

FutureNow FN485-6x2AD Installation Manual – Draft rev 15.07.2014

6 Channel DIN Rail Mountable FN485 Bus Smart Dimmer with Local Inputs

OVERVIEW

The FN485-6x2AD is used for switching and dimming up to six lighting loads that do not exceed the specifications. The outputs can be controlled via the local inputs or the FNB485 bus. The module is intended to be used together with a third party controller.



Figure 1. The FN485-6x2AD dimmer module



In contrast to many controllable dimming solutions on the market, where a combination of a low-voltage unit and a power dimmer is used, the FN485-6x2AD is an all-in-one dimmer that is able to drive lighting loads connected to its outputs directly.

Since the dimmer can work in both trailing and leading edge dimming modes, almost all types of light loads are supported. The supported types of light loads are detailed in the **Output** section.

In addition to the outputs, the FN485-6x2AD dimmer module also provides local inputs for manual operation offering standalone operation. This also improves reliability, since the operation of the outputs via the inputs do not rely on a controller. The manual inputs are usually connected to momentary wall switches and function similarly to traditional light switches.

The inputs can also be used as independent digital inputs for remote monitoring the status of different sensors, such as water leakage or door contacts, or if connected to a programmed output of a security system, its status (armed/disarmed/in alarm) can be determined remotely.

Main features

Robust Operation

- All-in-one dimmer
- 6 outputs for switching and dimming 6 lighting circuits
- 6 galvanically isolated multi-purpose inputs for direct control or connecting digital sensors
- Temperature monitoring
- Overheat protection (both from software and hardware)
- Overcurrent protection

Ultimate Flexibility

- Switching any loads
- Both trailing and leading edge dimming (dimming of resistive, capacitive and inductive loads)
- Automatic load type detection
- Switching (On/Off) any loads
- Possibility to combine two outputs for more wattage
- Standard DIN rail mount
- Voltage, frequency, power consumption metering
- 100 dim levels (800 level hardware resolution)
- Preset dim level – outputs will go to that level when turned on



- Dim level memory (if preset dim level is set to zero) - Modules remember their last dim level. When next turned on, lights will return to the last remembered value
- Adjustable minimum and maximum dim levels
- Adjustable ramp rates
- Monostable mode with adjustable timing

Enhanced Connectivity

- Easy-to-connect two-wire daisy-chain bus
- Available communication protocol
- Firmware upgrade via bus

Industry-Wide Interoperability

- Full Integration with home controllers from most major vendors (Control4, AMX etc.)
- Interoperable with any momentary contact switches available on the market

INSTALLATION

WARNING! Since the module is connected to line voltage, the installation must be performed by a qualified electrician in accordance with the local electrical codes!

Turn off power (main circuit breaker) before installation!

Terminal connections

Each module has a wiring diagram on the front which can help the installer when connecting the modules at installation sites. See Figure 2.

The terminal connections of the FN485-6x2DA are listed in Table 1.

