power Supply/Charger	Power Supply/Charger AC/DC 12V 2A N-2.1x5.5 (1 unit supplied with Quasar)	7E05029

2.2.6 Summary of Computer Options for Ophir Meters and Interfaces

Communications

With Ophir RS232, USB, Bluetooth and GPIB communication options you can transfer data from the sensor to the PC in real time or offline. You can also control your Ophir power meter from the PC.

- USB on Nova II, Vega, StarBright (optional on StarLite) power meters and Juno, Pulsar and USBI PC interfaces
- Bluetooth wireless on Quasar interface
- RS232 on Laserstar, Nova II, Vega and StarBright optional on Nova
- GPIB optional on Laserstar
- Ethernet on EA-1 interface

Ophir Power Meter and Interface Specifications

Model	StarBright	Nova II / Vega	StarLite	Laserstar	Nova	Juno	Pulsar-1, 2 or 4	EA-1	Quasar Bluetooth
Communication method	USB / RS232	USB / RS232	USB [c]	RS232 / GPIB	RS232	USB	USB	Ethernet	Bluetooth
Power Measurement									
Power log period	1s to 1000hr.	12s to 600hr.	N.A	12s to 600hr.	5s to 24hr.	5s to 500hr.	5s to 500hr.	5s to 500hr.	5s to 500hr.
Max points stored onboard	unlimited	Nova II 5400 Vega 27000	N.A	5400	300	N.A	N.A	N.A	N.A
Max points direct on PC	unlimited	unlimited	N.A	unlimited	unlimited	unlimited	unlimited	unlimited	unlimited
Analog output	1V, 2V, 5V, 10V F.S.	1V, 2V, 5V, 10V F.S.	1V F.S.	1V F.S.	1V F.S.	N.A	N.A	N.A	N.A
Energy Measurement									
Max real time data logging to PC	5000Hz USB 30Hz RS232	>2000Hz USB[a] >30Hz RS232	20Hz [c]	>30Hz RS232 >1500Hz GPIB[a]	>10Hz	10,000Hz [a]	25,000Hz [a]	>25,000Hz [a]	500Hz
Max onboard data logging rate	5000Hz	4000Hz [a]	N.A	>1500Hz [a]	>10Hz	N.A	N.A	N.A	N.A
Data transfer rate of a data file from instrument to PC	~500 points/s	~500 points/s	N.A	~500 points/s	~50 points/s	N.A	N.A	N.A	N.A
Max points stored onboard	unlimited	Nova II 59,400 Vega 250,000	N.A	59,400	1000	N.A	N.A	N.A	N.A
Trigger input and output	N.A	N.A	N.A	N.A	N.A	N.A	BNC trigger input to enable measurement of missing pulses. Can also be configured to give trigger output	N.A	N.A
Timing - time stamp for each pulse	resolution 1µs	N.A	N.A	N.A	N.A	resolution 10µs	resolution 1µs	resolution 1µs	resolution 10ms
General									
Automation interface	yes	yes	yes [c]	no	no	yes	yes	yes	no
LabVIEW VIs	yes	yes	yes [c]	yes	yes	yes	yes	no	no
Maximum baud rate	115200	38400	N.A	38400	19200 [b]	N.A.	N.A.	N.A.	N.A.
PC file format	Text files, spreadsheet compatible ASCII								
Number of sensors supported	One sensor per unit. Can combine several units with software for display of up to 8 sensors on one PC	One sensor per unit. Can combine several units with software for display of up to 8 sensors on one PC	One sensor per unit. Can combine several units with software for display of up to 8 sensors on one PC	One sensor per unit for single channel mode. Two sensors per unit for dual channel mode.	One sensor per unit.	One sensor per unit. Can combine several units with software for display of up to 8 sensors on one PC	4 / 2 / 1 sensors per unit. Can combine several units with software for display of up to 8 sensors on one PC	One sensor per unit. Can combine several units with software for display of up to 8 sensors on one PC	One sensor per unit. Can combine several units with software for display of up to 7 Quasars on one PC
Compatible sensors	Supports most Ophir pyroelectric, thermal and photodiode sensors								
Power supply	Powered from internal rechargeable battery power supply	Powered from internal rechargeable battery power supply	Powered from internal rechargeable battery power supply	Powered from internal rechargeable battery power supply	Powered from internal rechargeable battery power supply	Powered from USB	12V wall cube plugs into jack on rear	12V wall cube plugs into jack or PoE	Powered from internal rechargeable battery power supply
Dimensions	213 x 113 x 40mm	208 x 117 x 40mm	213 x 113 x 40mm	228 x 195 x 54mm	205 x 95 x 39mm	76 x 55 x 22mm	189 x 103 x 33mm	73 x 93 x 29mm	96 x 95 x 36mm

