

# User Manual

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**IA-2216-5**

16-ch Relay

RS-485 Controlled



Version 0614  
[www.intelligent-appliance.com](http://www.intelligent-appliance.com)

**IA Intelligent Appliance**  
*For Smart Solutions...*

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## Introduction

The IA-2216-5 is a Long Range, Multi-Drop Power Relay Controller.

It is CE, FCC Approved, ROHS compliant Industrial Grade, and low-cost Relay Controller, equipped with 16 Power Relays with a contact rating of 10 Amp at 250VAC.

It is an RS-485 Multi-Drop Relay Controller that can be easily modified into USB, WIFI or Ethernet controlled, simply by attaching an appropriate IA adaptor.

The IA-2216-5 is Intelligent-Appliance Series-3000 software compatible, powered by 24VDC supply voltage. IA-2216-5-12V devices are powered by 12VDC supply voltage.

The software support package includes both Labview and Microsoft Dot.Net libraries, open source examples and operation utilities for fast and easy software implementation.

## Features

- 16-ch Power Relay controller
- Relays are of SPDT Form C type
- RS-485 Controlled
- Long range Multi-drop solution.
- 12V or 24VDC Powered devices
- IA Series-3000 commands compatible
- Local & Global commands list
- Pluggable Terminal Block, available
- On-board Relays Contact Transient Voltage Suppression, Available.
- Din-Rail mounting ready
- Wall Mounting ready

## Specifications

### Relays

Channels	16
Contact method	SPDT, form C
Contact current	10 Amp @ 30 VDC 10 Amp @ 250 VAC
Relay ON Time	10ms
Relay ON Time	5ms
Mechanical Endurance	10 <sup>7</sup>
Electrical Endurance	10 <sup>5</sup>

### Communication

COM type	RS-485
COM range	4000 Feet, over 1KM
Factory Defaults	Baud Rate 19.2bps Data bits 8 Parity None Stop bits 1
Baud Rate Range	1.2K-230.4K
Address Range	00-0F Dip Switch 00-FF Software

### General

Power consumption	24VDC, 0.4Amp 12VDC, 0.8Amp
Operation Temperature	0 ~ 60° C
Storage Temperature	-30 ~ 80° C
Weight	430 gr
Module Size	265x115x45 mm
Mounting	DIN-Rail or Wall Mount

## Ordering Information

### **IA-2216S-5-P:**

16-ch, 10 Amp Relays Module, RS-485 controlled.

Voltage Suppressors	Installed
Terminal Blocks kind	Pluggable, Screw kind
Supply Voltage	24VDC

### **IA-2216S-5-P-12V:**

16-ch, 10 Amp Relays Module, RS-485 controlled.

Voltage Suppressors	Installed
Terminal Blocks kind	Pluggable, Screw kind
Supply Voltage	12VDC

### **IA-2216-5:**

16-ch, 10 Amp Relays Module, RS-485 controlled.

Voltage Suppressors	None
Terminal Blocks kind	Fixed, Screw kind
Supply Voltage	24VDC

### **IA-2216-5-12V:**

16-ch, 10 Amp Relays Module, RS-485 controlled.

Voltage Suppressors	None
Terminal Blocks kind	Fixed, Screw kind
Supply Voltage	12VDC

## **Warning & Safety**

Intelligent Appliance products are NOT authorized for use as components in life support devices or systems.

Do not operate the device in a manner not specified in the documentation. Misuse of the device may result in injury and/or damage equipment.

When wiring the device disconnect it from the power source and turn OFF all connected devices.