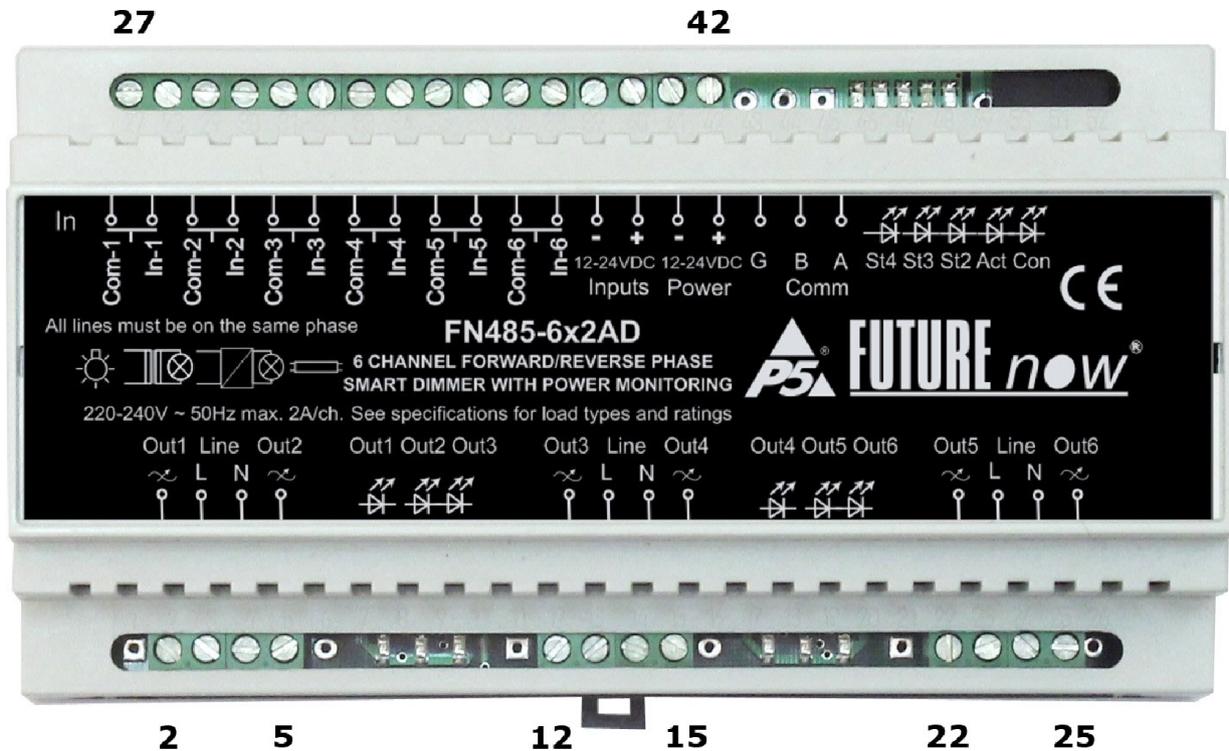


Figure 2. FN485-6x2AD front view with terminal connectors

No.	Description	No.	Description
1.	-	27.	Inputs Common
2.	Output 1 Live	28.	Input 1
3.	230V Line Input Live for ch1 and ch2	29.	Inputs Common
4.	Neutral	30.	Input 2
5.	Output 2 Live	31.	Inputs Common
6.	-	32.	Input 3
7.	-	33.	Inputs Common
8.	-	34.	Input 4
9.	-	35.	Inputs Common
10.	-	36.	Input 5
11.	-	37.	Inputs Common
12.	Output 3 Live	38.	Input 6
13.	230V Line input Live for ch3 and ch4	39.	Power for the Inputs GND
14.	Neutral	40.	Power for the Inputs +12V

			(FN485-6x2AD-12) or +24V (FN485-2xAD-24)
15.	Output 4 Live	41.	Power for the Main Circuitry GND
16.	-	42.	Power for the Main Circuitry +12V FN485-6x2AD-12) or +24V (FN485-6x2AD-24)
17.	-	43.	FN485 bus GND (in case the modules are powered separately)
18.	-	44.	FN485 bus Comm B
19.	-	45.	FN485 bus Comm A
20.	-	46.	
21.	-	47.	
22.	Output 5 Live	48.	
23.	230V Line input Live for ch5 and ch6	49.	
24.	Neutral	50.	
25.	Output 6 Live	51.	
26.	-	52.	

Table 1: FN485-6x2AD terminal connectors

Wiring

A typical wiring diagram is shown in figure 3.

