

## D360 8-Channel Patient Amplifier System

Isolated Amplification for EEG, EMG & Evoked Potentials



Primary View - All Amplifiers

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

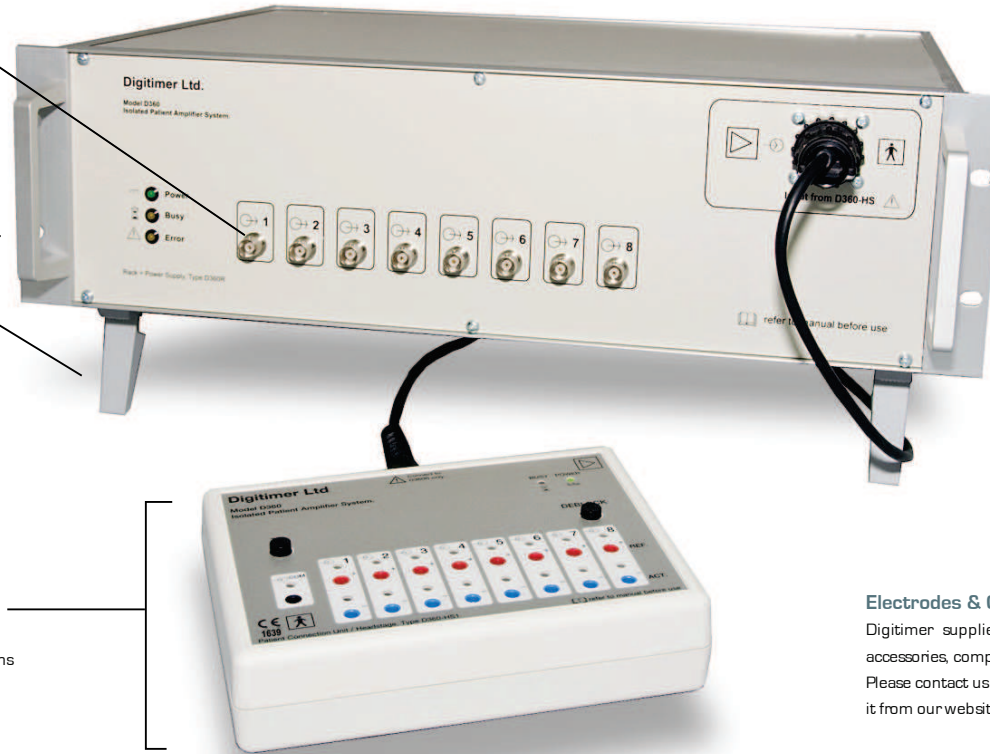
Impedance Check	Serial No	Deblock State	Deblock Type	Deblock Duration (ms)	Lower Threshold	Upper Threshold	Impedance Resolution	High
On	124	Reset	Manual	256	5000	11000	400	Off

Eight BNC Signal Outputs (duplicated on the rear via "D" connector) take the amplified signal into your chosen data acquisition system.

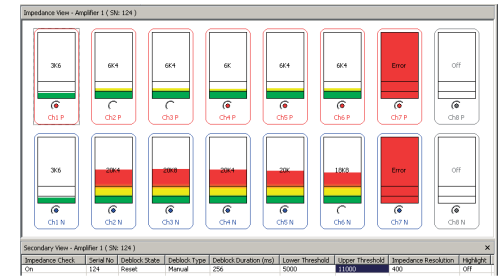
Bench or 19" Rack Mounting Options

Remote Pre-amplifier Headbox:-

- Status/Impedance Display LEDs
- 8 pairs of differential inputs
- Common input
- Impedance Test & De-block Buttons



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 tri-colour LEDs visible on the electrode connection headbox. The resistance values at which the colours change can be custom set by the operator.



## Optional Accessories

The D360 can be supplied with the optional accessories below:-



### D360 USB to Serial Adaptor\*

This device allows the D360 to be used with computers that have USB ports instead of a serial port.

Partcode: **D360-USB-TO-SERIAL**

\* Now included with each D360



### D360 Audio Interface (Switched)

The D360 AIS allows the operator to listen to the output of individual channels (one at a time), via the PC sound card.

Partcode: **D360-AIS**

## Electrodes & Consumables

Digitimer supplies a range of clinical neurodiagnostic accessories, compatible with the D360 Amplifier System. Please contact us for a copy of our brochure or download it from our website.



## Publications

At the time of compiling this brochure, the D360 had been cited in over 100 peer reviewed papers. A few example publications are given below. Their inclusion here is not intended to reflect any endorsement by the authors.

Carlyon FP, Mahendran S, Deeks JM, Long CJ, Axon P, Baguley D, Bleeck S, & Winter IM (2008). Behavioral and physiological correlates of temporal pitch perception in electric and acoustic hearing. The Journal of the Acoustical Society of America 123, 973.

Y. Huang, R. Chen, J. Rothwell, H. Wen (2007). The after-effect of human theta burst stimulation is NMDA receptor dependent. Clinical Neurophysiology 118, 1028-1032.

Mir P, Huang YZ, Gilio F, Edwards MJ, Berardelli A, Rothwell JC, & Bhatia KP (2006). Abnormal cortical and spinal inhibition in paroxysmal kinesigenic dyskinesia. Brain 129, 291-299.

For a complete list of publications, please visit [www.digitimer.com/clinical](http://www.digitimer.com/clinical)

### CE Certified for Human Use

Certified to the EU Medical Devices Directive, the D360 is an 8-channel isolated amplifier specifically designed for human electro-encephalography (EEG), electro-myography (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.

### Daisy Chain Multiple D360 for Greater Channel Number

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 1.5mm (DIN 42 802) 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 "D" connector at the rear of the main unit.

### Software Control Program Runs in the Background During Acquisition

Because the Windows™ compatible 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.

### External TTL Controlled De-block

D360 Amplifiers can include an external de-block BNC input, which allows the operator to "gate" the de-block function of the amplifier with a TTL-high command. This special modification is particularly useful for D360 operators who need the amplifier to detect responses with short latency responses following a magnetic stimulus.

## Specifications

### Pre-Amplifier Headstage, Patient Connection Unit

The differential preamplifier is a small (135mm x 185mm x 45mm) 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 100Mohm

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

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 a rear panel mounted 9-pin D type connector 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). *For those requiring high-cut frequencies lower than 20Hz, Digitimer offer a special modification which shifts this range from 2Hz to 2,530Hz, please contact us for details.*

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

The software provided runs on an IBM compatible PC. The minimum requirements are Windows 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.

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