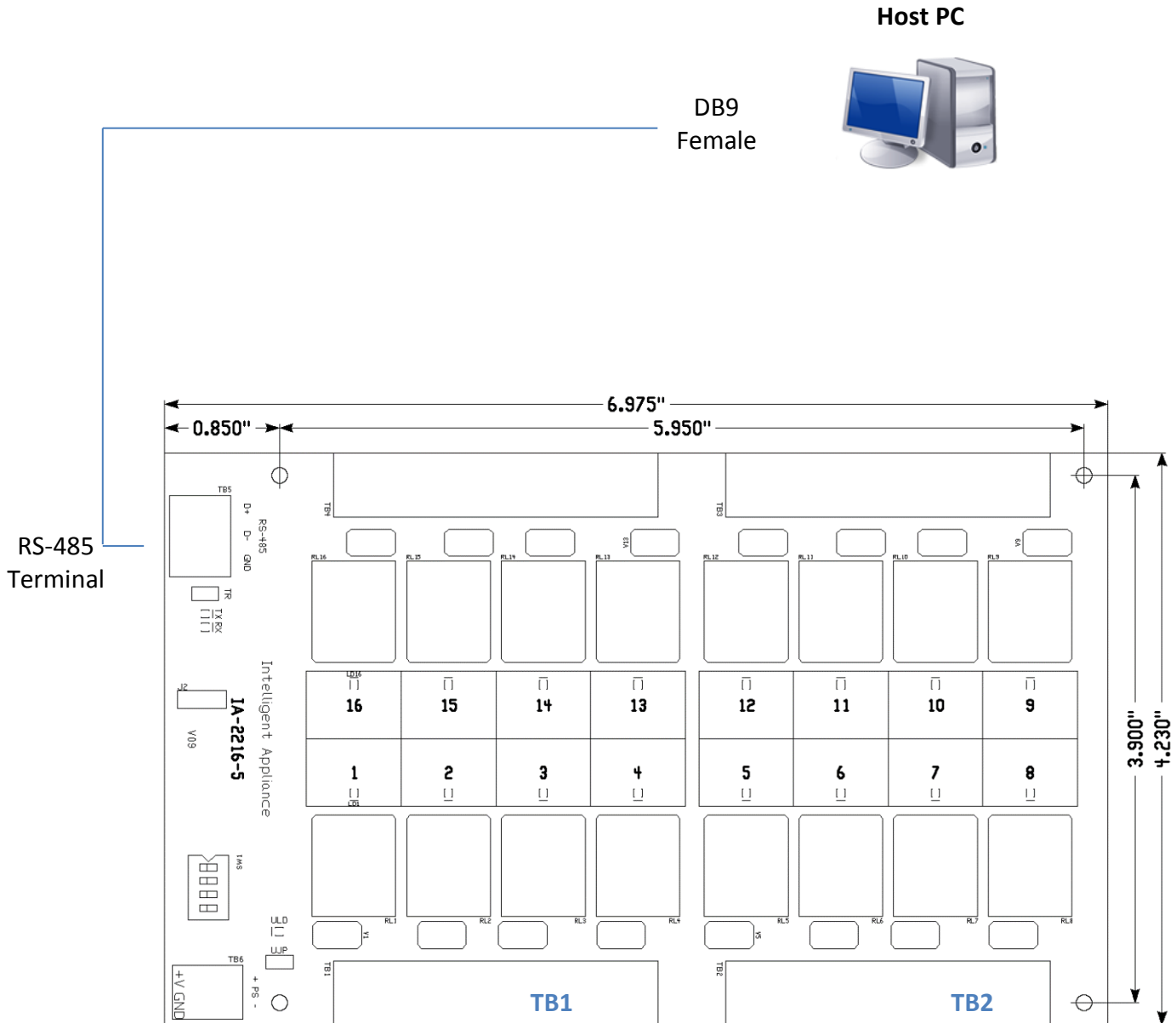
Not doing so may result in electric shock, injury and/or damage your equipment.