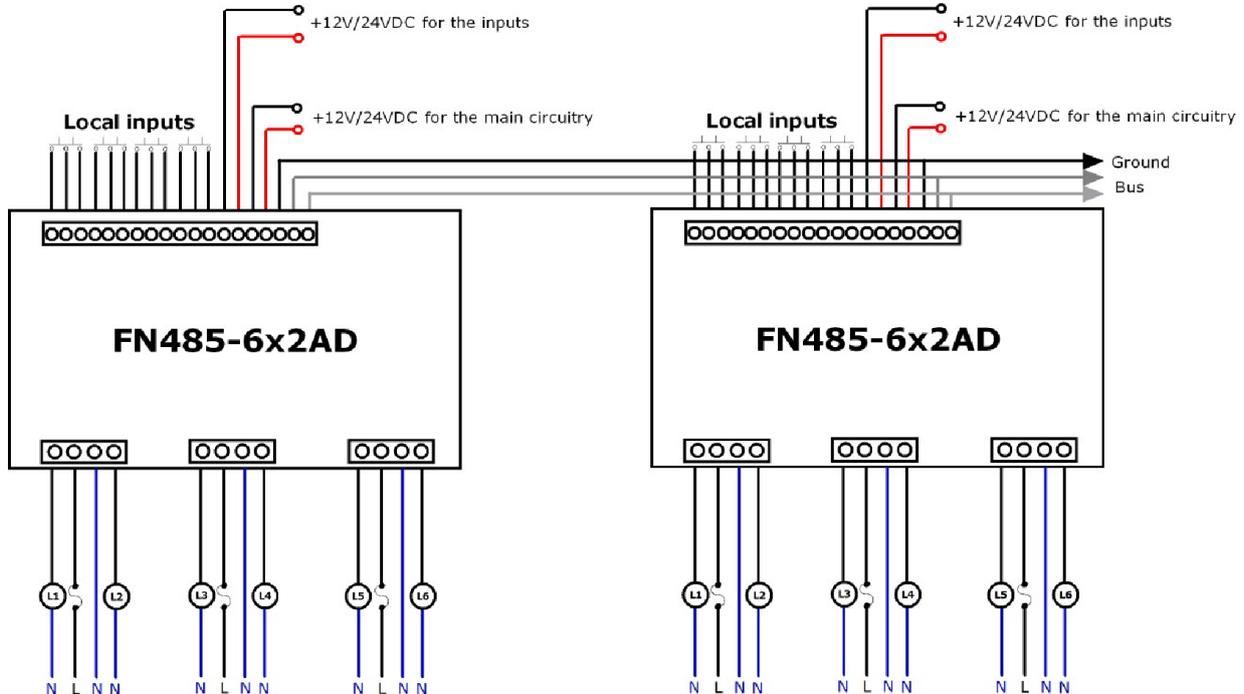


Figure 3. Wiring diagram

Please note that the neutrals are not connected to the module and that all line inputs must be on the same phase!

Recommended wire types

- Ethernet cable: Twisted pair, CAT5 or better.
- Outputs: According to the loads attached to the outputs (current and voltage).
- Inputs: A pair of low or high voltage cables. The inputs use low voltage signals.

All wires used and the way they are run must be in accordance with the local electrical codes.

Keep line voltage wiring physically separated from Ethernet and signal wiring.

Power requirements

The module must be powered through terminals 41 and 42 by 12V-24 V DC.



P5 Kft.

2014

www.futurenow.hu

In case the local inputs are used you must also power the inputs with 12-24V DC across terminals 39-40.

Please pay attention to the correct polarity.

The galvanic isolation of the inputs is only effective when a separate power supply is used for powering the inputs. The FN485-6x2AD has separate power input terminals (39 and 40) for this purpose. If you choose not to use the extra protection the isolated inputs offer (not recommended), you can use the same power to supply both the main circuitry and the inputs. In that case, simply connect terminal 39 to terminal 41 and terminal 40 to terminal 42.

Apply 230V 50 Hz AC live on terminals 3, 13 and 23 and neutral on terminal 4 and/or 14 and/or 24. You don't need to connect three neutrals because they are connected internally in the module. It's enough to connect one neutral as shown in Figure 4.

Please make sure that all the three line inputs are connected (terminal 3, 13 and 23) and are on the same phase!

If it's more convenient, the three line inputs can be connected in parallel with each other. Live on terminal 3 powers output 1 and output 2, Live on terminal 13 powers output 3 and output 4, while Live on terminal 23 powers output 5 and output 6.

