

# Model 4700

## Photodiode Characterizer

### Complete PD Measurement system

The 4700 Photodiode Characterizer is a complete photodiode test system. It will characterize PDs or APDs (upcoming) without the need for additional power supplies. It is this simple: Connect your device and press "start."

### Sensitive Current Measurement

Like our optical power meters, the dBm Optics photodiode meters employ an electrometer-based design. This approach allows much lower currents to be measured (below 200 fA) at much higher speeds. Normal current meter approaches cannot operate this fast because the impedance and input capacitance combines with that of the photodiode to yield slow response time. This is not the case with the dBm Optics 4700.

### High Speed

In addition to the speed advantages of the electrometer-based measurement approach, the 4700 has a high-speed parallel architecture that allows higher speed measurements. The 4700 will characterize a photodiode over a 100 nm span in less than 1 second.

### Full Electrical Measurement

The photodiode measurement cards for the 4700 have built-in voltage bias, thus eliminating the need for separate supplies.

### Integrated Polarization Dependency Characterization

The 4700 will simultaneously measure responsivity and polarization dependent responsivity (PDR) by using traditional all-states, swept all-states, or 4- or 6-state matrix methods. Full PDR over wavelength takes <8 seconds.

### High Photodiode Linearity Accuracy

Using the -923 Precision Superposition Dual Attenuator Option, PD linearity measurements of 0.05 dB will be achieved.

### Integrated Return Loss

For fiber coupled devices, return loss is often an important specification. The ORL option for the 4700 provides return loss simultaneous with the responsivity measurement.

### Fiber Coupled or Free Space

The 4700 will perform fiber-coupled characterization three different ways: using a tunable laser; free space using a TLS and collimator; or using a monochromator.