# IA-2216-5

16-ch Relay  
RS-485 Controlled

## Installation

## System Wiring



## Pin Assignment

**TB5** – Main Port (RS-485, Screw Terminal Block)

Pin	Function
#1	DT+
#2	DT-
#3	GND

**TB1 to TB4** – Relay #1 to Relay #16

**TB6** – Power supply input terminal

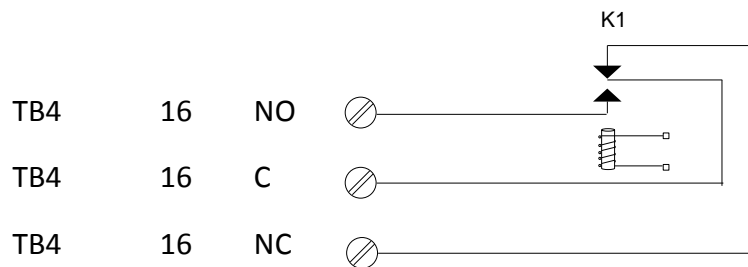
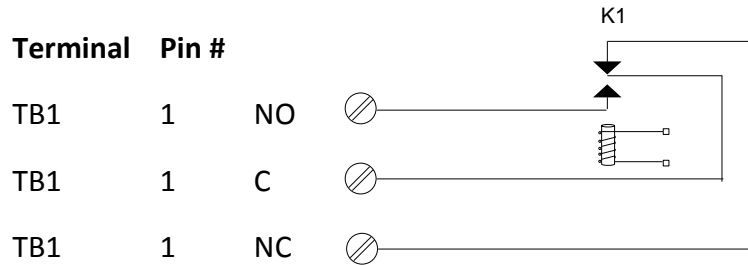
## User Defined Jumpers & Led

**UJP Jumper** – User defined jumper

**ULD Led** – User defined led

## Relay Layout

### SPDT, Form C, Channels 1-16



## Software Installation

### Locating the new COM port

Start the 'Device Manager' utility. (Usually by selecting 'My Computer', Right Clicking the mouse button, choosing manage, Left Clicking and then double Left clicking on the Device Manager will list hardware items).

Select the '+' character to the left of the 'Ports (COM&LPT)', and you'll get a line that will define for example: 'USB Serial Port (COM4)'.

This line informs us that we should refer to COM4, in this case, in order to control the IA-2216-5 while connected to this computer through its USB port.

### IA-3000 Utility

Install the IA-3000 Utility in your computer by clicking on the 'Setup icon in the 'IA-Utility' directory, on the IA-3000 CD. Or download it from our online Knowledge Base.

### Handling IA-3000 Utility

1. Start the IA-3000 Utility by pressing 'Start' on the computer's main screen, select 'All Programs', and finally 'IA-3000'.
2. Select the appropriate COM
3. Select '19200' to fit into the right of the 'Baud' label (in case that the IA-2216-5 is at its default setting stage).
4. Press the 'Search' button and wait for the utility to list all chained items.
5. As soon as all items are listed, you may press the 'Stop Search' button, or you can let the software finish its search by itself.
6. Select the desired device out of the items list that appears beneath the 'Search' button.
7. Once the device is selected, its form will be shown in the right hand of the screen.
8. Left clicking the buttons will activate or dis-activate the appropriate relay.

## Address Configuration



### Warning

#### Note!

In case of operating two or more devices on the same chain, make sure that each device has its own unique address!

Never install two devices, of same address, on the same chain!

#### Note!

All items are set to same default address ('00') while delivered

1. Start IA-3000 Utility.
2. Press Search and then Select the desired IA module.
3. Choose 'Config' at the upper left screen location.
4. Define the desired address right to the 'Address' label.
5. Update the module using the 'Update' button.
6. 'Update OK' message indicates a successful updating (Old software versions indicate 'Fail' while successfully updating the module).
7. Check the updated address by closing the 'Configuration' screen, and running a new 'Search'.

## Command Set

The following table is a quick reference table for the IA-2216-5 , A host computer / PLC may control the IA-2216-5 by simply sending ASCII commands though a standard COM port. Each command is structured from a delimiter character, modules address, command character, data if any carriage returns character. All commands must use UPPER CASE characters.