Notes:
(a) The above refers to the rate for logging every single point in turbo mode. Above that rate, the instrument will sample points but not log every single point.
(b) For pyroelectric sensors, maximum guaranteed baud rate is 9600.
(c) StarLite must be USB enabled in order to work with StarLab. If your StarLite has not been USB enabled, please contact your Ophir distributor in order to obtain a USB Activation Code.

2.3 Software Solutions

2.3.1 StarLab

StarLab turns your PC into a laser power/energy multi-channel station

Extensive Graphic Display of Data

- Line Plot, Histogram, Bar chart, Simulated Analog Needle
- Multiple data sets on one graph or separate graphs on the same screen

Advanced Measurement Processing

- Power/Energy Density, Scale Factor, Normalize against a reference
- Multi-channel comparisons
- User defined mathematical equations: channels A/B, (A-B)/C etc.
- Position & size measurement with BeamTrack sensors

Data Logging for Future Review

- Can be displayed graphically or saved in text format
- Easily exported to an Excel spreadsheet

Fully supports StarBright, StarLite, Vega, Nova-II, Pulsar, Juno, Quasar, EA-1 and USBI devices with all standard Ophir sensors

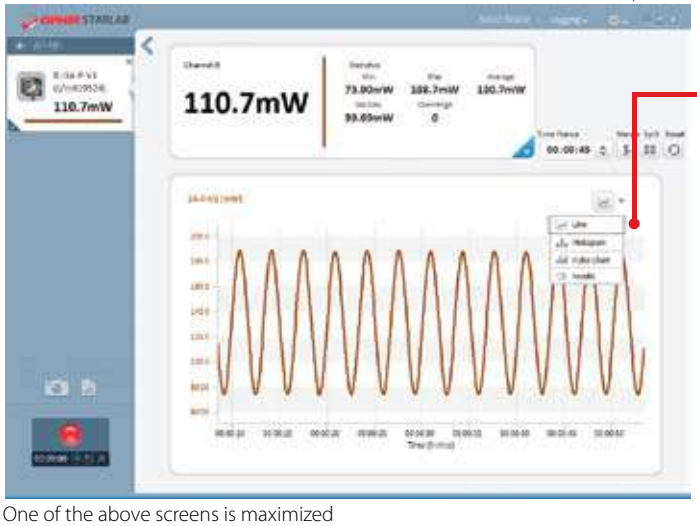
Flexible Display Options with StarLab

Choose which channels to display

Setup screen

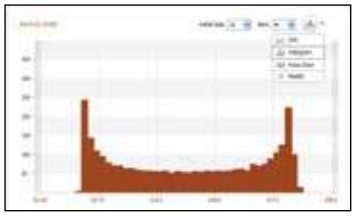
You may choose to display them separately

