

Numio-ECU:

User manual for: **Electronic Command Unit**

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1. User responsibilities

NumioECU will operate in accordance with the information contained in this User Manual, the device label and other documents that could be attached to the device. The device must be installed, operated and repaired in accordance with the instructions provided by the manufacturer.

NumioECU should be **ONLY** used in accordance with the Intended Use contained in this manual. Do not use this unit for other purposes not specified by the manufacturer.

Should the device need to be repaired or replaced, it must be reported to the technical service and be repaired only by qualified personnel authorized by Numio Tecnologías S.L.

Installer of this product is responsible for any malfunction resulting from improper use, improper repair, damage or alteration by any person or entity other than Numio Tecnologías S.L. or authorized by this manufacturer.

Safety warnings

- Read and follow all cautions and warnings.
- Read this manual before using NumioECU.
- NumioECU is intended for using by qualified installers only.
- Do not open the unit if you have not been trained previously for technical support by the manufacturer of the product. Never touch the internal electronic boards without proper electrostatic discharge (ESD) protection.

2. Introduction to this manual

This manual is the Instructions for Use of the models of NumioECU. The essential aspects to be able to use NumioECU safely, the intended use and the different models of the device are included in this manual

It is very important to read this manual before using NumioECU. Images and diagrams are included to make the installation of the device easier.

This document is subject to periodic reviews.

For any query regarding this manual or about the use of NumioECU, please contact us:

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3. General description of the device

The upper view of the device is presented in Figure 1.



Figure 1: Command unit picture

The Electronic Control Unit (numioECU) has been designed by our group of experts with more than 25 years of experience developing medical devices, to satisfy the requirement of our customers. Ten of thousand of them are in operation in the world with long durability and reliability, overall comparing it with the previous mechanical relay technology.

The highly integrated nurse call system also required of additional technology for proper operation as our Electronic Control Unit. This technology ensures safety conditions for patients and care in the hospital room avoiding accidents with fatal consequences.

The Electronic Command Unit (numioECU) is a device specially designed for turning on and off lights in hospital's bed heads. The system allows commuting one or two lights by means of a single or double control and/or conventional push buttons. Contactors are based on solid state relays. The main advantages of these components are:

- Small size and light weight,
- No noise during operation,
- High immunity to electrical noise,
- Wide range of AC voltage,
- Easy handy, setting and fixing.

The device converts the requirement of normal operation voltage of 110 or 220VAC to low voltage DC for the turn the lights on and off. This safety requirements increase significantly the protection of the patient avoiding the possible body currents or electrocution.

Order identification

There are several models of the device. The selection of the model for ordering should be done according to the next table:

numioECU - XX Y Z			
Identifier	XX	Y	Z
Description	Control operation voltage supported in C1 and C2 inputs	Number of channels and isolation	AC voltage
Alternatives	24: 5VDC - 24 VDC	A: One channel, L isolated B: Two channels, L isolated C: One channel, L and N isolated D: Two channels, L and L isolated	1: 110 VAC - 50/60Hz 2: 230VAC - 60 Hz

See below the connection diagrams for more information.

Intended use

This device is intended for switching lights in systems with increased requirements of interference immunity and potential separation according to the ISO EN60601-1 and DIN VDE 0834. It has its own internal power supply and is quiet. The control is impulsive, potential-free via keys or other relays. The devices are for screw fastening suitable in medical care units.

The device is intended to be installed by qualified electricity installers only. It should not be accessible to patients, carers, healthcare professionals, or other not qualified personal. It is to be used in hospital or homecare environment. The device should be properly grounded into bedhead units and lighting rails. The device can be used to force the nurse calls (21-27 VDC model).

4. Connections variants

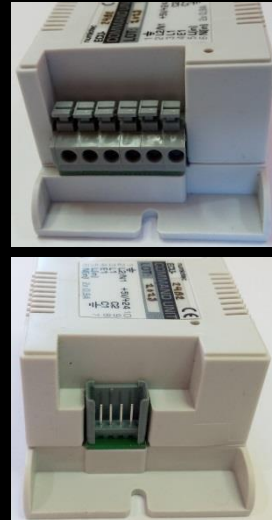
The connections of the device strongly depend of the model of the unit, particularly of the number of channels and isolation.

Models of 110 VAC and 230VAC are connected in the same way.