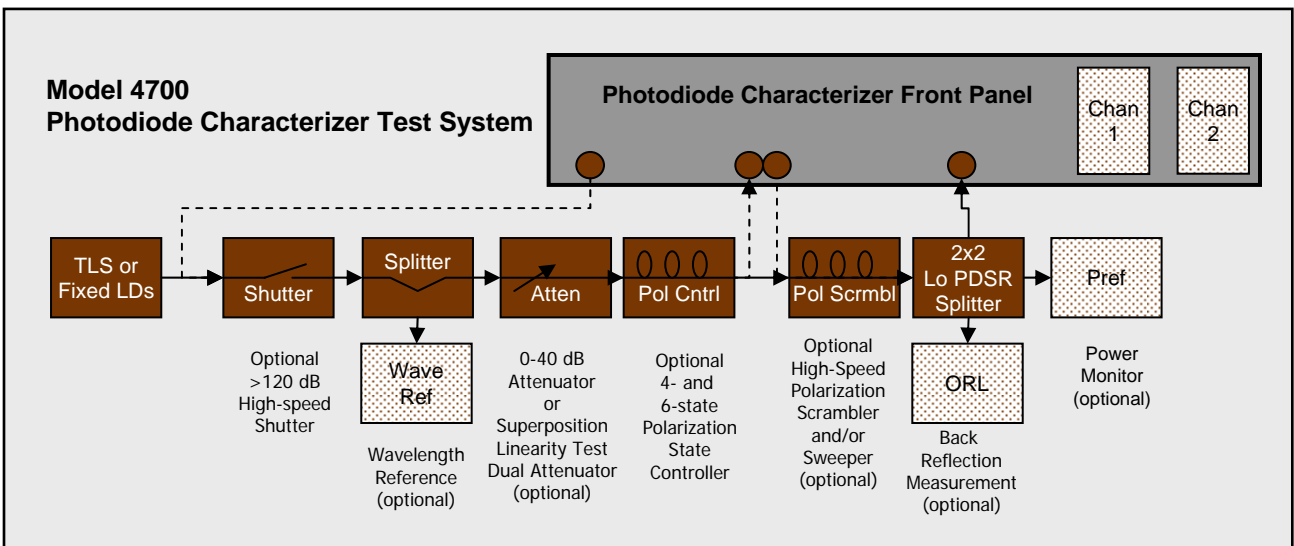
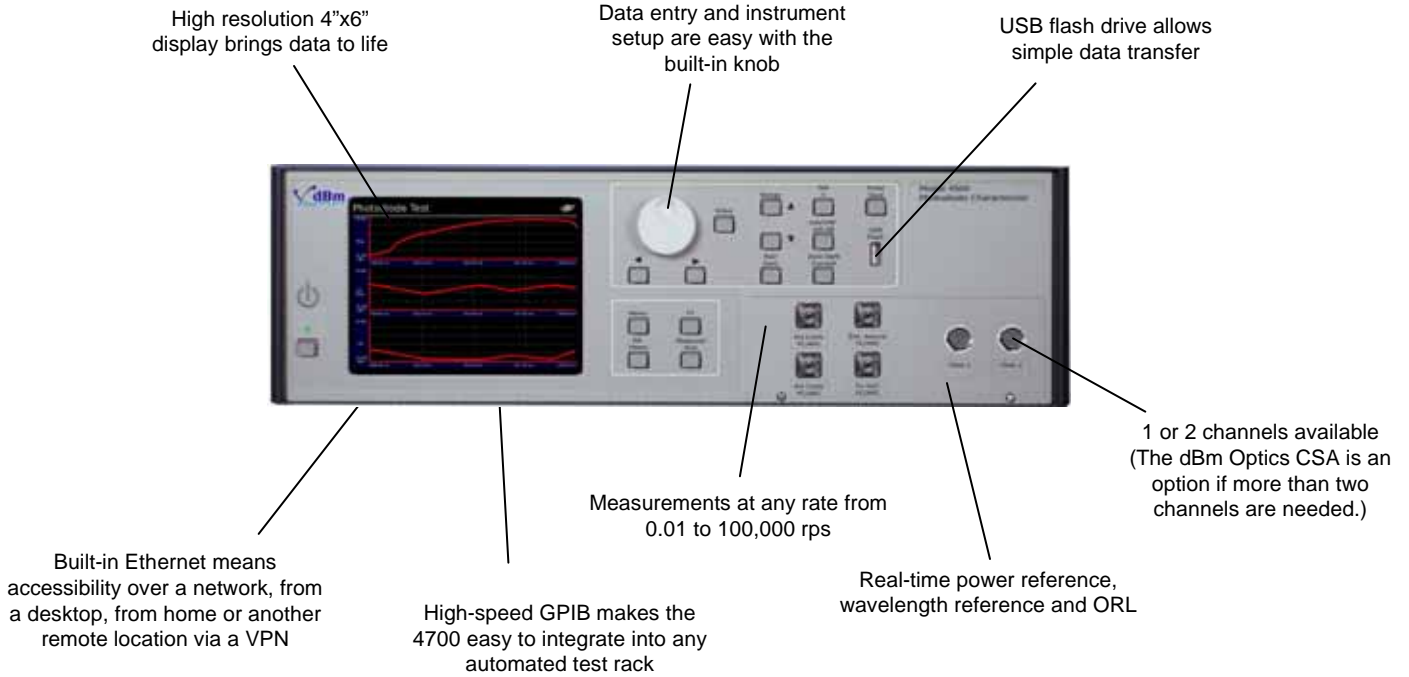
## Summary

- Simultaneous responsivity, PDR, and return loss measurement across wavelength
- Measure linearity to <0.05 dB
- Cover telecom photodiode wavelengths 800-1700 nm (pumps, O-Band, S-Band, C-band, and L-band) with 4300-TLS, and 200-2000 nm with 4300-MON
- Measure directly from the photodiode, or 0-10 V from a trans-impedance amplifier
- Test embedded PD in amplifiers simultaneous with optical parametric tests
- Great absolute accuracy, measurements down to <200 fA
- >100 dB total dynamic range
- Confirm Polarization Dependent Responsivity to <0.005 dB
- Linearity measurement to +/-0.05 dB
- High speed measurement: 0-100,000 rps
- Large color display makes data visualization and analysis simple
- Communicate over GPIB or Ethernet
- Exchange data using a USB flash drive
- 1-16 channels
- System can be upgraded with additional capabilities such as polarization control, attenuation, shutter
- 4-year warranty