Maximize one of the sources

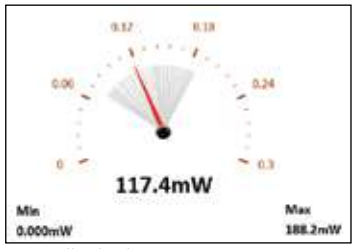


One of the above screens is maximized

Choose line graph

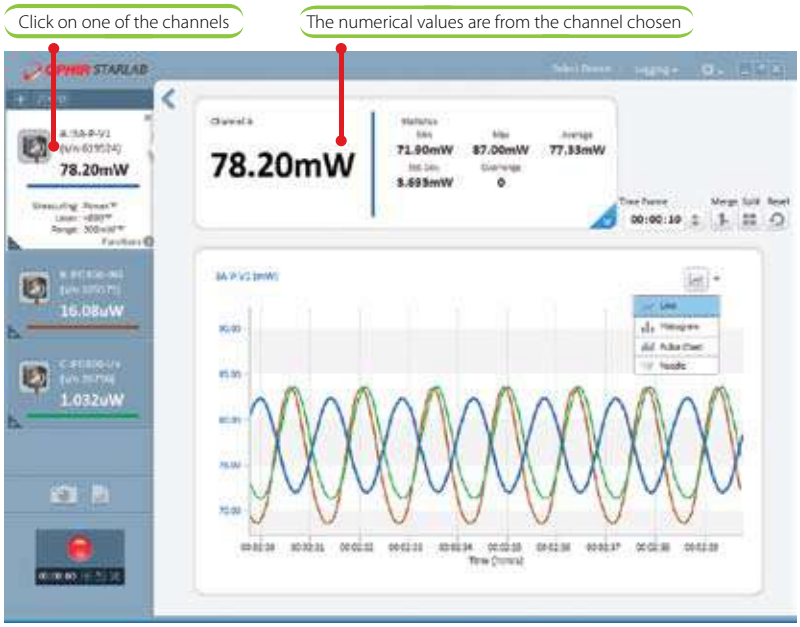


or histogram

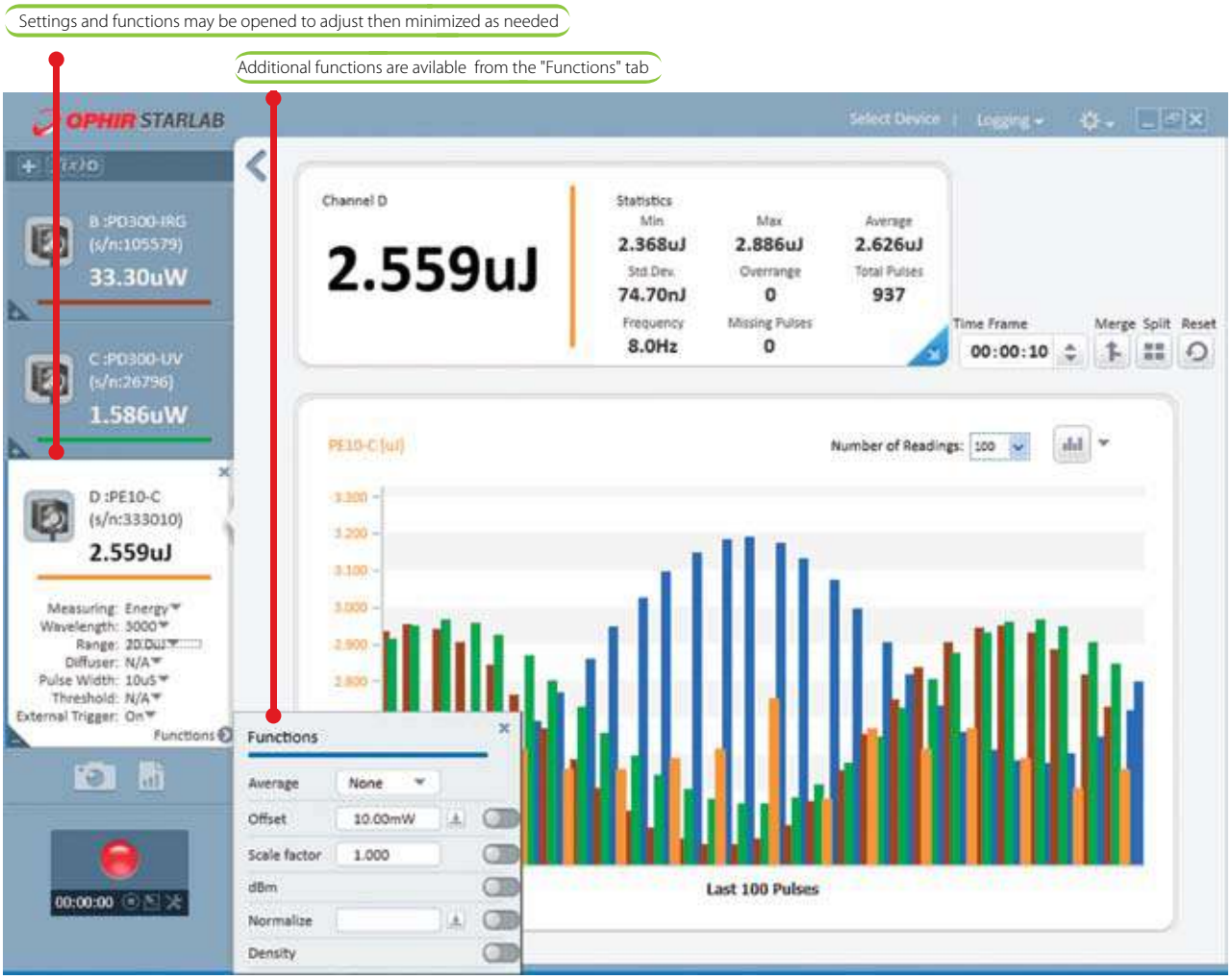


or needle display

Multiple Sensors displayed together



Here multi line graph display has been chosen



Here multi line histogram display has been chosen

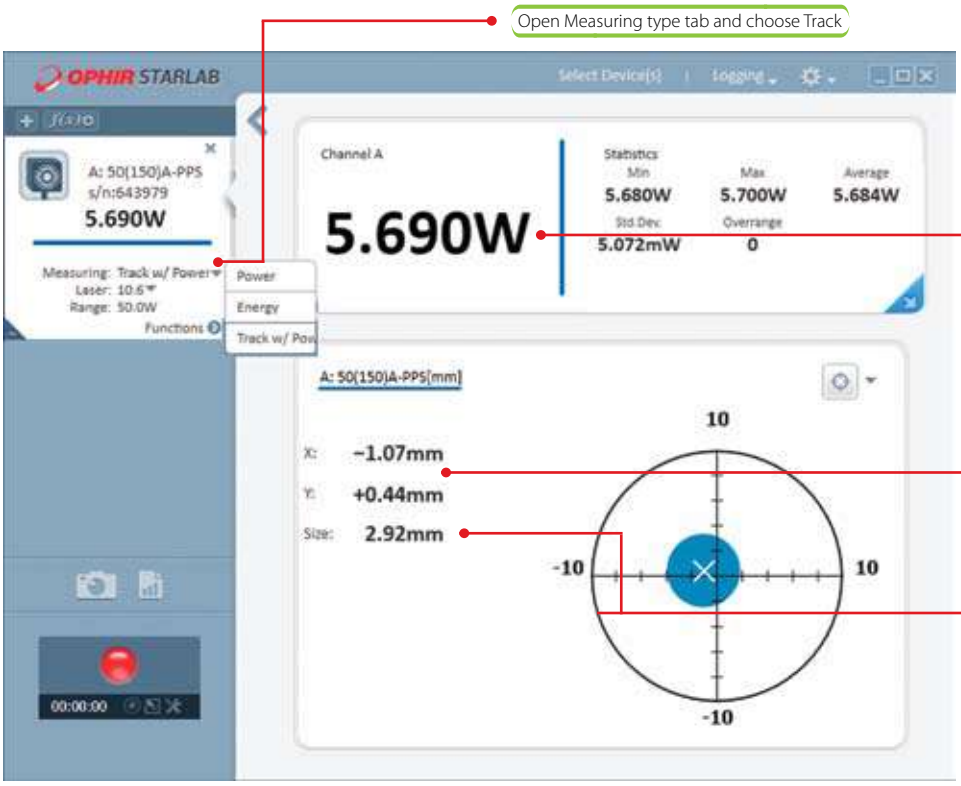
Functions and Logging

Functions

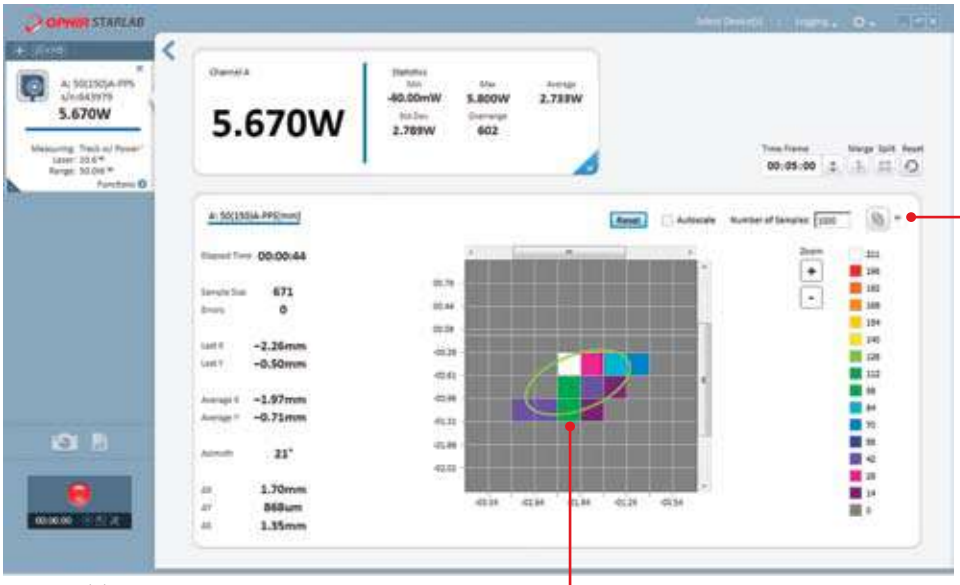
Logging


```
:PC Software:StarLab Version 3.00 Build 19
:Logged:25/05/2014 at 09:33:22
:Channel B:Vega Thermopile 3A-P-V1 (s/n:999999)  VG2.31 (s/n:657028)
:Channel A:Juno Photodiode PD300 (s/n:694646)  JN1.24 (s/n:6061180)
:Math M:(A-B)^2

:Channel B:Statistics
:Min:3.440mW
:Max:12.22mW
:Average:7.882mW
:Std.Dev.:3.070mW
:Overrange:0

:First Pulse Arrived : 25/05/2014 at 09:33:22.562000