Pin out description

Pin	Description
1	Ground (green-yellow)
2	Commutated phase L2, connection to the second lamp
3	Commutated phase L1, connection to the first lamp
4	Input phase L _e for external lamps (220VAC or 110VAC)
5	Input phase L for internal power supply and for external lamps (220VAC or 110VAC)
6	Input neutral for internal power supply

Pin	Description
7	Ground (for switching system)
8	Return from the external switch 2 for lamp or phase 2 on/off
9	Return from the external switch 1 for lamp or phase 1 on/off
10	Output for external switch (From 5VDC to 24VDC)



Connectors used:

Pin 1-6: DG235-5.0-06P

Pin 7-10: MKF13264-6-0-404

One channel, L isolated (numioECU - XXAZ)

The module is one channel only. The push button in the right can be connected as described below. Lamps in L1 must use standard CE ballast or LED lamps. Switch in the right size is a separate working contact.

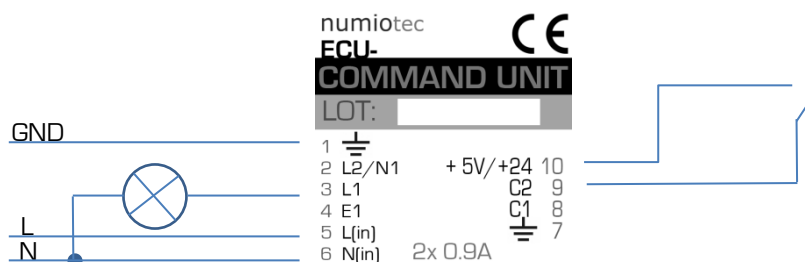


Figure 2: one channel, L isolated version

Two channels, L isolated (numioECU - XXBZ)

The module can switch one or two lamps at the same time. The push button in the right can be connected as described below. Lamps in L1 and L2 must use standard CE ballast or LED lamps. Switch in the right size are two separate working contacts.

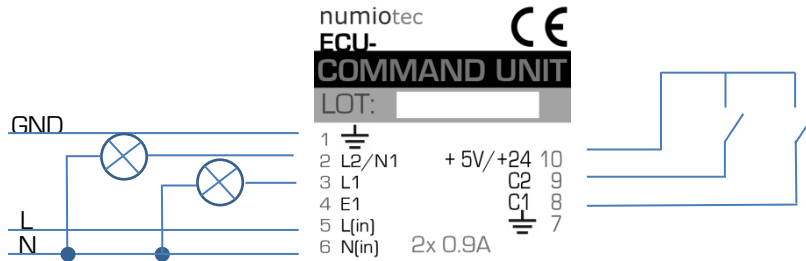


Figure 3: Two channels, L isolated version

One channel, L and N isolated (numioECU - XXCZ)

The module is intended for one lamp only. The push button in the right can be connected as described below. L and N are fully isolated when the lamp is off. Lamps in L1 must use standard CE ballast or should be LED lamps. Switch in the right size is a separate working contact.

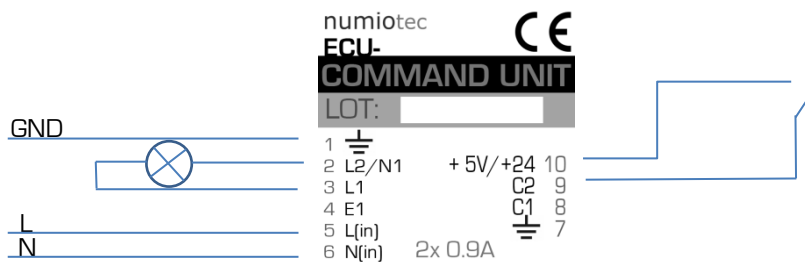


Figure 4: One channel, L & N isolated version

Two channels, L and L_a isolated (numioECU - XXDZ)

The module is intended for commute 2 phase separately. The push button in the right can be connected as described below. L and L_a (input E1) are fully isolated when the lamp is off. Lamps in L1 must use standard CE ballast or should be LED lamps. Switch in the right size are two separate working contacts.

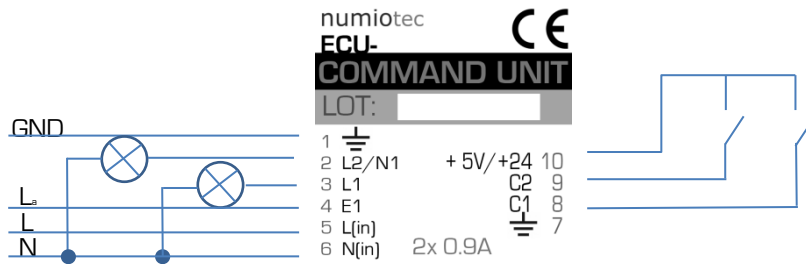


Figure 5: Two channels, L and L_s isolated version

Different Control connections

The control can take place via various types of external systems. The following are the most common connections (see Figure 5).

