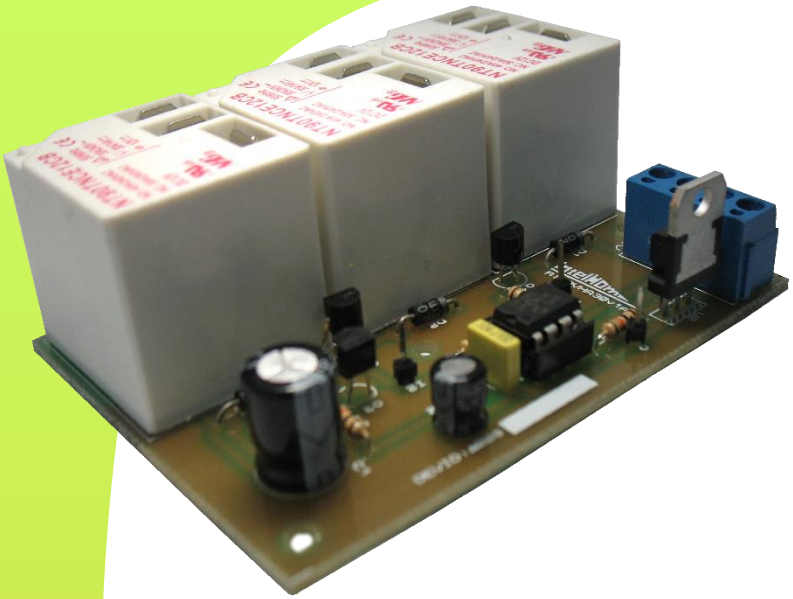
Rly3VHA30v1p1



Device ID	A008 ---- ----
Protocols	ihdw1
ihdw Buffer Size	4 bytes
Microcontroller	PIC12F683
Free EEPROM	227 bytes
Operating Voltage	11-13 VDC
Maximum Current	290 mA @ 12 V
Board Dimensions	64 x 85 mm^2
Height	33 mm
Relays Max. Current	30 A @ 240 VAC

This module consists of three 30A relays can be used to turn electrical devices on and off via *ihd* commands. All three switch pins of each relay (COM, NO, NC) are available to use. All relays can operate independently, or they can be linked together from software. Each relay has two modes for turning on or off; one mode changes relay state according to a variable called *Auto*, and other mode powers relay without considering the value of *Auto* variable. There is a self-test feature on this module that helps to troubleshoot the device. There are some pins on the board can be connected to emergency switches to turn on or off each relay manually. Every relay has its own timer to change its state automatically if needed. Timer resolution is 1 second, and it can delay up to 65535 seconds equals to 18 hours and 12 minutes. The module can be frozen to avoid changing the state of relays; this feature is useful in situations that no electrical instrument must be turned on or off like diffusion of flammable gas in the area.

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Introduction

This module consists of three 30A relays can be used to turn electrical devices on and off via *ihd* commands. All three switch pins of each relay (COM, NO, NC) are available to use. All relays can operate independently, or they can be linked together from software. Each relay has two modes for turning on or off; one mode changes relay state according to a variable called *Auto*, and other mode powers relay without considering the value of *Auto* variable. There is a self-test feature on this module that helps to troubleshoot the device. There are some pins on the board can be connected to emergency switches to turn on or off each relay manually. Every relay has its own timer to change its state automatically if needed. Timer resolution is 1 second, and it can delay up to 65535 seconds equals to 18 hours and 12 minutes. The module can be frozen to avoid changing the state of relays; this feature is useful in situations that no electrical instrument must be turned on or off like diffusion of flammable gas in the area.

EEPROM Data Structure

There is a *PIC12F683* microcontroller on this module that has 256 bytes of EEPROM. The EEPROM divided into several parts as described below.

- Bytes 0-5 store device ID.
- The device address stored in bytes 6-8,
- Bytes 9-22 used to store the value of properties.
- Bytes 23-249 are not used and have no specific data.
- Bytes 250-252 stores module state variables and must not be edited. The value of the last byte may be changed for device maintenance.
- Bytes 253-255 are reserved for special purposes.

All bytes can be read using *ihdw ReadEEPROM* command. Bytes 0-8 are read-only; other bytes can be modified by *ihdw WriteEEPROM* command. The only way to change module address is sending *ihdw SetAddress* packet.