 Timestamp      Channel B      F(B)           Channel A      Math M
         0.000  1.762e-002  6.620e-003
         0.064  1.830e-002  7.360e-003
         0.128  1.911e-002  8.110e-003
         0.136                             1.067e-002     6.554e-006
         0.193  1.986e-002  8.860e-003
         0.203                             8.480e-003     1.444e-007
         0.256  2.057e-002  9.570e-003
         0.269                             6.540e-003     9.181e-006
         0.321  2.123e-002  1.023e-002
         0.354                             4.900e-003     2.841e-005
         0.384  2.182e-002  1.082e-002
         0.406                             3.550e-003     5.285e-005
         0.449  2.232e-002  1.132e-002
         0.865  2.291e-002  1.191e-002
         0.870                             3.400e-004     1.339e-004
         0.928  2.258e-002  1.158e-002
         0.936                             3.600e-004     1.259e-004
         0.993  2.216e-002  1.116e-002
         1.003                             4.800e-004     1.141e-004
         1.056  2.164e-002  1.064e-002
         1.070                             7.600e-004     9.761e-005
         1.120  2.104e-002  1.004e-002
         1.136                             1.340e-003     7.569e-005
         1.184  2.038e-002  9.380e-003
         1.203                             2.370e-003     4.914e-005
         1.664  1.558e-002  4.580e-003
```

BeamTrack Power/Position/Size Screens



Power / Position / Size screen



Position stability screen

2.3.2 System Integrator Solutions

Besides their use as stand-alone, fully featured laser power/energy meters, Ophir devices are easily incorporated into larger end-user applications. This allows system integrators to leverage Ophir's excellence in measurement capabilities with legacy analysis packages.