The option A (left of the graph) is the conventional pasive conection system. The control is at low voltage: 5 VDC to 24 VDC and completely passive. The device has incorporated an anti-bounce system to ensure the proper turning the lamp on and off.

The option B (right in the graph) is intended for that case where the switch intended is active (nurse call systems, per example).

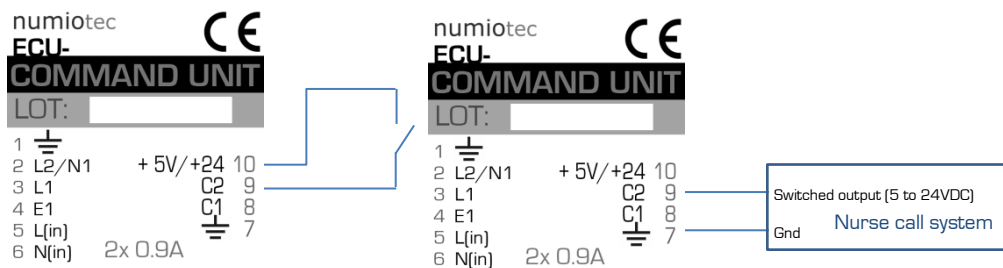


Figure 5: Different control connections, A) Conventional passive contact, B) Active control system

The connection corresponds to one independent impulse switches but could also be applicable for the two channel models repeating it for the second channel.

5. Warranty

The manufacturer warrants this product against any manufacturing defect or in materials for one year from the date of purchase.

The warranty includes repairing, replacing or changing the product and/or components free of charge to the customer, including labour and materials. Transport costs are not included.

This warranty will not be valid under the following conditions:

- When the use and the care of the device have not been in accordance with the instructions contained in this manual.
- When the fault is caused by incorrect use or installation of the unit.
- When the product has been opened or maintained by personnel not authorized and formed by Numio Tecnologías S.L. or companies authorized by this manufacturer.

6. Technical specifications

6.1. Electrical specifications

Output voltage	5 VDC to 24VDC (Not regulated)	
	Device designed for continuous operation	
Consumption	Average power consumption (without load)	40 mA
	Maximum current load (each channel)	0.9 A
Normative	ISO 9001:2008, EN ISO 13485:2012, ISO EN 60601-1-2: 2007, EN ISO 11197:2009	
	EC directive of Electromagnetic Compatibility (EMC)	

6.2. Electromagnetic and RF specifications

Guidance and manufacturer's declaration - electromagnetic emissions		
The device is intended for use in an electromagnetic environment specified below. The customer or the user should ensure that it is used in said environment		
Emission test	Conformity	Electromagnetic environment - Guide
RF emissions CISPR 11	Group 1	The device uses RF energy only for its internal function. Therefore, their RF emissions are very low and are not likely to cause any interference to nearby electronic devices.
RF emissions CISPR 11	Class B	The device is suitable for use in all establishments, including domestic establishments and those directly connected to the public low voltage power supply network that feeds buildings used for domestic purposes.
Harmonic emissions IEC 61000-3-2	Class A	
Fluctuations of voltage/flickers emission IEC 61000-3-3	Comply	

Guidance and manufacturer's declaration – electromagnetic immunity


The device is intended for use in an electromagnetic environment specified below. The customer or the user should ensure that it is used in said environment

Immunity test	Test level of Standard IEC 60601	Level of conformity	Electromagnetic environment - Guide
Electrostatic discharge (DES) IEC 61000-4-2	±6 kV by contact ±8 kV by air	±6 kV by contact ±8 kV by air	The floors should be made of wood, concrete or ceramic tile. If the floors are covered with synthetic material, the relative humidity should be at least 30%.
Transient/fast bursts IEC 61000-4-4	±2 kV for network power lines ±1 kV for input / output lines	±2 kV for network power lines Not applicable	The quality of the power supply network should be that of a typical commercial environment or that of a hospital.
Shock wave IEC 61000-4-5	±1 kV line to line ±2 kV line to ground	±1 kV line to line Not applicable	The quality of the power supply network should be that of a typical commercial environment or that of a hospital.
Voltage drops, interruptions and voltage variations in the power input lines IEC 61000-4-11	<5% U_T (drop >95% in U_T) for 0,5 cycles 40% U_T (drop 60% in U_T) for 5 cycles 70% U_T (drop 30% in U_T) for 25 cycles >5% U_T (drop >95% in U_T) for 5 s	<5% U_T (drop >95% in U_T) for 0,5 cycles 40% U_T (drop 60% in U_T) for 5 cycles 70% U_T (drop 30% in U_T) for 25 cycles >5% U_T (drop >95% in U_T) for 5 s	The quality of the power supply network should be that of a typical commercial environment or that of a hospital. The quality of the power supply network must be controlled, protected or free of these events. Device continues operating during the interruption of the power supply; this is because device is powered by a battery.
Magnetic field at network frequency (50/60 Hz) IEC 61000-4-8	3 A/m	3 A/m	Magnetic fields at network frequency should be at characteristic levels of a typical location of a typical commercial environment or hospital.