<b>COMMAND SET.....</b>	<b>13</b>
?AA0 – GET DEVICE NAME .....	14
?AA1 – GET DEVICE FIRMWARE VERSION .....	15
?AA2 – GET OUTPUTS STATUS.....	16
?AA50 – GET DEVICE MODE (REGISTER #50).....	17
?AAID – GET MODULE’S ID NUMBER .....	18
?AAS – GET USER JUMPER AND LED STATUS .....	19
!AA2DDDD – SET RELAY STATUS .....	21
!AA3DD – ACTIVATE RELAY N .....	22
!AA4DD – DE ACTIVATE RELAY N .....	23
!AA50DD – SET DEVICE MODE REGISTER #50 VALUE.....	24
!AA6DD – SET BAUD RATE.....	25
!AA7DD – SET MODULE’S ADDRESS.....	26
!AAEDDDD – SET INITIAL STATE .....	27
!AASDD – SET USER DEFINED LED .....	28
^^E – FORCE INITIAL STATE AT ALL MODULES.....	30

## ?aa0 – Get device name

**Description** Request the Device model name. Can be used to identify the connected module type at the specified address.

**Syntax** ?aa0<CR>  
? Delimiter character  
aa Hexadecimal address of the device  
0 Get device Model command  
<CR> Carriage Return - End of command

**Response** \_nnnn<CR> if the command was valid  
\_ Response delimiter  
nnnn A string containing the device name  
<CR> Carriage Return - end of response

**Example** Command: ?010<CR>  
Response: \_2216<CR>

Request the device at address 01Hex to send its model name.  
The response indicates that the command was successful and that the device at this address is IA-2216

## ?aa1 – Get device firmware version

**Description** Request the Device version

**Syntax** ?aa1<CR>  
? Delimiter character  
aa Hexadecimal address of the device  
1 Get device Version command  
<CR> Carriage Return - End of command

**Response** \_nnnn<CR> if the command was valid  
\_ Response delimiter  
nnnn A string containing the device version  
<CR> Carriage Return - end of response

**Example** Command: ?001<CR>  
Response: \_A125<CR>

Request the device at address 00 Hex to send its version.  
The response indicates that the command was successful and that the device version at this address is A1.04

## ?aa2 – Get Outputs status

**Description**      Read digital inputs and relays present status

**Syntax**            ?aa2<CR>  
?            Delimiter character  
aa          Hexadecimal address of the device  
2            Read I/O status  
<CR>       Carriage Return - End of command

**Response**        \_dddd<CR>

**Examples**        Command: ?002<CR>  
Response: \_1002<CR>  
Relay #13 and #2 are activated

## ?aa50 – Get Device mode (Register #50)

**Description** This command reads the module operation mode

**Syntax** ?aa50<CR>  
? Delimiter character  
aa Hexadecimal address of the device  
50 System Mode command  
<CR> Carriage Return - End of command

**Response** \_dd<CR> if the command was valid  
dd Mode (00-FF)  
82 Enable BR and Address changes  
02 Report on command errors  
00 Normal  
<CR> Carriage Return - End of command

**Example** Command: ?005<CR>  
Response: \_82<CR>

In this example the module operation mode enables baud rate change. It will also send error messages for invalid commands.

## ?aaID – Get module’s ID number

<b>Description</b>	This command reads the Device ID
<b>Syntax</b>	?aaID<CR> ?       Delimiter character aa       Hexadecimal address of the device ID       Command for read ID <CR>    Carriage Return - End of command
<b>Response</b>	_ID nnnnnnnn
<b>Example</b>	Command: ?00ID<CR> Response: _ID 00412534<CR>  In this example we read S/N of device #00

## ?aaM – Get Next Output State Memory value

**Description**      Read Next Output State Memory value

**Syntax**            ?aaM<CR>  
?            Delimiter character  
aa          Hexadecimal address of the device  
M          Read Next Output State Memory  
<CR>      Carriage Return - End of command

**Response**        \_dddd<CR>

**Examples**        Command: ?00M<CR>  
Response: \_1002<CR>  
Relay #13 and #2 will be activated if ^^M command  
Will take place.