Table 1- Rly3VHA30v1p1 EEPROM data structure

Address	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
00	A0	08	??	??	??	??	??	??	??	??	??	??	??	??	??	??
10	??	??	??	??	??	??	??	FF	FF	FF	FF	FF	FF	FF	FF	FF
20	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF
30	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF
40	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF
50	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF
60	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF
70	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF
80	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF
90	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF
A0	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF
B0	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF
C0	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF
D0	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF
E0	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF
F0	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	??	??	FA	??	??	??

Device ID	Device Address	Properties	Free	State Variables	Reserved

Properties

Here is the list of module properties, these values define the behavior of the module. The module must be reset after changing properties to load new values. Note that the most significant byte of each value stores first.

Table 2- Rly3VHA30v1p1 properties

Name	1OffOnDelay	EEPROM Address	9 = 0x09
Type	Number	Size	2 bytes
Range	0-65535	Default Value	1
Description	The delay (in seconds) between relay 1 off and on states. This delay is used by *1OffDelayOn* command.		

Name	1OnOffDelay	EEPROM Address	11 = 0x0B
Type	Number	Size	2 bytes
Range	0-65535	Default Value	1
Description	The delay (in seconds) between relay 1 on and off states. This delay is used by *1OnDelayOff* command.		

Name	2OffOnDelay	EEPROM Address	13 = 0x0D
Type	Number	Size	2 bytes
Range	0-65535	Default Value	1
Description	The delay (in seconds) between relay 2 off and on states. This delay is used by *2OffDelayOn* command.		

Name	2OnOffDelay	EEPROM Address	15 = 0x0F
Type	Number	Size	2 bytes
Range	0-65535	Default Value	1
Description	The delay (in seconds) between relay 2 on and off states. This delay is used by *2OnDelayOff* command.		

Name	3OffOnDelay	EEPROM Address	17 = 0x11
Type	Number	Size	2 bytes
Range	0-65535	Default Value	1
Description	The delay (in seconds) between relay 3 off and on states. This delay is used by *3OffDelayOn* command.		

Name	3OnOffDelay	EEPROM Address	19 = 0x13
Type	Number	Size	2 bytes
Range	0-65535	Default Value	1
Description	The delay (in seconds) between relay 3 on and off states. This delay is used by *3OnDelayOff* command.		

Name	LinkRelays	EEPROM Address	21 = 0x15
Type	Number	Size	1 bytes
Range	0-9	Default Value	0
Description	By changing this property, you can link relays together. 0: No link 1: Relay 2 acts same as relay 1 2: Relay 3 acts same as relay 1 3: Relays 2 and 3 act same as relay 1 4: Relay 1 acts same as relay 2 5: Relays 3 acts same as relay 2 6: Relays 1 and 3 act same as relay 2 7: Relay 1 acts same as relay 3 8: Relay 2 acts same as relay 3 9: Relays 1 and 2 act same as relay 3		

Name	Always restore relay 1 state on delays.	EEPROM Address	22 = 0x16 - Bit 0
Type	Boolean	Size	1 bit
Range	0-1	Default Value	0
Description	If this bit is set, the state of relay 1 will be changed after the delay of *1OnDelayOff* and *1OffDelayOn* commands even if the device is frozen.		

Name	Always restore relay 2 state on delays.	EEPROM Address	22 = 0x16 - Bit 1
Type	Boolean	Size	1 bit
Range	0-1	Default Value	0
Description	If this bit is set, the state of relay 2 will be changed after the delay of *2OnDelayOff* and *2OffDelayOn* commands even if the device is frozen.		

Name	Always restore relay 3 state on delays.	EEPROM Address	22 = 0x16 - Bit 2
Type	Boolean	Size	1 bit
Range	0-1	Default Value	0
Description	If this bit is set, the state of relay 3 will be changed after the delay of *3OnDelayOff* and *3OffDelayOn* commands even if the device is frozen.		

Name	Listen to FreezeAll broadcast.	EEPROM Address	22 = 0x16 - Bit 7
Type	Boolean	Size	1 bit
Range	0-1	Default Value	0
Description	If this bit is not set, the device won't listen to *FreezeAllRelays* message.		