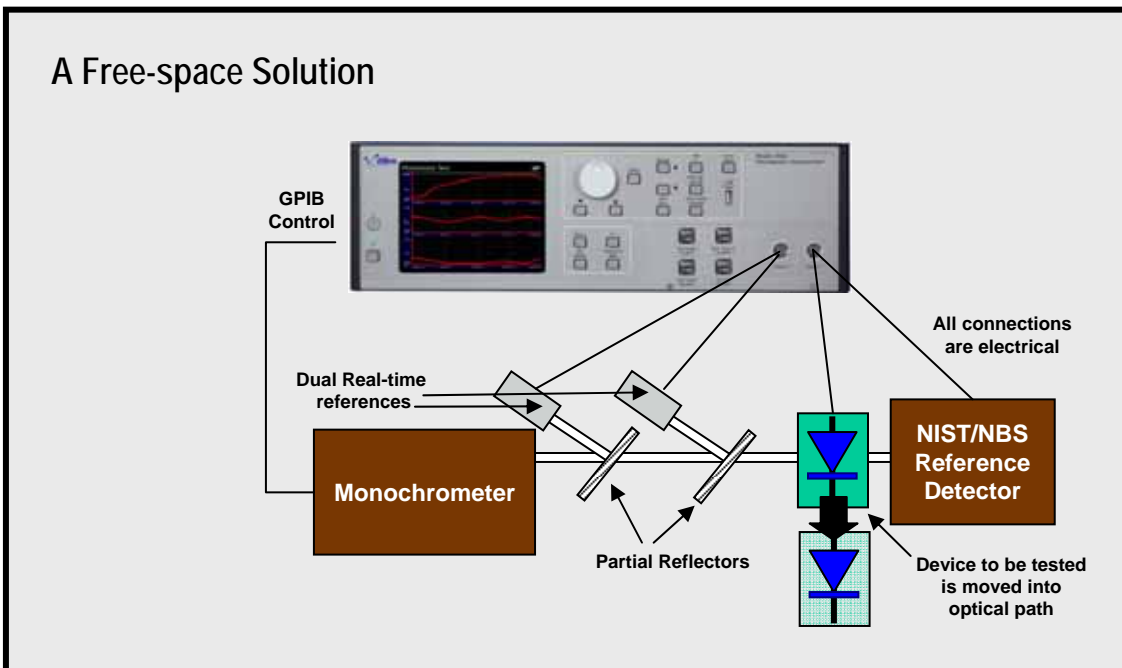
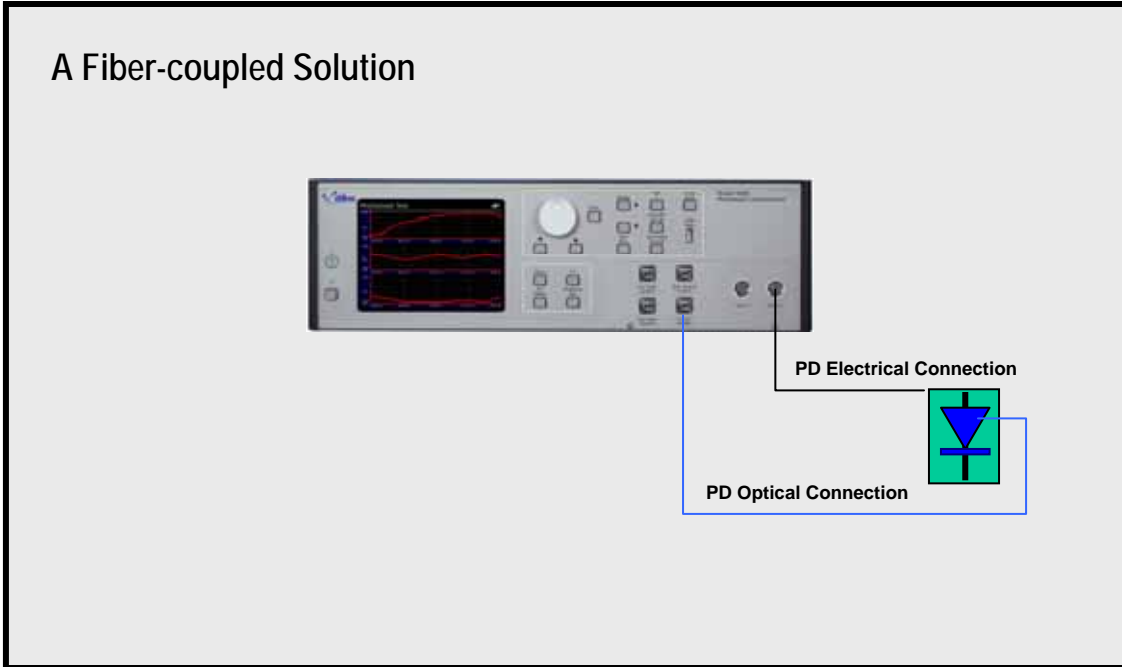
*Complete, Affordable*



# Model 4700 Photodiode Characterizer Overview



# Model 4700 Photodiode Characterizer System Configuration



# Model 4700 Photodiode Characterizer

## Photodiode Measurement Modules 280 and 288 Specifications

For use in measuring responsivity or current from external photodiode.