## ?aaS – Get User jumper and led status

**Description** This command reads the status of UJP (User Jumper) and ULD (User Led) status.

**Syntax** ?aaS<CR>  
 ? Delimiter character  
 aa Hexadecimal address of the device  
 S Read jumper & led status  
 <CR> Carriage Return - End of command

**Response** \_dd<CR> if the command was valid  
 \_ Delimiter character  
 dd Output digits  
 A 1<sup>st</sup> Input nibble  
 B 2<sup>nd</sup> Input nibble

			UJP				ULD
8	4	2	1	8	4	2	1
D7	D6	D5	D4	D3	D2	D1	D0
A				B			

ULD=1 LED is ON  
 UJP=1 UJP jumper is CLOSED

**Example** Command: ?00S<CR>  
 Response: \_11<CR>

In this example the LED is ON and JP1 is CLOSE

## !aa2dddd – Set relay status

<b>Description</b>	This command defines module's relay state.
<b>Syntax</b>	<pre>!aa2dddd &lt;CR&gt;</pre> <p>!        Delimiter character aa      Hexadecimal address of the device 2       System control command d       Relay output activation command data for each nibble in hex format &lt;CR&gt;   Carriage Return - End of command</p>
<b>Response</b>	dddd if the command was valid and if FB messages are enabled
<b>Example</b>	Command: !0028008 <CR> Response:   8008 <CR>
	This command will activate relay #16 an #4

## !aa3dd – Activate relay N

<b>Description</b>	This command activates a single relay.
<b>Syntax</b>	<pre>!aa3dd &lt;CR&gt;</pre> <p>! Delimiter character aa Hexadecimal address of the device 3 Single relay activation command dd N Relay ID in hex format &lt;CR&gt; Carriage Return - End of command</p>
<b>Response</b>	Sdd if the command was valid
<b>Operation method</b>	The !aa3dd<CR> command activate a single relay in the range of “00” to “0F”.
<b>Example</b>	Command: !00305<CR> Response:  S05<CR>
	Relay #6 will be activated.

## !aa4dd – De activate relay N

<b>Description</b>	This command De activates a single relay.
<b>Syntax</b>	<pre>!aa4dd &lt;CR&gt; !      Delimiter character aa     Hexadecimal address of the device 4      Single relay De activation command dd     N Relay ID in hex format &lt;CR&gt;  Carriage Return - End of command</pre>
<b>Response</b>	Sdd if the command was valid
<b>Operation method</b>	The !aa4dd<CR> command De activate a single relay in the range of "00" to "0F".
<b>Example</b>	Command: !00405<CR> Response:  S05<CR>  Relay #6 will be De activated.

## !aa50dd – Set device mode Register #50 value

**Description** This command defines the device operation mode

**Syntax** !aa50dd <CR>  
! Delimiter character  
aa Hexadecimal address of the device  
50 System mode command  
dd Mode Register #50 (00-FF)

82	Enable Board Rate change, ETC
02	Report on command errors
00	Normal

<CR> Carriage Return - End of command

**Response** |dd EE OK if the command was valid

**Example** Command: !00582<CR>  
Response: |82 EE OK

This command will:

- Enables Baud Rate setting,
- Enables the device error messages.  
(error messages are sent in response to invalid commands)

Make sure setting a normal mode like '00' or '02' right after making the changes.

