1000 Series Amplifier Cages

Above: Desktop enclosure (DTE-1000) housing CC-1000 amplifier cage. Six plug-in amplifiers fully populate the CC-1000.

- **Direct connection to DI-720 & DI-730 Series data acquisition products**
- **Desktop and rack mount configurations**
- **Convenient insertion and removal of amplifiers via front panel**

Each amplifier cage is a modular system that can house up to 6 plug-in modules at once. A separate power supply provided with the CC-1000 cage supplies power to each amplifier slot. Each power supply is capable of supporting two cages. Unused amplifier positions may be covered with optional blank module cover plates. The lower-cost CC-1000 and CC-1000/NP (with no power supply) may be used to deliver amplifier output signals to DI-720 and DI-730 Series data acquisition boards and other products.

Specifications:	**CC-1000/NP[1]**	**CC-1000[1]**
Power Supply:		
Power supply voltages	n/a	±12V@2A, +5V@3A
Module cage power connection	n/a	5-pin DIN
Power supply-to-cage cable	n/a	6ft. shielded
Power requirements	n/a	115-240VAC, 50/60Hz, 75VA
General:		
Desktop enclosure model number	DTE-1000	DTE-1000
Bus connectors	60-pin card-edge	60-pin card-edge
Capacity	6 modules	6 modules
Dimensions	5.25 x 19 x 8.67 inches	5.25 x 19 x 8.67 inches
Construction	Cast and extruded aluminum	Cast and extruded aluminum

1) The CC-1000 and CC-1000/NP **ARE NOT** to be used in human life support applications.

BMA-931 Bioamp

- **High gain to x50,000 (up to 500,000 with a head-stage)**
- **Balanced differential inputs for low noise measurements**
- **Selectable high-pass and low-pass corner frequencies**
- **Applicable to a wide range of biopotential measurements (EMG, ECG, EOG, etc.)**
- **Selectable AC/DC coupling**

The BMA-931 is a high performance, low noise AC/DC preamplifier. It's well-suited for conditioning a variety of biopotential signals, including ECG, EEG, EMG, EGG, ENG, and evoked potentials. The modular design, wide gain range, sharp cutoff bandpass filters, and true DC response make the BMA-931 an excellent choice as a primary recording amplifier. Plugging the low-noise ISO-Z Isolated Head-Stage into the BMA-931 makes an ideal combination for recording signals from human subjects. For high-impedance intracellular or extracellular microelectrode work, just plug the Super-Z Ultra High Input Impedance Head-Stage into the BMA-931. When isolation or ultrahigh input impedance aren't required, the BMA-931 can be used alone for economical performance.

ISO-Z Isolated Amplifier Head-Stage

- **Provides medical-grade isolation for the BMA-931**
- **Built-in calibration signal**
- **Provides an additional gain stage of x10**
- **Supplied, long interconnecting cable allows head-stage location at the signal source**

The ISO-Z is a low noise, high impedance amplifier head-stage. It's designed to plug into the BMA-931 Bioamplifier Module for applications where it's necessary or desirable to isolate the subject from the data acquisition system. It uses a medical-grade isolation amplifier to isolate the input connections from chassis or earth grounds. The ISO-Z supplies both gain and calibration, further enhancing its performance. The low impedance output of the ISO-Z is able to drive long cables, making it ideal for use in applications where the DI-1000 Series chassis must be located at a distance from the recording site.

Model BMA-931 Specifications(1)

Input type	Differential, balanced to chassis common
Input range	±6V
Input impedance	$>10^9\Omega$
Wideband noise (referred to input)	<5µv P-P
Common mode rejection	>110db @ 60Hz
Gain range	50 - 50,000, 10 steps(2)
Filter cutoff slope	-12db/octave
High frequency filter	100 - 50,000 Hz, 6 positions
Low frequency filter	DC - 300Hz, 6 positions
Input connector	Amphenol, 7-pin socket
Output range	±10V
Output offset (position) range	±3V
Output connector	BNC
Power requirements	±12VDC @50ma
Dimensions	2.75" W x 5" H x 10" D

(1) The BMA-931 **IS NOT** to be used for human life support applications.
(2) Gain extended to x500,000 with head-stage

Model ISO-Z Specifications(1,2)

Input type	Differential, balanced to floating common
Input range	±600 mV
Input impedance	$>10^{10}\Omega$ differential
Wideband noise (referred to input)	<12µv P-P, <4µv rms
Common mode rejection	>100db @ 60Hz
Gain range	10x
Frequency response	DC-8KHz
Input connector	Pin jacks; .080 in. dia.
Output range	±6V
Output connector	Amphenol, 7-pin plug
Head-Stage output cable length	12 ft.
Isolation voltage (continuous)	1,500 V
Isolation voltage (10 seconds)	5,000V
Leakage current (any input to gnd)	<5µa
Calibrator voltages	500µv , 10Hz square wave
Power requirements	±12VDC @20ma from BMA-931
Dimensions	3.5" W x 1.2" H x 4.3" D

(1) The ISO-Z **IS NOT** to be used for human life support applications.
(2) Required for making recordings of human subjects.

