

Specifications

Appendix A

Measurement Modes

% FS	Phase sensitive detector output expressed as a percentage of the present full-scale sensitivity setting
SIGNAL	Phase sensitive detector output expressed directly in terms of voltage at input to signal channel
NOISE	Noise in a bandwidth defined by the output filter time constant and slope controls and centered at the reference frequency expressed as a percentage of the present full-scale sensitivity setting
Harmonic	Fundamental (F) or 2F modes

Displays & Indicators

Two, 3½ -digit liquid crystal displays, analog center-zero panel meter and back-lit LED indicators show the settings of all the main instrument controls and outputs.

Signal Channel

Voltage Inputs

Modes	A only or Differential (A-B)
Full-scale Sensitivity	100 nV to 3 V rms in a 1-3-10 sequence
Impedance	100 M Ω // 30 pF
Maximum Input	\pm 100 V DC; 30 V AC pk-pk without damage, 10 V AC pk-pk without saturation
Voltage Noise	5 nV/ $\sqrt{\text{Hz}}$ at 1 kHz typ
CMRR	> 100 dB at 1 kHz degrading by 6 dB/octave
Frequency Response	0.5 Hz to 120 kHz
Grounding	BNC shields can be grounded or floated via 1 k Ω to ground

Current Input

Mode	10 ⁶ V/A or 10 ⁸ V/A
Full-scale Sensitivity	
10 ⁸ V/A	10 fA to 30 nA in a 1-3-10 sequence
10 ⁶ V/A	10 fA to 3 μ A in a 1-3-10 sequence
Frequency Response	
10 ⁸ V/A	-3 dB at 330 Hz
10 ⁶ V/A	-3 dB at 60 kHz
Impedance	
10 ⁸ V/A	< 2.5 k Ω at 100 Hz
10 ⁶ V/A	< 250 Ω at 1 kHz

Maximum Input	15 mA continuous, 1 A momentary without damage. 10 μ A AC pk-pk without saturation on 10 ⁶ V/A; 100 nA AC pk-pk without saturation on 10 ⁸ V/A
Noise	
10 ⁸ V/A	13 fA/ $\sqrt{\text{Hz}}$ at 500 Hz
10 ⁶ V/A	130 fA/ $\sqrt{\text{Hz}}$ at 1 kHz
Grounding	BNC shield can be grounded or floated via 1 k Ω to ground
Line Notch Filter	> 34dB attenuation @ $\pm 1\%$ of 50 or 60 Hz and/or 100 or 120 Hz
Dynamic Reserve	130 dB max
Gain Accuracy	
Flat Mode	1% typical
Bandpass Mode	2% typical
Gain Stability	200 ppm/ $^{\circ}\text{C}$ typical

Reference Channel

TTL Input	
Frequency Range	0.5 Hz to 120 kHz
Analog Input	
Impedance	1 M Ω // 30 pF
Frequency Range	0.5 Hz to 120 kHz
Level	
Sinusoidal Input	1.0 V rms**
Squarewave Input	100 mV rms**
	**Note: Lower levels can be used with the analog input at the expense of increased phase errors.
Maximum input voltage	5.0 V rms
Phase	
Set Resolution	0.1 $^{\circ}$ (front-panel) or 0.005 $^{\circ}$ (computer command only) increments
Accuracy	$\pm 1^{\circ}$ typical
Noise	0.005 $^{\circ}$ rms at 100 ms TC, 12 dB/octave
Orthogonality	
Above 5Hz	90 $^{\circ} \pm 0.5^{\circ}$
0.5Hz - 5Hz	90 $^{\circ} \pm 5^{\circ}$ max
Drift (Flat Mode)	< 0.05 $^{\circ}/^{\circ}\text{C}$
Lock Acquisition Time	2 cycles + 100 ms

Demodulator

Description	Switching type demodulators operating in either square wave or Walsh function modes.
Output Zero Stability	
High Dynamic Reserve	500 ppm/°C
Normal	50 ppm/°C
High Stability	5 ppm/°C
Harmonic Rejection	
Low-Pass	>80 dB at 1 kHz
Bandpass	>60 dB at 1 kHz
Time Constant	
Main output	1 ms to 3 ks in a 1-3-10 sequence
Roll-off	6 and 12 dB/octave
P.S.D. Monitor Output	100 μ s nominal
Roll-off	6 dB/octave only
Offset	Auto and Manual: ± 150 % FS

Oscillator

Frequency	
Range	0.5 Hz to 120 kHz
Setting Resolution	better than 1%
Absolute Accuracy	$\pm 2\%$
Distortion (THD)	0.5%
Amplitude	
Range	
Front panel	1 mV to 1.999 V
Computer Control	1 mV to 2.000 V and 5.000 V
Setting Resolution	
1 mV to 500 mV	1 mV
501 mV to 2 V	4 mV
Output	
Impedance	900 Ω

Auxiliary Inputs

AUX ADC INPUT CH1 - CH4	
Maximum Input	± 15 V
Resolution	1 mV
Input Impedance	1 M Ω // 30 pF
Sample Rate	
CH1 only	200 Hz max.

CH1 - CH4	50 Hz max.
Trigger Mode	Internal or External
Trigger input	TTL compatible

Outputs

OUT Analog Output

Function	Output, Noise, Ratio and Log Ratio.
Amplitude	± 15 V (± 10.0 V = \pm full scale)
Impedance	1 k Ω

Signal Monitor

Amplitude	± 10 V max
Impedance	1 k Ω

Aux D/A Outputs

Maximum Output	± 15 V
Resolution	1 mV
Output Impedance	< 150 Ω

Reference Output

Waveform	0 to 5 V square wave
Impedance	TTL compatible

Power - Low Voltage

± 15 V at 100 mA rear panel DIN connector for powering **SIGNAL RECOVERY** preamplifiers

Interfaces

RS232 and GPIB (IEEE-488). All settings can be adjusted from the front-panel

General

Power Requirements

Voltage	110/120/220/240 VAC
Frequency	50/60 Hz
Power	< 130 VA

Dimensions

Width	440 mm (17.25")
Depth	89 mm (3.5 ")
Height	
With feet	105 mm (4.1 ")
Without feet	89 mm (3.5 ")

Weight

9.1 kg (20 lbs)

All specifications subject to change without notification

B1 RS232 Connector Pinout

Figure B-1, RS232 Connector (Female)

Pin	Function	Description
1	Earth Ground	Ties the chassis of the model 5209 to that of the computer
2	Transmit Data	The 5209 transmits data on this line
3	Receive Data	The 5209 receives data on this line
4	Request to Send	This line is asserted by the 5209 when the input buffer is not full
5	Clear to Send	The computer should assert this line to allow the 5209 to transmit data. If left unconnected, the line assumes the asserted state allowing data transmission to proceed
7	Logic Ground	Data signals are referenced with respect to the voltage at this pin

All other pins are not connected

B2 Preamplifier Power Connector Pinout

Figure B-2, Preamplifier Power Connector

Pin	Function
1	-15 V
2	Ground
3	+15 V

Pins 4 and 5 are not connected. Shell is shield ground.