Commands

To use this module, you must send *ihdw* commands to it. The below table contains all commands that are supported by *Rly3VHA30v1p1*. For more information about sending *ihdw* commands refer to *ihd Protocol* datasheet available at *intelHom* website (www.intelhom.com).

Table 3- Rly3VHA30v1p1 commands

Name	1Off	Value	20 = 0x14
Description	Turns relay 1 off and disables changing relay 1 state by *Auto* commands.		
Input (0 bytes)	no parameters	Output (0 bytes)	no results

Name	1On	Value	21 = 0x15
Description	Turns relay 1 on and disables changing relay 1 state by *Auto* commands.		
Input (0 bytes)	no parameters	Output (0 bytes)	no results

Name	1DisableAuto	Value	22 = 0x16
Description	Disables changing relay 1 state by *Auto* commands.		
Input (0 bytes)	no parameters	Output (0 bytes)	no results

Name	1EnableAuto	Value	23 = 0x17
Description	Enables changing relay 1 state by *Auto* commands.		
Input (0 bytes)	no parameters	Output (0 bytes)	no results

Name	1AutoOff	Value	24 = 0x18
Description	Turns relay 1 off, if it can be changed by *Auto* commands.		
Input (0 bytes)	no parameters	Output (0 bytes)	no results

Name	1AutoOn	Value	25 = 0x19
Description	Turns relay 1 on, if it can be changed by *Auto* commands.		
Input (0 bytes)	no parameters	Output (0 bytes)	no results

Name	1OffDelayOn	Value	26 = 0x1A
Description	Turns relay 1 off and turns it on again after *1OffOnDelay* property. This command disables changing relay 1 state by *Auto* commands.		
Input (0 bytes)	no parameters	Output (0 bytes)	no results

Name	1OnDelayOff	Value	27 = 0x1B
Description	Turns relay 1 on and turns it off again after *1OnOffDelay* property. This command disables changing relay 1 state by *Auto* commands.		
Input (0 bytes)	no parameters	Output (0 bytes)	no results

Name	1SwitchOnOff	Value	28 = 0x1C
Description	Switches relay 1 between on and off states. This command disables changing relay 1 state by *Auto* commands.		
Input (0 bytes)	no parameters	Output (0 bytes)	no results

Name	1SwitchOnOffAuto	Value	29 = 0x1D
Description	Switches relay 1 between on, off and auto states. This command disables changing relay 1 state by *Auto* commands in on/off states.		
Input (0 bytes)	no parameters	Output (0 bytes)	no results

Name	2Off	Value	30 = 0x1E
Description	Turns relay 2 off and disables changing relay 2 state by *Auto* commands.		
Input (0 bytes)	no parameters	Output (0 bytes)	no results

Name	2On	Value	31 = 0x1F
Description	Turns relay 2 on and disables changing relay 2 state by *Auto* commands.		
Input (0 bytes)	no parameters	Output (0 bytes)	no results

Name	2DisableAuto	Value	32 = 0x20
Description	Disables changing relay 2 state by *Auto* commands.		
Input (0 bytes)	no parameters	Output (0 bytes)	no results

Name	2EnableAuto	Value	33 = 0x21
Description	Enables changing relay 2 state by *Auto* commands.		
Input (0 bytes)	no parameters	Output (0 bytes)	no results

Name	2AutoOff	Value	34 = 0x22
Description	Turns relay 2 off, if it can be changed by *Auto* commands.		
Input (0 bytes)	no parameters	Output (0 bytes)	no results

Name	2AutoOn	Value	35 = 0x23
Description	Turns relay 2 on, if it can be changed by *Auto* commands.		
Input (0 bytes)	no parameters	Output (0 bytes)	no results

Name	2OffDelayOn	Value	36 = 0x24
Description	Turns relay 2 off and turns it on again after *2OffOnDelay* property. This command disables changing relay 2 state by *Auto* commands.		
Input (0 bytes)	no parameters	Output (0 bytes)	no results

Name	2OnDelayOff	Value	37 = 0x25
Description	Turns relay 2 on and turns it off again after *2OnOffDelay* property. This command disables changing relay 2 state by *Auto* commands.		
Input (0 bytes)	no parameters	Output (0 bytes)	no results