Super-Z Ultra High Input Impedance Head-Stage

- **Provides an ultra high input impedance front end for the BMA-931 (>$10^{15}\Omega$)**
- **Excellent for intra- and extracellular microelectrode work**
- **Switch-selectable gains of x1 or x10**
- **Built-in, 5-step DC calibrator**
- **Switch selectable AC/DC coupling**

The Super-Z is an auxiliary ultra high impedance amplifier head-stage for use with the BMA-931 Bioamplifier Module. FET electrometer input buffers are used to create the highest possible input impedance. That high impedance means the Super-Z can be used with any type of electrode, including tiny ion-specific microelectrodes, so it's well-suited for use in studying high-impedance cell-level signals. A stable input DC offset control allows you to null out electrode polarization potentials or other offset voltages, which can interfere with measurement accuracy. The Super-Z's switchable x1/x10 gain provides an overall range of 50 - 500,000x when used with the BMA-931. A five-step DC calibrator is standard.

Super-Z Hi Z Specifications(1)

Input type	Differential, balanced to chassis common
Input range	±6V
Input impedance	>$10^{15}\Omega$ differential
Wideband noise (referred to input)	<12µv P-P
Common mode rejection	>100db @ 60Hz
Gain range	1x/10x switchable
Input connector	Pin jacks; .080 in. dia.
Output range	±6V
Output offset (position) range	±25, 250, 2500 mv jumper selectable
Output connector	Amphenol, 7-pin plug
Head-Stage output cable length	12 ft.
Calibrator voltages	20, 50, 500, 1000 µv
Power requirements	±12VDC @ 20ma from BMA-931
Dimensions	3.6" W x 1" H x 4" D

(1) The Super-Z Hi Z **IS NOT** designed for patient-connected measurements.

PM-1000 High Performance Transducer Amplifier

- **Excellent for pressure and force measurements of any kind**
- **Built-in, 6-position low-pass filter**
- **9 Switch-selectable gain ranges**
- **Built-in, adjustable excitation**
- **Industry standard Canon WK6-32S input connector**

This DC-type bridge amplifier is designed for use with most resistive bridge transducers and solid state pressure transducers. When paired with the appropriate transducers, it's ideal for measuring mouth pressure, force, or acceleration. When used with a pneumotach and differential transducer, it can also be used to measure airflow. The PM-1000 can be used as a low drift, differential DC amplifier with a wide gain range. Variable low-pass active filters, including a mean pressure function, allow the frequency response to be tailored to eliminate vibration signals or other noise. Up to six PM-1000 modules can be accommodated in any DI-1000 Series module cage. The PM-1000 IS NOT designed for patient-connected (clinical) blood pressure applications.

PM-1000 Specifications(1)

Input type	Differential, balanced to chassis common
Transducer compatibility	Statham, Gould, Grass, etc.
Common mode rejection	>100db @ 60Hz
Input connector	Canon WK6-32S
Excitation voltage	+4 to +10VDC adjustable
Balance control	±0.5, ±0.1, ±0.01 VDC 10-turn (internally selectable ranges)
Sensitivity	1mV-10VFS, 9 ranges
Gain attenuator	15-turn, 0-1x
Low pass filter	6-position
Filter frequencies	0.1(Mean), 10, 50, 100, 500, 5000Hz
Filter cutoff slope	-12db/octave
Input connector	BNC
Output range	±10V
Output offset (position) range	±3V
Output connector	BNC
Power requirements	±12VDC @ 50ma
Dimensions	2.75" W x 5" H x 10" D

(1) The PM-1000 **IS NOT** designed for patient-connected measurements.

PA-931 Low Cost Transducer Amplifier

- **Low-cost alternative to the PM-1000**
- **High gain to x1100**
- **Built-in, adjustable excitation**
- **2-position filter switch**
- **Continuously variable sensitivity of x1 to x11**
- **Industry standard Canon WK6-32S input connector**

The PA-931 offers an economical alternative to the PM-1000, and provides the same level of compatibility with a wide range of resistive and solid state transducers. The PA-931 is a good choice for cost-sensitive applications that don't demand the PM-1000's high degree of measurement flexibility. Instead of the PM-1000's nine-step attenuator, the PA-931's design substitutes a ten-turn sensitivity control and a 10x/100x range switch. The six-position low-pass filter switch on the PM-1000 is replaced by a three-position switch on the PA-931, providing passive mean and 1kHz selections. Up to six PA-931 modules will fit in any DI-1000 Series module cage. Like the PM-1000, the PA-931 IS NOT designed for patient-connected (clinical) blood pressure applications.

PA-931 Specifications(1)

Input type	Differential, balanced to chassis common
Transducer compatibility	Statham, Gould, Grass, etc.
Common mode rejection	>100db @ 60Hz
Input connector	Canon WK6-32S
Excitation voltage	+4 to +10VDC adjustable
Balance control	±0.2, ±0.05VDC, 10-turn (internally selectable ranges)
Sensitivity	x10-x1100, 2 ranges
Sensitivity knob	10-turn, 1-11x
Low pass filter	3-position
Filter frequencies	0.1(Mean), 1000Hz, Off
Filter cutoff slope	-6db/octave
Input connector	BNC
Output range	±10V
Output connector	Amphenol, 7-pin plug
Power requirements	±12VDC @ 50ma
Dimensions	2.75" W x 5" H x 10" D

(1) The PA-931 **IS NOT** designed for patient-connected measurements.