Communication Protocols

All Ophir devices support one or two forms of communication with the PC.

Device	USB	RS232	GPIB	Bluetooth	Ethernet
StarBright	●	●			
Vega	●	●			
Nova II	●	●			
StarLite*	●				
Laserstar		●	●		
Nova		●			
Juno	●				
EA-1					●
Pulsar	●				
USBI	●				
Quasar				●	

* With USB activation code

USB

Ophir provides a common interface for communication and control of all of our USB speaking devices. OphirLMMeasurement is a COM object that is included as part of the StarLab installation (StarLab 2.10 and higher) that allows the system integrator to take control of the StarBright, StarLite, Juno, Nova-II, Pulsar, USBI and Vega devices; integrating them into his in-house measurement and analysis package.

For communication via USB, device drivers and additional support software must be installed on your PC. These components are installed as part of the StarLab application's installation process.

RS232

RS232 communication is the simplest to integrate into your Customized Solutions (OEM) application. Integrated Development Environments (IDE's) such as Microsoft Visual Studio provide functions and methods for accessing the PC's com port.

The following is all that you need to get your RS232 applications up and running

- User Commands document contains an alphabetical listing and detailed description of all commands available with the StarBright, Vega and Nova II devices.
- Appendix A5 of the StarCom User Manual (P/N 1J06025) contains an alphabetical listing and detailed description of all commands available with the Nova and LaserStar devices.
- Appendix A4 of the StarCom User Manual (P/N 1J06025) gives an example of polling the Nova device for measurements. This was written in VB6.
- An appropriate RS232 assembly
- Nova RS232 Assembly (P/N 7Y78105[a]) for use with the Nova device
- Nova II / Vega RS232 cable (P/N 7E01206) for use with the Nova-II and Vega devices (included with the Nova II / Vega)
- Laserstar RS232 cable (P/N 7E01121, included with the LaserStar)
- StarBright RS232 cable (P/N 7E01213, included with the StarBright)

GPIB

Besides RS232, the Laserstar can also communicate via GPIB (IEEE 488.1). Using the SDK supplied by the vendor of your GPIB controller hardware, a Laserstar IEEE cable (P/N 7Y78300[b]) and the StarCom User Manual, you can integrate the Laserstar into your GPIB solution.

Bluetooth

Bluetooth system integration for the Quasar is easily accomplished, in a similar way to our RS232 devices. For more information (and a list of commands), please contact Ophir.

Ethernet

The EA-1 Ethernet Adapter device provides system integration using a Telnet connection over an Ethernet network. A list of user commands is provided, similar to the RS232 commands described above. See the EA-1 User Manual for more details, available on the website.

System Integrators will need the following components:

- OphirLMMeasurement COM Object.pdf. lists and describes the methods and events available for configuring, controlling and uploading measurements from Ophir devices.
- OphirLMMeasurement.dll. COM object component developed and supplied by Ophir for communication with the StarBright, StarLite, Juno, Nova-II, Pulsar, USBI and Vega devices. The COM object is registered when the application is installed. OphirLMMeasurement COM Object.pdf describes how to register it on another PC where the Ophir application has not been installed.
- Standard USB cable for use with the Pulsar and USBI devices (included).
- Standard mini-B USB cable for use with the Juno device (included).
- Nova II / Vega USB cable (P/N 7E01205) for use with the Nova-II and Vega devices (included with the Nova II / Vega).

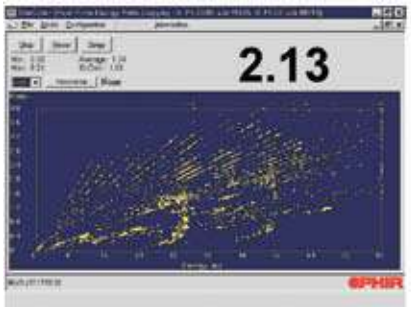
Ophir provides example projects of COM Object clients in VC#, VB.NET and LabVIEW. These are found in the Automation Examples subdirectory of our StarLab PC Application.