### General Specifications

Measurement rate:	100,000 readings per second (10 $\mu$ sec measurement time)
Measurement modes:	Current measurement; Voltage measurement
Photodiode bias supply voltage range:	0 to 10V
Photodiode bias supply voltage resolution:	5 mW resolution
Photodiode bias supply voltage noise:	<50 $\mu$ V DC to 20 KHz
Display, absolute measurement:	Displays 1 mV per mA measured from photodiode with no user calibration applied. Display in linear (mW) or log (dBm).
Display, relative measurement (Pref ON):	Displays the cal factor of mA per mW applied. Display in log (dB).
Math:	Both dB and linear offset functions available standard.
PD calibration factors:	Selectable from front panel; GPIB, Ethernet; or RS-232.
Triggering:	Selectable through CSA mainframe. <40 nsec maximum trigger misalignment.
Maximum input:	$\pm$ 40 V peak (no damage)
Channels:	1 channel for Model –280; 8 channels for Model –288
Input connection:	12-pin circular connector

### Voltage Mode Specifications

Range	Resolution	Noise @ 10 $\mu$ sec <sup>1</sup>
10 V	200 $\mu$ V	<1 mV
1 V	200 $\mu$ V	<200 $\mu$ V

<sup>1</sup> Peak-to-peak noise.)

### PD Current Mode Specifications

Range	Resolution	Noise @ 100 msec <sup>1</sup>	Noise @ 10 $\mu$ sec <sup>1</sup>	Equiv Optical Power (direct)		Equiv Optical Power (10% tap)	
1 A	20 $\mu$ A	<20 $\mu$ A	<80 $\mu$ A	30 dBm	1 W	40 dBm	10 W
100 mA	2 $\mu$ A	<2 $\mu$ A	<8 $\mu$ A	20 dBm	100 mW	30 dBm	1 W
10 mA	200 nA	<200 nA	<800 nA	10 dBm	10 mW	20 dBm	100 mW
1 mA	20 nA	<20 nA	<80 nA	0 dBm	1 mW	10 dBm	10 mW
100 $\mu$ A	2 nA	<2 nA	<8 nA	-10 dBm	100 $\mu$ W	0 dBm	1 mW
10 $\mu$ A	200 pA	<200 pA	<800 pA	-20 dBm	10 $\mu$ W	-10 dBm	100 $\mu$ W
1 $\mu$ A	20 pA	<20 pA	<80 pA	-30 dBm	1 $\mu$ W	-20 dBm	10 $\mu$ W
100 nA	2 pA	< 2 pA	< 40 pA	-40 dBm	100 nW	-30 dBm	1 $\mu$ W
10 nA	200 fA	< 200 fA	< 4 pA	-50 dBm	10 nW	-40 dBm	100 nW

<sup>1</sup> Peak-to-peak noise.)

### Response Time

Range	Response with 1pF PD Capacitance
1 A	~ 20 KHz
100 mA	~ 20 KHz
10 mA	~ 20 KHz
1 mA	~ 20 KHz
100 $\mu$ A	~ 7.5 KHz
10 $\mu$ A	~ 7.5 KHz
1 $\mu$ A	~ 0.1 KHz
100 nA	~ 0.1 KHz
10 nA	~ 0.01 KHz

# Model 4700 Photodiode Characterizer

## APD/PD Models 290 and 298

### Specifications

For use in measuring responsivity or current from external avalanche photodiode.

#### General Specifications

Control Modes	Constant Voltage or Constant Current
Measurement rate:	100,000 readings per second (10 $\mu$ sec measurement time)
Measurement modes:	Current Measurement, and Voltage Measurement at specified Current
Photodiode bias supply voltage range:	0 to 100V
Photodiode bias supply voltage resolution:	5 mV resolution
Photodiode supply current range:	0 to 1mA
Photodiode supply current resolution:	250 nA resolution
Current measurement noise	<25 nA rms DC to 20 KHz
Photodiode bias supply voltage noise:	<10 mV rms DC to 20 KHz
Display, absolute measurement:	Displays 1 mW per mA measured from Photodiode with no user calibration applied. Display in linear (mW) or log (dBm).
Display, relative measurement (Pref ON):	Displays the cal factor of mA per mW applied. Display in Log (dB).
Math:	Both dB and linear offset functions available standard.
Module location:	May be placed in 2004 mainframe; in remote 2112, 2124 or 2160 extension chassis; or in the Remote Module enclosure.
PD calibration factors:	Selectable from front panel; GPIB, Ethernet; or RS-232.
Triggering:	Selectable through CSA mainframe. <40 nsec maximum trigger misalignment.
Maximum input:	$\pm$ 110 V peak (no damage)
Channels:	1 channel for Model -290; 8 channels for Model -298
Input connection:	12-pin circular connector