CT-1000 Cardiotachometer

- **LED display shows current measurements**
- **Uses exponential and derivative enhancement techniques to discriminate the R-wave from other components**
- **Wide dynamic gain range and an adjustable latency time prevent false triggering from strong P or T waves**

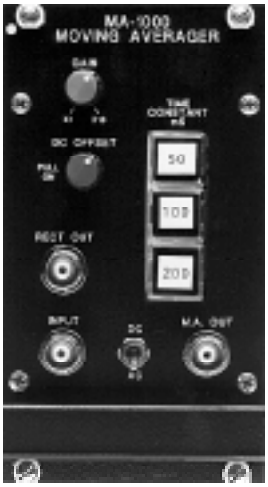
The CT-1000 is a combined ECG amplifier, R-wave detector, and rate meter for the determination of heart rate (beats/min) or beat-to-beat-interval (mS). Input can be either a direct electrode connection, or a high-level signal. A TTL detect pulse is provided for external use, and a polarity reversal switch allows the amplifier to be used with any ECG lead. An amplified ECG signal is available on the card edge connector, as is an inhibit input for external gating of the R-wave function. The CT-1000 is compatible with the ISO-Z isolation head-stage for patient-connected applications.

CT-1000 Specifications(1)

Input impedance (lo level, hi level)	>1000MΩ differential, 1MΩ single-ended
Input voltage range (lo level, hi level)	±100µV to ±20mV, ±10V
Input coupling	AC
Dynamic R-wave capture range	>20dB
Output pulse	TTL
Inhibit input	TTL, negative logic
Latency time adjustment range	50mS to 1.05 seconds
Usable rate range	12 to 500 bpm
Usable interval range	1mS to 9.999 seconds
Measurement resolution	1mS (interval), 0.1 bpm (rate)
Output impedance	<10Ω
Parallel data out	12-bits with strobe, TTL
LED indicators	R-detect, saturation
Digital readout	Rate or interval, 4-digit LED
Input/output connectors	BNC
Power requirements	±12VDC @ 50mA, 5VDC @ 300mA
Dimensions	5.5" W x 5" H x 9" D

(1) The CT-1000 **IS NOT** designed for patient-connected measurements.

MA-1000 Moving Averager



- **For EMG and ENG measurements**
- **Uses easily replaceable time constant modules to implement moving average**
- **Comes standard with time constants of 50, 100, and 200mS, but any values between 10 and 500mS are available**

The MA-1000 consists of an adjustable-gain input buffer, a precision full-wave rectifier, and a moving averager circuit, and is used for the accurate quantification of electromyogram (EMG) and electroneurogram (ENG) signals. The moving averaging circuit is a 3rd order Paynter low-pass filter that creates a contoured or smoothed envelope around the rectified signal, with selectable degrees of smoothing. Smoothing is accomplished by the selection of a time constant, conveniently implemented by front panel push-button switches.

MA-1000 Specifications(1)

Input impedance	1MΩ single-ended
Input voltage range	±10V
Input coupling	AC or DC, switchable
Rectifier offset and asymmetry	±5mV max
Frequency response	DC to 25kHz
Rectified output voltage range	0 to 10V
Moving average output voltage range	0 to 10V
Output impedance, any output	<10Ω
Input/output connectors	BNC
Power requirements	±12VDC @ 50mA
Dimensions	2.5" W x 5.05" H x 9.5" D

(1) The MA-1000 **IS NOT** designed for patient-connected measurements.

Ordering & Cross Reference Guide

Biomedical Amplifier Cages and Accessories	**Order Number**
19" rack mount, 6-amplifier cage, and 1 power supply-to-cage cable	CC-1000/NP
19" rack mount, 6-amplifier cage, power supply, and 1 power supply-to-cage cable	CC-1000
Desktop enclosure for CC-1000/NP and CC-1000 (21" x 6.75" x 11.75")	DTE-1000
Blank module cover assembly	CC-1000/CP
Blank module for customer circuitry	CC-1000/BM
Biomedical Amplifiers	
Bioamplifier module	BMA-931
High performance transducer amplifier	PM-1000
Low cost transducer amplifier	PA-931
Cardiotachometer amplifier (comes with input connector. Input cable required, sold separately)	CT-1000
Input cable for CT-1000 (9ft., standard pin jacks)	CT-1000/ICA
Spare input connector for CT-1000	CT-1000/CON
Moving Averager amplifier	MA-1000
Replacement Time Constant Module (any value between 10mS and 500mS)	MA-821-TCM
Bioamplifier (BMA-931) Head-stages	
Isolation head-stage module for the BMA-931	ISO-Z
High input impedance head-stage for the BMA-931	Super-Z

use with DI-72x and DI-730 Series Data Acquisition Interfaces

SEE PRICE LIST FOR ORDERING INFORMATION & PRICES

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