Note: (a) P/N 7Y78105 replaces P/N 78105

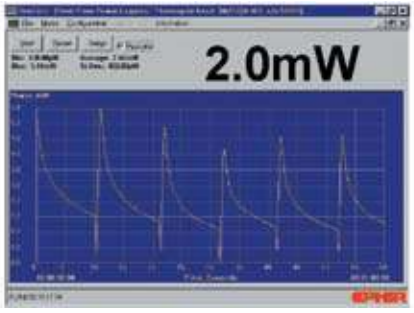
Note: (b) P/N 7Y78300 replaces P/N 78300

2.3.3 StarCom

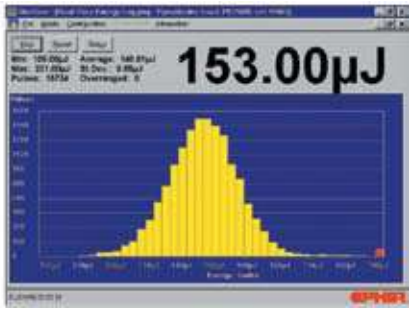
This software is supplied with the Nova II, Laserstar, Vega and Nova with RS232 option. It allows you to measure, analyze and record power and energy from any Ophir sensor.
You can log the data from each sensor simultaneously to file.



Plot of ratio of energy B/A vs. energy A



Plot of power vs. time



Histogram plot of energy distribution

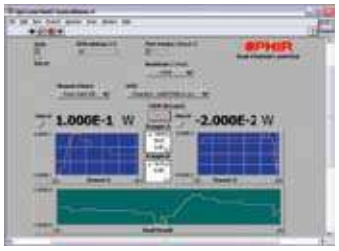
2.3.4 LabVIEW Solutions

Ophir has long recognized the growing LabVIEW community of developers. For over 10 years, we have been providing LabVIEW libraries for all of our devices. These are full open-source applications that can be used as is or tailored by the LabVIEW programmer to his specific needs.

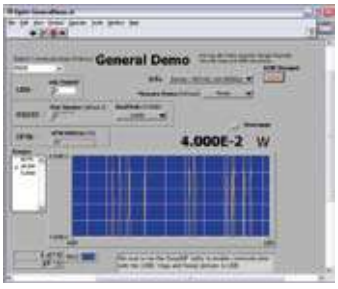
These starter applications are basic software only that allows the LabVIEW programmer to experiment freely to fully feel the strength of our devices' respective command sets.
These applications contain VIs (Virtual Instruments) to control the instrument. You can combine VIs to create successively larger and more versatile larger VIs by simply connecting them together. Users can create sophisticated, custom applications in minutes. In most cases, applications can be built and tested even before the instrument even arrives. The versatility of these tools is limitless.

All of our LabVIEW libraries can be downloaded from our web site: www.ophiropt.com

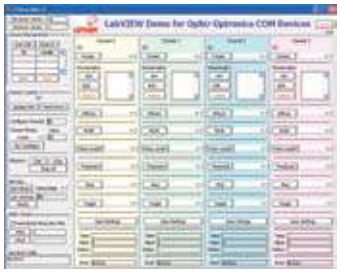
VI Libraries
Ophnova.llb
Library supplied for use with the Nova. Communication is in RS232 and is based on NI-VISA.



Ophlstrd.llb
Library supplied for use with the Dual-Channel LaserStar. Communication can be set to RS232 or GPIB and is based on NI-VISA.



OphInstr.llb
This library can be configured to work with the Nova-II, Vega, USBI or Single-Channel LaserStar devices. It can also work with the Juno with a Thermopile or Photodiode sensors. It can be set to RS232, USB or GPIB. It is based on NI-VISA for all 3 communication protocols.



LabVIEW COM Demo.llb
Library supplied for use with all of our USB speaking devices (StarBright, StarLite, Juno, Nova-II, Pulsar, USBI, Vega). Makes use of our COM object. Included with our StarLab application.