The loads should be connected between the module's output lives (terminal 2, 5, 12, 15, 22, 25) and a neutral somewhere outside the module. The same neutral must be used for all the loads though.

FN 485 bus

You must use twisted cable pair for the RS-485 bus. The maximum length of the bus cable is 1000m.

It is recommended to run an additional wire connecting the GNDs of all units together to eliminate possible voltage differences on units that are supplied by separate power supply units.

Use shielded cable in noisy or industrial environment.

The units must be daisy chained on the bus. Avoid star and tree topologies.

Up to 32 FutureNow modules can be connected on a bus using the standard communication driver chip. A lower impedance driver chip is available upon request which allows for using up to 127 FN modules on one bus.



Outputs

Since the dimmer can work in both trailing and leading edge dimming modes, almost all load types are supported be it resistive, inductive or capacitive, such as incandescent, line voltage and low voltage halogens with both electronic and iron core transformers, phase-cut dimmable fluorescents and compact fluorescents, phase-cut dimmable line voltage LEDs.

Do not attach any other types of loads to the outputs if dimming of the outputs is enabled! Using an improper load can damage both the attached device and the FN485-6x2AD, possibly creating a fire hazard!

Apart from dimming dimmable loads, the FN-6x2AD can be used to switch (on/off only) non-dimmable loads.

To avoid inadvertent dimming of non-dimmable loads, the dimming of the outputs is disabled by default.

If dimming of the outputs is disabled, non-dimmable lights and other types of loads that don't exceed the output ratings can be turned on/off.

Local Inputs

For each output, there is a local input to allow for manual operation. If you do not wish to use local inputs, this section may be skipped.

Connect dry contacts (pushbuttons, momentary switches, relay contacts, etc.) or open collector transistor outputs across the appropriate input terminals and the input common terminal. Low voltage for the inputs is supplied by the module itself.

WARNING! Avoid supplying voltage on these terminals!

All input ports are galvanically isolated to protect the unit against unwanted effects of ground loops, overvoltage or misconnections.

It should be noted that the galvanic isolation is only effective when an independent power supply is used for powering the inputs. The FN4856x2AD has separate power input terminals for this purpose. See section "Power Requirements" if you don't want to use two separate power supply units.

To assure an additional level of safe and reliable operation, the inputs are also software protected against the effects of noise spikes that usually occur when heavy inductive loads

(motors, fans, etc.) are switched nearby. In most systems lacking this level of protection, these spikes may result in unwanted operation.

Three-way switches can be implemented by simply connecting multiple momentary switches in parallel.

Status LED Indicators

In order to make installation and debugging easier, communication and channel status are displayed via LEDs.

Use the board layout drawing in Figure 4. to locate the status LEDs.