Name	2SwitchOnOff	Value	38 = 0x26
Description	Switches relay 2 between on and off states. This command disables changing relay 2 state by *Auto* commands.		
Input (0 bytes)	no parameters	Output (0 bytes)	no results

Name	2SwitchOnOffAuto	Value	39 = 0x27
Description	Switches relay 2 between on, off and auto states. This command disables changing relay 2 state by *Auto* commands in on/off states.		
Input (0 bytes)	no parameters	Output (0 bytes)	no results

Name	3Off	Value	40 = 0x28
Description	Turns relay 3 off and disables changing relay 3 state by *Auto* commands.		
Input (0 bytes)	no parameters	Output (0 bytes)	no results

Name	3On	Value	41 = 0x29
Description	Turns relay 3 on and disables changing relay 3 state by *Auto* commands.		
Input (0 bytes)	no parameters	Output (0 bytes)	no results

Name	3DisableAuto	Value	42 = 0x2A
Description	Disables changing relay 3 state by *Auto* commands.		
Input (0 bytes)	no parameters	Output (0 bytes)	no results

Name	3EnableAuto	Value	43 = 0x2B
Description	Enables changing relay 3 state by *Auto* commands.		
Input (0 bytes)	no parameters	Output (0 bytes)	no results

Name	3AutoOff	Value	44 = 0x2C
Description	Turns relay 3 off, if it can be changed by *Auto* commands.		
Input (0 bytes)	no parameters	Output (0 bytes)	no results

Name	3AutoOn	Value	45 = 0x2D
Description	Turns relay 3 on, if it can be changed by *Auto* commands.		
Input (0 bytes)	no parameters	Output (0 bytes)	no results

Name	3OffDelayOn	Value	46 = 0x2E
Description	Turns relay 3 off and turns it on again after *3OffOnDelay* property. This command disables changing relay 3 state by *Auto* commands.		
Input (0 bytes)	no parameters	Output (0 bytes)	no results

Name	3OnDelayOff	Value	47 = 0x2F
Description	Turns relay 3 on and turns it off again after *3OnOffDelay* property. This command disables changing relay 3 state by *Auto* commands.		
Input (0 bytes)	no parameters	Output (0 bytes)	no results

Name	3SwitchOnOff	Value	48 = 0x30
Description	Switches relay 3 between on and off states. This command disables changing relay 3 state by *Auto* commands.		
Input (0 bytes)	no parameters	Output (0 bytes)	no results

Name	3SwitchOnOffAuto	Value	49 = 0x31
Description	Switches relay 3 between on, off and auto states. This command disables changing relay 3 state by *Auto* commands in on/off states.		
Input (0 bytes)	no parameters	Output (0 bytes)	no results

Name	GetState	Value	50 = 0x32
Description	Returns device state word.		
Input (0 bytes)	no parameters	Output (2 bytes)	Bit0: Reserved. Bit1: Indicates if the output 3 is on. Bit2: Indicates if the output 2 is on. Bit3: Indicates if the output 1 is on. Bit4: Reserved. Bit5: Indicates if the output 3 is on in auto mode. Bit6: Indicates if the output 2 is on in auto mode. Bit7: Indicates if the output 1 is on in auto mode. Bit8: Reserved. Bit9: Indicates if the output 3 is in auto mode. Bit10: Indicates if the output 2 is in auto mode. Bit11: Indicates if the output 1 is in auto mode. Bit12: Reserved. Bit13: Reserved. Bit14: Indicates if the device is frozen. Bit15: Reserved.

Name	ReadEEPROM	Value	0 = 0x00
Description	Reads data from the device EEPROM.		
Input (2 bytes)	First byte: Address to start reading Second byte: Number of bytes to read (always 1)	Output (3 bytes)	First byte: Address of reading start Second byte: Number of read bytes (1) Third byte: Read data

Name	WriteEEPROM	Value	1 = 0x01
Description	Writes data to the device EEPROM.		
Input (3 bytes)	First byte: Address to start writing Second byte: Number of bytes to write (always 1) Third byte: Data to write	Output (0 bytes)	no results

Name	SoftResetDevice	Value	4 = 0x04
Description	Restarts the device.		
Input (0 bytes)	no parameters	Output (0 bytes)	no results