#### APD/PD Current Measurement Specifications

Range	Resolution	Noise @ 100 msec <sup>1</sup>	Noise @ 10 $\mu$ sec <sup>1</sup>	Equiv Optical Power (direct)		Equiv Optical Power (10% tap)	
10 mA	200 nA	<200 nA	<800 nA	10 dBm	10 mW	20 dBm	100 mW
1 mA	20 nA	<20 nA	<80 nA	0 dBm	1 mW	10 dBm	10 mW
100 $\mu$ A	2 nA	<2 nA	<8 nA	-10 dBm	100 $\mu$ W	0 dBm	1 mW
10 $\mu$ A	200 pA	<200 pA	<800 pA	-20 dBm	10 $\mu$ W	-10 dBm	100 $\mu$ W
1 $\mu$ A	20 pA	<20 pA	<80 pA	-30 dBm	1 $\mu$ W	-20 dBm	10 $\mu$ W
100 nA	2 pA	< 2 pA	< 40 pA	-40 dBm	100 nW	-30 dBm	1 $\mu$ W
10 nA	200 fA	< 200 fA	< 4 pA	-50 dBm	10 nW	-40 dBm	100 nW

(<sup>1</sup> Peak-to-peak noise.)

#### Response Time

Range	Response with 1pF PD Capacitance
10 mA	~ 20 KHz
1 mA	~ 20 KHz
100 $\mu$ A	~ 7.5 KHz
10 $\mu$ A	~ 7.5 KHz
1 $\mu$ A	~ 0.1 KHz
100 nA	~ 0.1 KHz
10 nA	~ 0.01 KHz

#### Voltage Measurement Noise & Accuracy

Range	Resolution	Noise	Accuracy
100V	2mV	2mVrms	0.19% +/-10mV

# Model 4700 Photodiode Characterizer

## Ordering Information

Model	Description
4700	1-2 Channel Photodiode Characterizer (Standard accessories: USB flash memory card; power cord; user manual)
202	Precision Power Meter Module, 800nm-1700nm
201	Power Meter Module, 800nm-1700nm
201V (upcoming)	Power Meter Module, 190nm-1100nm
210	Remote Power Meter Module, 800nm-1700nm
210V (upcoming)	Remote Power Meter Module, 190nm-1100nm
222	Precision Power Meter Module, 800nm-1700nm, with Analog Output
280	Photodiode measurement module
288	8 channel Photodiode measurement module
290	APD measurement module
301	Real-time Power Reference Module
310	Optical Shutter/Automatic Dark Calibration
401	Wavelength Reference Module
501	Bare fiber adapter, low stress, easy alignment
502	Bare fiber-to-FC adapter
650LN	Tunable Laser Source, low noise; 1475-1625nm; internal
650HP	Tunable Laser Source, high power; 1475-1625nm; internal
692	Laser Diode Sources, 1-5 sources. Specify 1-5 of the most common sources: 1490 DFB, 1310 FP, 1550 DFB, or any of 1480 DFB, 980 SM, 980 MM Flexcore 5/125, 1490 FP, 1310 DFB, 1550 FP, or any wavelength from 1519 to 1630 nm DFB.
705	Rack ears and slides
706	Swivel handle
732	Add large data memory, +500MB
740	Internal GPIB controller (required for automatic external TLS or Polarization Controller control)
750	Add printer port, external keyboard & mouse ports
921	Built-in variable attenuator; 0-20 dB
922	Built-in variable attenuator; 0-40 dB
923	Precision superposition dual attenuator
940	Optical Return Loss (ORL) module
952I	Automated PDL all-states method and slow speed polarization independent insertion loss measurement
952E	All-states PDL measurement including external polarization sweeper
953E	Matrix Method PDL; external controller
953I	Polarization 4- and 6-state control; internal controller
956	4- and 6-state polarization controller
957I	Polarization scrambler; internal
958I	Precision arbitrary polarization controller

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