## !aa6dd – Set baud rate

**Description** For compatibility with existing devices the IA-2216-5 can be set to other standard baud rates

**Syntax** !aa6dd <CR>  
! Delimiter character  
aa Hexadecimal address of the device  
6 Change device baud rate command  
dd Two characters representing the desired baud rate:  
12 1200  
24 2400  
48 4800  
96 9600  
19 19200 (default)  
38 38400  
57 57600  
11 115200  
<CR> Carriage Return - End of command

**Response** |dd<CR> if the command was valid  
| Response delimiter  
dd New baud rate  
<CR> Carriage Return - End of response

**Example** Command: !01696<CR>  
Response: |96<CR>

Change the baud rate of the device at address 01Hex to 9600



### Note

1. Mode must be set to “82” first to enable BR change. (!00582)
2. Changes will take effect after the next power up. (Power off)
3. Make sure setting the mode back to normal right after changing the BR.

## !aa7dd – Set module’s address

**Description** Each device must have a unique network address. This command defines a module’s address.

**Syntax** !aa7dd <CR>  
! Delimiter character  
aa Hexadecimal address of the device  
7 Change device baud rate command  
dd New Hexadecimal address  
<CR> Carriage Return - End of command

**Response** |dd<CR> if the command was valid

**Example** Command: !00701<CR>  
Response: |01<CR>

Change the address of the device at address 0(Hex) to 1(Hex)



### Note

1. Factory default is 00Hex
2. Mode must be set to “82” first to enable Address change. (!00582)
3. In products chained system, each product must be set to a unique address.
4. The updated address is displayed on the boards 7 segment led display.

## !aaEdddd – Set initial state

<b>Description</b>	This command defines relays state at POWER-UP
<b>Syntax</b>	<pre>!aaEdddd &lt;CR&gt; !      Delimiter character aa     Hexadecimal address of the device E      System control command d      Relay output activation command data for each nibble in hex format &lt;CR&gt;  Carriage Return - End of command</pre>
<b>Response</b>	Edddd<CR> if the command was valid
<b>Example</b>	Command: !00E1001<CR> Response:  E1001<CR>  This command will define the initiate state of relays #13 and #1 as “No Active”.



### Note

Default state is !00E00000000 (All relays are OFF at power up)

## !aaMdddd – Set Next Output State Memory Register

<b>Description</b>	This command defines <b>Next Output State Memory Register</b>
<b>Syntax</b>	<pre>!aaMdddd &lt;CR&gt;</pre> <p>!       Delimiter character aa      Hexadecimal address of the device M      System control command dddd   Relay output activation command data for each nibble in hex format &lt;CR&gt;   Carriage Return - End of command</p>
<b>Response</b>	Edddd<CR> if the command was valid
<b>Example</b>	Command: !00M1001<CR> Response:  M1001<CR>
	This command will define relays #13 and #1 as activated per Next Output State activation command ^^M.

## !aaSdd – Set user defined led

**Description** This command turns ON or turns OFF the ULD LED

**Syntax** !aaSdd <CR>  
! Delimiter character  
aa Hexadecimal address of the device  
S Set Led status  
0d LED status:  
01 On  
00 Off  
<CR> Carriage Return - End of command

**Response** |0d<CR> if the command was valid

**Example** Command: !00S01<CR>  
Response: |01<CR>

This command will turn on the LED



### Note

The default LED status is ON.

## ^^E – Force initial state at all modules

<b>Description</b>	This command forces all modules of this net into their pre-defined initiate state.
<b>Syntax</b>	^^E<CR> ^^     Delimiter character E     Command Letter <CR>   Carriage Return - End of command
<b>Response</b>	No FB message
<b>Example</b>	Command: ^^E<CR> Response: No FB message

## ^^M – Forces module’s Internal Memory Register value to its Output State

<b>Description</b>	This command forces all modules Internal Memory Register value to their Output State.
<b>Syntax</b>	^^M<CR> ^^ Delimiter character M Command Letter <CR> Carriage Return - End of command
<b>Response</b>	No FB message
<b>Example</b>	Command: ^^M<CR> Response: Relays’ state is set and found identical to the device internal Memory value. Response: No FB message