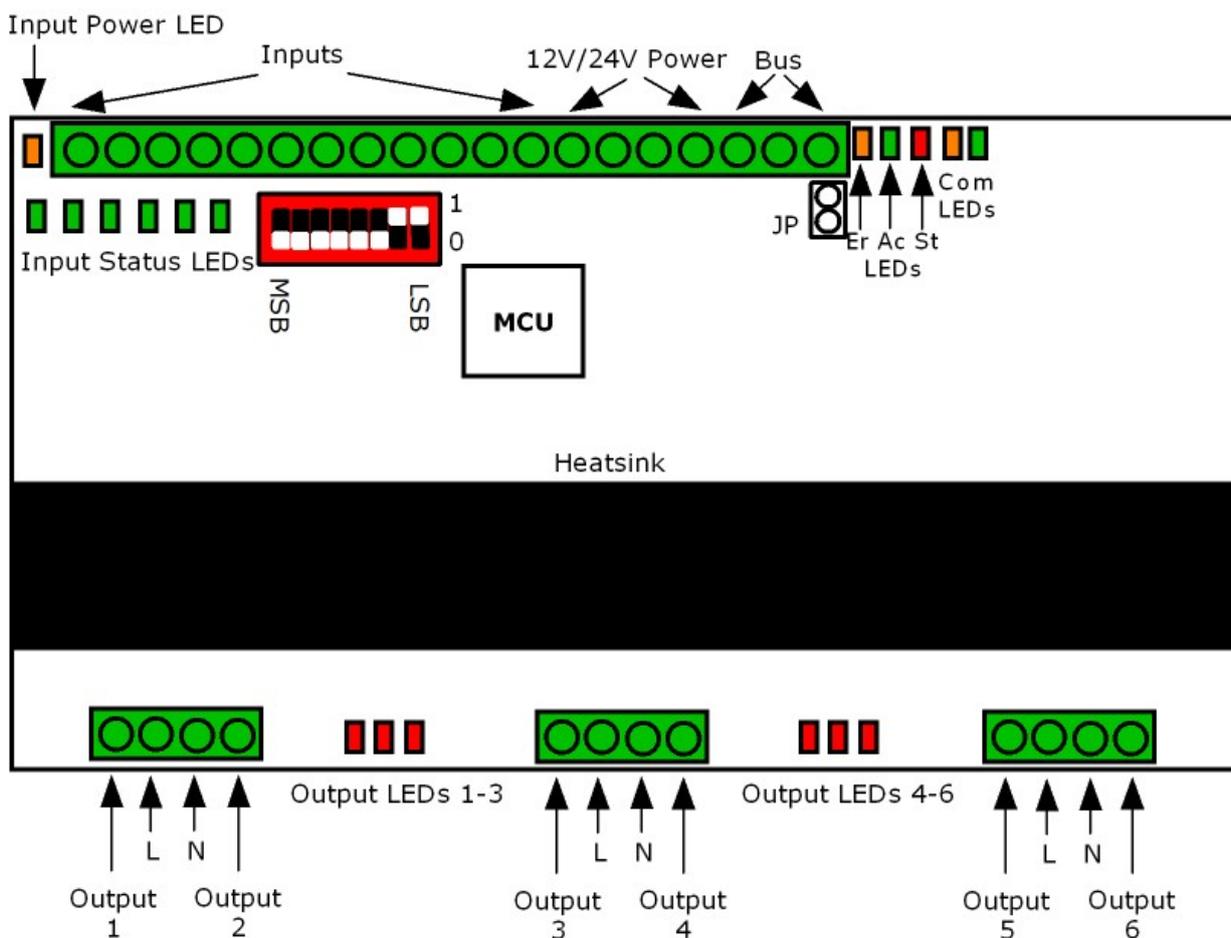


Figure 4. The board layout of the FN485-6x2AD



Input status LEDs

Each input has a dedicated status LED that illuminates solid green when the corresponding input is activated.

Power LED

When on, indicates that the 12V DC power for the main circuitry is present.

Input power LED

When on, indicates that the input power is present.

Communication LEDs

Con LED = FN485 bus data Rx

Indicates that data is received on the FN485 bus.

Act LED = FN485 bus Tx

Data is being transmitted on the FN485 bus.

Status LEDs

St2 LED = No address/bootload

It is blinking if no valid address is set by the DIP switch and there is no line voltage on the module. It is solid red if there's no valid address but there is line voltage.

St3 LED = AC/bootload

It is blinking if the address is valid but there's no line voltage on the module. It is solid green if the address is valid and there is line voltage on the module.

Both St3 and ST4 LEDs are on when the bootload mode is active.

St4 LED = Error

The Er LED turns on if the module gets overheated. This LED will not turn off until the module is power cycled or the temperature of the heat sink falls below 40°C.

Output status LEDs

Each output has a dedicated status LED that illuminates solid red when the corresponding output is activated. In case of overcurrent the corresponding LED starts flashing. The error condition resets when the output is turned on again.

CONFIGURATION

Assigning an address to the module

Each daisy chained unit is identified by the unique address set by the DIP switches. The address range is 1-127. Switches #2 through #8 are used for setting the 7-bit long address. Switch #8 represents the least significant bit. A bit is set (1) when the corresponding switch is in the ON position and cleared (0) when the switch is in the OFF position.

