

# D360 8-Channel Isolated Amplifier & Filter System

The D360 is an 8-channel isolated amplifier specifically designed for human electroencephalography (EEG), electromyography (EMG) or evoked potential (EP) studies.

The system comprises a main amplifier unit with a remote active headbox and dedicated Microsoft Windows™ compatible control software. Multiple D360 amplifier systems can be connected to a single PC allowing multiples of 8 channels to be controlled by one PC system. Electrode connection is via touch-proof DIN sockets on the headbox and signal output to your chosen acquisition device is possible either through the eight BNC connectors on the front panel or a pair of "D" connectors at the rear of the main unit.



- Isolated for Patient Safety
- Software Control of Gain & Filter Settings
- Impedance Checking & Unblock Functions
- Suitable for EEG, EMG and EP Amplification

Channel Name	Group	50Hz Notch	Input Mode	Gain	HighCut (Hz)	LowCut (Hz)	Deblock State
Channel 1	1	In	On	2000	10000	1	Reset
Channel 2	2	In	On	30000	10000	1	Reset
Channel 3	3	In	On	3000	10000	1	Reset
Channel 4	4	In	On	4000	10000	1	Reset
Channel 5	5	In	Fos Ref	6000	7500	1	Reset
Channel 6	5	In	Fos Ref	6000	7500	1	Reset
Channel 7	5	In	Fos Ref	6000	7500	1	Reset
Channel 8	5	In	Fos Ref	6000	7500	1	Reset
Channel 9	6	Out	Neu Ref	1000	15000	0.5	Reset
Channel 10	6	Out	Neg Ref	1000	15000	0.5	Reset
Channel 11	6	Out	Neg Ref	1000	15000	0.5	Reset
Channel 12	6	Out	Neg Ref	1000	15000	0.5	Reset
Channel 13	6	Out	Neg Ref	1000	15000	0.5	Reset
Channel 14	6	Out	Neu Ref	1000	15000	0.5	Reset
Channel 15	6	Out	Neg Ref	1000	15000	0.5	Reset
Channel 16	6	Out	Neg Ref	1000	15000	0.5	Reset

Because the D360 Control Software can run in parallel with your data acquisition program, adjustments to the amplifier settings or tasks such as impedance checking and deblocking can be made while still monitoring data collection.

Electrode impedance checking allows the D360 operator to instantly identify electrodes exhibiting unacceptable resistances. Impedance levels are indicated by green, yellow and red bars within the Impedance View Window (right), or by eight tricolour LEDs visible on the electrode connection headbox. The resistance values at which the colours change can be custom set by the operator.



### **Pre-Amplifier Headstage, Patient Connection Unit**

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The differential preamplifier is a small A5 sized box containing touch-proof connectors for patient electrodes with tri-colour LED indication of electrode impedance. Any combination of channels may be selected to use a Common Reference electrode.

Input impedance of each channel is 100M $\Omega$  On/off control of individual channels. The electronic inputs of individual channels can be grounded reducing cross-talk noise when recording from fewer channels. This also disconnects the patient from the electronics.

Control enabling the +ve [ref] or -ve [act] input of each channel to be connected to a common Reference input.

The unit is connected to the main unit via a lightweight cable with a plug at the main unit end.

Impedance Checking of individual inputs (not Common). An LED is situated next to each input socket. Pressing the Impedance Check button causes the LED to show one of three colours indicating the impedance of that electrode. The actual value is also passed to the main system for PC display. The impedance range for each colour is selectable within the software.

The front panel contains three LEDs which are used to indicate the unit's power supply status and data-bus activity and errors.

### **Main Amplifier Unit**

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The main amplifier unit can be bench or rack mounted. It contains the 8 channels of amplification and filtering as well the PC interface circuitry. Each channel output has a BNC socket located on the front panel for connection to acquisition devices. These outputs are duplicated on rear panel mounted 9-pin D type connectors providing a convenient method for connection to multi-channel acquisition hardware. The functional parameters of each channel can be individually set on the PC which is connected to the amplifier via a low-noise serial interface. A second interface connector is fitted to the rear panel so that multiple D360's can be daisy-chained, allowing commands to further D360s from a single software control interface.

8 Channels of amplification, filter and isolation - all parameters are independent.

Overall system GAIN for each channel x100 - x1,000,000 (10mV/V - 1 $\mu$ V/V). Outputs have a  $\pm$ 10V range.

LOW-CUT FILTER settings are variable between 0.05Hz and 255Hz for -3dB and are second order. (The user may compile their own set of values into the list but the program comes with predefined settings of 0.1, 0.2, 0.3, 0.5, 1, 2, 3, 5, 10, 20, 30, 50, 100, 200, 250 -Hz).

NOTCH FILTER - factory set at 50 or 60Hz. User has 'In' or 'Out' control.

HIGH-CUT FILTER settings are variable between 20Hz and 25,500Hz for -3dB and are second order. (The user may compile their own set of values into the list but the program comes with predefined settings of 20, 30, 50, 100, 200, 300, 500, 1k, 2k, 3k, 5k, 10k, 20k -Hz).

The front panel contains three LEDs which are used to indicate the units power supply status, Internal-Error and Data-Bus Busy. It also has an isolated connector for the headstage as well as 8 BNC sockets for monitoring the output of each channel (these signals are mirrored on 9-way 'D' connectors on the rear panel).

The rear panel contains a mains IEC inlet socket with voltage selection, fuses and mains on/off switch, as well as 9-way "D" connectors, for connecting all channels to an acquisition system and for serial connection to a PC. The unit also has two 'mini-DIN' sockets for daisy-chaining further D360 systems.

The case is 19" rack mountable but also has retractable legs making it suitable for bench top use. (483 x 300 x 133 mm (W x D x H)

plus handles, connectors and feet) Mains operating voltage between 90 - 250V (selectable) and 50-60Hz.

### **Control Software**

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The software provided runs on an IBM compatible PC. The minimum requirements are Windows 2000, NT4 or XP and Internet Explorer 5.0, or better, installed.

A set of COM (Common Object Model) components is provided to allow the end user direct control of one or more D360 Amplifier Systems from within any "COM aware" scripting environment. This may be WSH (Windows Scripting Host), Microsoft Word™ or any modern programming language such as C++, Visual Basic or Delphi.

A Front Panel program (that uses the above components) gives a Graphical User Interface (GUI) allowing mouse control of all functions and parameters.