Name	Freeze	Value	53 = 0x35
Description	Freezes the device. When the device is frozen relays state will not change by any command.		
Input (0 bytes)	no parameters	Output (0 bytes)	no results

Name	Unfreeze	Value	56 = 0x38
Description	Unfreezes the device. When the device is unfrozen relays act normally.		
Input (0 bytes)	no parameters	Output (0 bytes)	no results

Name	FreezeAllRelays Broadcast	Value	11 = 0x0B
Description	If this message is broadcasted and *Listen to FreezeAll broadcast* bit is set, all relays will be frozen or unfrozen according to the parameter of the message.		
Input (1 byte)	0: Unfreeze 1: Freeze	Output (0 bytes)	no results

Emergency Switches

Each relay can be connected to an emergency switch that helps to turn relay on/off when the device does not operate correctly. The switch must be connected among *Ix* and *O* pins series to a 10KΩ resistor.

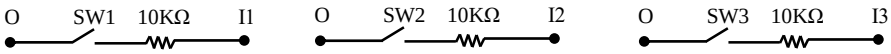

Figure 1- Emergency switches connections

Self-Test Feature

There is a 10KΩ resistor near *O* pin on the board (R4). To do a self-test, you must connect its right leg (that is near microcontroller) to *GND* for a moment. If the module works fine, all relays will be turned on and off consecutive.

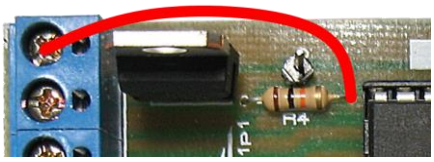

Figure 2- Self-Test activation

Troubleshooting

If the module stopped working, first of all, check the module power supply and data connection lines. Then use the self-test feature to ensure the microcontroller and relays working correctly. If the device still not working refer to this section to find the problem. If the problem does not solve, it is recommended to replace the module with a new one and contact *intelHom* service office in your country.

State of all relays do not change:

The device is frozen by *Freeze* command. Send *Unfreeze* command to it.

State of one or more relays do not change:

If you are using, *AutoOn* or *AutoOff* commands send *EnableAuto* command the relay to ensure that it is in auto mode.

One or more relays do not turn off:

If there is an emergency switch for the relay, ensure that the switch must be open.

One or more relays do not turn on:

Energize the relay by connecting the anode of *1N4148* diode beside that relay on the board to *GND*. If the relay does not turn on, it must be replaced with new one.

One or more relays do not turn off:

Send turn off command to the relay and check voltage at two sides of the *1N4148* diode beside that relay. If there is no voltage difference, the relay must be replaced with a new one.

Relays do not work, and the device does not respond to *GetState* command:

Press the microcontroller down to fasten it in the socket. If the module still not working, try to readdress and reprogram it several times. The problem may be solved.

Relays does not hold their current state after resetting device:

Refer to the next section.

If none of the above solutions solved the problem, just replace the module with a new one.

Maintenance

The current state of relays stores into the microcontroller EEPROM, this will help the module to preserve its last state after resetting or powering off and on. According to *PIC12F683* datasheet EEPROM life is not infinite and after about 10`000`000 write cycles EEPROM block cannot be used anymore. In this case, the modules will stop storing its state. To solve this problem new address (address of fresh EEPROM blocks) must be assigned for storing state variables. To do this follow below steps.

1. Ensure that device state will not be saved anymore by changing relays state and resetting device several times.
2. Use *ihdw EEPROMRead* command to read current address of state variables. The address of state variables stored into EEPROM at address 0xFC.

   00FC01 ← reads 1 byte from address FC

   The default value of this byte is 0xFA.
3. According to Table 1, you can see that bytes 23-249 are free and can be used for storing state variables, but it is recommended to subtract 2 from current address (because this module has two bytes as state variables) and store it as a new address for state variables. For example, if the current value of byte at position 0xFC is 0xFA store 0xF8 as the new address to EEPROM at position 0xFC.
4. To save new value to EEPROM, you must use the *ihdw EEPROMWrite* command.

   01FC01F8 ← writes 1 byte to address FC with the value of F8
5. Send *SoftResetDevice* command to the device.
6. Send *Unfreeze* command to the device.

Worldwide Sales and Service

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