Set a valid, non-zero unique address for each of the modules using the DIP switches. It should be noted that in case there's no valid address set, the operation of the module is disabled even from the local inputs!

Note that all units must have a unique address! Be sure not to have two or more units set to the same address!

The address of a module (including the FN Gateway) is independent of its physical location on the bus and of the module's type. Modules do not need to be addressed in the order they are connected to the bus.

Do not use address 0 because it is reserved for broadcast commands.

Switch #1 activates boot loading mode. It must be in the OFF position during normal operation.

Figure 5. illustrates a DIP switch with an address set to 3.

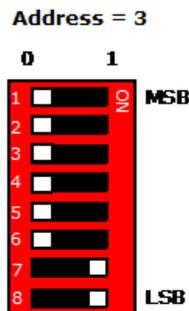


Figure 5. The address of a module set to 3 using DIP switches

The settings detailed below can be changed using FN485 bus commands.

Channel settings

The input modes can be defined here. The input mode determines the logical connection between the input and the output of the same channel. For details on possible input modes and how they work, see "Operation via local inputs" part of this document.



You can also choose the dimming method. As a generally rule, leading edge dimming can be used with resistive and inductive loads, while capacitive loads require trailing edge dimming. If you are not sure which mode to set, the module can automatically test the connected load type and set the mode that suits best. For some loads you have to experiment to see which mode works best. For example some phase-cut dimmable fluorescents and LEDs work better with trailing edge dimming while others require leading edge dimming.

The monostable duration defines how long an output will stay on (before automatically turning off) when triggered from the same channel input if the input mode is set to monostable.

Dim settings

They way the outputs dim.

The meaning of each setting is detailed below:

Preset level: If other than zero, the output will go to that level when turned on. Zero means the output will go to the last used dim level.

Minimum level: Some load types can't be dimmed down all the way to zero. They cut off at some point and produce some strange behavior (flickering or pulsing) below that point. Light bulbs also need a minimum dim level to produce visible light. Setting the minimum level slightly above these cut-off points makes these loads dimmable all the way down more smoothly.

Maximum level: The module is not allowed to be dimmed over this level. One reason can be to extend the bulb's life another one is to limit the brightness to fit the environment.

Default ramp rate: This is the time it takes for the light to go from zero to 100% when turned on/off via the inputs, via the website, or TCP commands. Shorter ramps will take a proportionally shorter time. For example going from zero to 50% will take half of the time than what the ramp rate is set to.

Hold ramp rate: The time it takes for the light to go from zero to 100% when the corresponding input is held. Shorter ramps will take a proportionally shorter time. For example going from zero to 50% will take half of the time than what the ramp rate is set to.

Combining channels:

If dimming or switching a higher load than what a single channel can handle is required, it is possible to combine two outputs. Ch1 can be combined with ch2, ch3 with ch4 and ch5 with ch6. Outputs of a combined channel pair will always produce the same dim level. There are two ways how combining can be done.

Software only combination:



P5 Kft.

2014

www.futurenow.hu

The above channel pairs can be combined from software only, by checking the respective checkboxes on the Dim Settings page. The combined pairs will be tied together, they will always be at the same dim level but hardware-wise they are separate outputs with different loads/lighting legs attached to them.

Hardware and software combination:

Besides being combined from software, the combined output pairs can also be combined hardware-wise, i.e. they will drive the same load. For example output 1 and output 2 will be connected in parallel.

The rating of the combined output pairs will be slightly lower than double of a single channel.

Connecting outputs that are not combined in the software in parallel is dangerous. It can damage the module, possibly creating a fire hazard!

Dimming enabled: There are loads that are not dimmable. Examples are most fluorescents and most LEDs. These lights can only be turned on and off. Apart from non-dimmable lights the FN485-6x2AD is capable of switching (On/Off) any types of load that doesn't exceed the specifications. Please note that in order to prevent inadvertent dimming of non-dimmable loads, dimming of the outputs is disabled by factory default.

