



Model 206 Brachytherapy Electrometer

The CNMC Model 206 Electrometer, with its innovative modular design, can be set up with an appropriate input feedback module to accurately measure a wide range of current output from any well chamber. LDR sources as low as 0.1 mCi of ¹²⁵I can be measured with a 4-digit accuracy. 10 Ci ¹⁹²Ir HDR sources can be measured in charge or current mode.

One removable feedback module optimized for LDR or HDR is supplied with Model 206. Additional input modules may be purchased to suit other applications. The 200 nC module can be added to economically extend electrometer use to calibration of teletherapy machines. The extra input modules can be stored conveniently in the compartment located in the rear panel of the Model 206 when not in use.

Because most well chambers exhibit high capacitance, use of an external 300 V bias battery is recommended to assure stability of LDR measurements. This battery can be stored in the rear panel compartment of the Model 206.

Specifications

Display:	0.7 in, 4-1/2 digit custom LCD, with floating decimal point, display hold and low battery indications
Display update:	0.6 second
Accuracy:	±0.2% of full scale
Repeatability:	±0.03% of full scale
Linearity:	±0.05% of full scale
Stability:	long term (1 yr) ±0.1% of full scale Input leakage current: less than 5 fA
Ranges:	three decade autoranging, unit powers up in high range with manual increase in sensitivity
Electrometer range:	with appropriate module selection, the 206 is capable of the following:
Current:	0.001 pA to 1999.9 μA
Charge:	0.0001 pC to 19999 nC
Activity/Dose:	determined by multiplying the above by the chamber calibration factor
Front panel controls:	
Power switch:	on/off/bias
Bias selector:	off/-150 V/-300 V/+300 V/+150 V/ ext
Zero adjust:	10 turn pot, ±0.2 mV
Display hold:	momentary contact
Increase sensitivity:	one decade/contact
Reset:	momentary and twist-to-lock (<1 s discharge)
Preamp output:	2 V; banana jack (back panel) 10 kΩ
Bias:	Internal bias: electronic, ±300 V and ±150 V External bias: via banana jacks (back panel)
Module storage:	rear panel compartment holds up to three accessory feedback modules
Power:	six "D" cell batteries, 1000 hours of continuous operation
Dimensions:	23 cm high, 13.2 cm wide, 25 cm deep (9 in x 5.2 in x 10 in)
Input:	triaxial BNC
Weight:	4.8 kg (10 lb)

Accessories

BB-493K	300 V external bias battery with leads
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Model	Nominal range	Min.-max. reading	Chamber
HDR, Current Mode			
206-126	200 nA	.0001 - 199.99 nA	44D HDR-1000
206-127	2,000 nA	0.001 - 1,999.9 nA	
HDR, Charge Mode			
206-108	20,000 nC	00.01 - 19,999 nC	44D, HDR-1000
LDR, Current Mode			
206-120	2000 pA	0.001 - 1,999.9 pA	44D, HDR-1000
206-121	20,000 pA	00.01 - 19,999 pA	44D, HDR-1000
LDR and Teletherapy, Charge Mode			
206-111	20,000 pC	00.01 - 19,999 pC	HDR-1000
206-110	200 nC	.0001 - 199.99 nC	44D, Farmer

Features:

- ▶ Suitable for LDR, HDR and Intravascular
- ▶ Less than 5 fA leakage current
- ▶ Auto-ranging over 3 decades
- ▶ Instant-on – no stabilization period
- ▶ User selectable feedback element
 - Sets measurement range
 - Selects appropriate display units
 - Mates to any well chamber

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Specifications

- Display: 0.7 in, 4-1/2 digit custom LCD, with floating decimal point, display hold and low battery indications
- Display update: 1 s
- Accuracy: $\pm 0.2\%$ of full scale
- Repeatability: $\pm 0.03\%$ of full scale
- Linearity: $\pm 0.05\%$ of full scale
- Stability: long term (1 yr) $\pm 0.1\%$ of full scale
- Units: nC, pC, nA, pA (function of feedback module)
- Input leakage current: ... less than 3 fA
- Preamp output: 2 V; banana jack (back panel) 10 k Ω .
- Front panel controls:
 - Power switch: on/off/bias
 - Bias selector: off/-150 V/-300 V/+300 V/+150 V/ ext.
 - Zero adjust: 10 turn pot, ± 5 mV
 - Display hold: momentary contact
 - Increase sensitivity: ... one decade/contact
 - Reset: momentary and twist-to-lock (<1 s discharge)
- Internal bias: electronic, ± 300 V and ± 150 V
- External bias: via banana jacks on back panel
- Ranges: unit powers up in high range with manual increase in sensitivity (decrease of sensitivity is automatic)
- Electrometer range: with appropriate module selection, the 206 is capable of the following:
 - Current: 0.001 pA to 1999.9 μ A
 - Charge: 0.0001 pC to 19999 nC
 - Standard range: 200 nC module, 0.0001 to 199.99 nC
 - Activity/dose: determined by multiplying the above by the chamber calibration factor
- Module storage: rear panel compartment holds up to three accessory feedback modules
- Power: six "D" cell batteries, 1000 hours of continuous operation (access panel on bottom)
- Dimensions: 21.3 cm high, 13.2 cm wide, 20.1 cm deep (8.4 in x 5.2 in x 7.9 in)
- Weight: 4.5 kg (10 lb)

Removable feedback modules

A standard 200 nC feedback module with a triaxial BNC connector, optimized for beam calibrations with a 0.6 cc Farmer-type ionization chamber, is supplied with each Model 206 electrometer. It allows the Model 206 to provide readings of 00.01 - 199.99 nC in high, 0.001 - 19.999 nC in medium, and 0.0001 - 1.9999 nC in low range, making it usable with chamber volumes 100 times smaller than 0.6 cc for comparable exposures. The standard module may be substituted with another module at no additional cost, or additional extra-cost feedback modules may be added to suit multiple applications. The following table lists optional feedback modules. Triaxial BNC input connector is standard. TNC is available on request.

Model	Units	Ranges (minimum to maximum)		
		High (nominal)	Medium	Low
206-108	nC	1 - 20,000	0.1 - 1,999.9	0.01 - 199.99
206-109	nC	0.1 - 2,000	0.01 - 199.99	0.001 - 19.999
206-110	nC	0.01 - 200	0.001 - 19.999	.0001 - 1.9999
206-111	pC	1 - 20,000	0.1 - 1,999.9	0.01 - 199.99
206-112	pC	0.1 - 2,000	0.01 - 199.99	0.001 - 19.999
206-113	pC	0.01 - 200	0.001 - 19.999	.0001 - 1.9999
206-127	nA	0.1 - 2,000	0.01 - 199.99	0.001 - 19.999
206-126	nA	0.01 - 200	0.001 - 19.999	.0001 - 1.9999
206-121	pA	0.1 - 2,000	0.01 - 199.99	0.001 - 19.999
206-120	pA	0.01 - 200	0.001 - 19.999	.0001 - 1.9999