NOTE: U_T is the AC voltage supply before the application of the test level.

Guidance and manufacturer's declaration – electromagnetic immunity

The device is intended for use in an electromagnetic environment specified below. The customer or the user should ensure that it is used in said environment

Immunity test	Test level of Standard IEC 60601	Level of conformity	Electromagnetic environment - Guide
Conducted RF IEC 61000-4-6	3 V _{rms} of 150 kHz to 80 MHz	3 V _{rms}	<p>Mobile and portable RF communications devices should not be used any closer to any part of the device, including cables, than the recommended separation distance calculated from the equation applicable to the transmitter frequency.</p> <p>Recommended separation distance</p> $d = 1.17 \sqrt{P} \quad 150 \text{ kHz to } 80 \text{ MHz}$ $d = 1.17 \sqrt{P} \quad 80 \text{ MHz to } 800 \text{ MHz}$ $d = 2.33 \sqrt{P} \quad 800 \text{ MHz to } 2.5 \text{ GHz}$
Radiated RF IEC 61000-4-3	3 V/m of 80 MHz to 2.5 GHz	3 V/m of 80 MHz to 1 GHz (due to the limitations of the testing laboratory)	<p>Where P is the maximum output power of the transmitter in watts (W) according to the manufacturer of the transmitter and d is the recommended separation distance in meters (m).</p> <p>The field strengths from the fixed RF transmitter, as determined by an electromagnetic site study^a, should be less than the compliance level in each frequency range.^b</p> <p>Interference may occur in the vicinity of devices marked with the following symbol:</p> 

NOTE 1: At 80 MHz and 800 MHz, the highest frequency range is applied.

NOTE 2: These guidelines cannot be applied in all situations. Electromagnetic propagation is affected by absorption and reflection from structures, objects and people.

^a Field strength of fixed transmitters, such as base stations for radio telephones (cellular / cordless) and land mobile radios, amateur stations, AM and FM radio broadcasts, and TV broadcasts cannot be predicted theoretically accurately. To assess the electromagnetic environment due to fixed RF transmitters, a study of the electromagnetic location should be considered. If the field strength measurement at the location where the device is used exceeds the applicable prior RF compliance level, the device should be observed to verify normal operation. If abnormal operation is observed,

Additional measures may be necessary, such as reorientation or relocation it.

▫ Over the frequency range of 150 kHz to 80 MHz, the field strength should be less than 3 V/m.

Recommended separation distances between portable and mobile RF communications devices and NumioECU

The device is intended for use in an electromagnetic environment in which RF radiations are controlled. Customer or user can help prevent electromagnetic interference by maintaining a minimum distance between portable and mobile RF communications devices (transmitters) and the device as recommended below, according to the maximum output power of the communications devices.

Maximum power output of the transmitter W	Separation distance according to the frequency of the transmitter (m)		
	150 kHz to 80 MHz $d = 1.17 \sqrt{P}$	80 MHz to 800 MHz $d = 1.17 \sqrt{P}$	800 MHz to 2.5 GHz $d = 2.33 \sqrt{P}$
0,01	0,12	0,12	0,23
0,1	0,38	0,38	0,74
1	1,2	1,2	2,3
10	3,8	3,8	7,3
100	12	12	23

For assigned transmitters with a maximum output power not listed above, the recommended separation distance d in meters (m) Can be determined using the equation applicable to the transmitter frequency, where P is the maximum power output in watts (W) according to the manufacturer of the transmitter.

NOTE 1: At 80 MHz and 800 MHz, the separation distance is applied for the highest frequency range.

NOTE 2: These guidelines cannot be applied in all situations. Electromagnetic propagation is affected by absorption and reflection from structures, objects and people.

7. Troubleshooting

Problem	Identification	Solution(s)
Lamp is not switched	When press the contact, the lamp is not switched	Review the contacts in the screw connectors
Lamp is not switched according the contact selected	When press the contact of lamp 1, the lamp 2 is switched ON/OFF	Review the connection C1 & C2
Lamp is switched without selecting the contact	The lamp is switched ON/OFF with not control	Review the ground connection in the unit (pin 1)