Never enable dimming of non dimmable loads. Doing so can damage the device connected to the output, possibly creating a fire hazard!

MORE

Firmware Upgrade

Upgrading the firmware of the module is possible via the FN485 bus.

Set DIP switch #1 to ON. ST1 and ST2 LEDs will turn ON.

Run FN485bootloader.exe on a windows computer. Select the address of the module you would like to upgrade the firmware of.

Start the process. The FN485 Tx and Rx LEDs will flash as the firmware uploads.

OPERATION



Operation via local inputs

The inputs can be activated by shorting the appropriate input terminal to the input common terminal.

Throughout this section it is assumed that momentary switches are connected to the local inputs.

In order to power the circuitry for the local inputs, an input power of 8-16V must be applied across terminals 39 and 40. In case local inputs are not needed, this power connection is not necessary.

Input Modes

There are different input modes. Setting the input mode is possible via bus commands. The inputs are factory defaulted to toggle mode. The input modes work as follows:

1. Toggle mode (factory default)

Each short button press toggles the corresponding output. Holding the button for than 0.5 s will dim up and down (always to the opposite of the last direction) the output until the button is let go of or min/max dim level is reached.

2. Independent inputs

Inputs can be disconnected from their corresponding outputs, in which case they will have no effect on them. However, the status changes of the digital inputs can be retrieved via the bus. This can be used for monitoring the status of digital sensors connected to the inputs or to activate lighting scenes or macros whenever the input gets triggered.

3. Input follow mode

The status of outputs will follow the state of the corresponding inputs, as in case of a regular maintained switch. (The output will be on while the momentary switch is pressed and off while it is released).

4. Toggle without dimming mode

Each press of the button toggles the corresponding output. No holding the button is interpreted. Dimming is not possible.

5. Monostable mode

The outputs can be programmed to switch on for an adjustable amount of time when the corresponding input is triggered (in case of a staircase lighting for example).



Operation via bus commands

The Bus Communication Protocol Description is available upon request.

Basically, any third party controller or software that can implement the FN485-2x6AD's simple communication protocol can control the FutureNow FN485-6x2AD. The following ones are the most widely used:

- AMX
- Control4
- Crestron
- RTI

Software modules/plug-ins for the above controllers and softwares are either available or P5 will provide full assistance in creating them.

Besides these special-purpose controllers, there are applications using embedded industrial PC boards or PCs, running Linux, Windows, Mac OS.

TECHNICAL SPECIFICATIONS

Power requirements

FN485-6x2AD

Main circuitry: 9-24V DC max. 50mA@12V

Inputs: 9-24V DC, max. 30mA@24V

Line: 220 - 240V AC +/-10%, 50/60Hz max. 15mA@230V AC

Outputs

Load: Incandescent, 230V halogens: max. 750W

Fluorescents and electronic low voltage transformers: max. 500W

Compact fluorescents: max. 400W

LEDs: max. 250W

All channels combined: max 3000W

The above ratings are valid at 25C ambient temperature, only half ratings are allowed at 40C.

Inputs



P5 Kft.
2014

www.futurenow.hu

Type: 6 x galvanically isolated, noise protected common GND digital inputs for dry contacts or open collector transistor outputs

Functions: Assigned to the corresponding output (Toggle, Follow, Monostable, Toggle without dimming) or Independent

Terminals

Type: Screw terminals for max. 2.5 mm² wires

Communication

FN485 two wire bus

Other parameters

Operating temperature: 0 °C – 40 °C (32-104 °F)

Dimensions: W x H x D = 157 mm x 86 mm x 57 mm (9 DIN unit width)

Weight: 0,48 kg

Color: Light grey with black cover plate

Standards

EN 60669-2-1

RoHS

Test methods

EN 55015:2013

EN 61547:2009

REFERENCES

FN485-6x2AD Bus Communication Protocol Description

FN485 bootloader software

CONTACT DETAILS

info@p5.hu