HAYWARD®

Home Automation Interface Module

for Aqua Logic PS (Rev 2.2 or later) & Pro Logic PS Models

Owner's Manual

Contents

AQ-CO-SERIAL

Introduction

The AQ-CO-SERIAL is a serial home automation module that provides a command set which enables any attached system to fully emulate an Aqua Logic PS pool control running software rev 2.2 or later or any Pro Logic PS pool control. Thus, buttons can be transmitted, and the Aqua Logic PS/Pro Logic PS LED and messaging display states are returned.

A complete description of the operation of an Aqua Logic PS or Pro Logic PS can be found in the user manuals at www.hayward.com.

Tools Needed
- RS232 Cable (Straight through Male to Female DB9 Cable, 25' max)
- Four conductor low voltage control wire up to 100 feet (RS-485 wiring)
- Aqua Logic PS model pool control with Rev: 2.2 or later firmware OR Pro Logic PS model pool control

Functionality
The AQ-CO-SERIAL interconnects an RS-232 bus from any Home Automation system with the Aqua Logic PS/Pro Logic PS using the powered RS-485. A typical system is shown below.
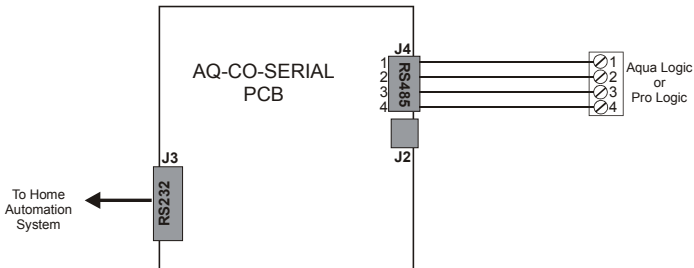

Power
The AQ-CO-SERIAL is powered via RS485 from the Aqua Logic PS/Pro Logic PS control.

Common Setup
The RS-232 end is connected to the Home Automation System and the RS485 end is connected to the Aqua Logic PS/Pro Logic PS. The AQ-CO-SERIAL enclosure is 5" X 5.25" X 1.25" and is designed to be mounted indoors only.

Refer to the diagram below. The Home Automation system is connected to the RS232 (J3) connector. To communicate with Aqua Logic PS/Pro Logic PS, the connectors J2 or J4 are used. (J2 and J4 are connected in parallel internally).

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The Aqua Logic PS/Pro Logic PS communicates to its peripherals via a half duplex asynchronous RS-485 link that also supplies DC power. All peripherals are wired in parallel on this bus. The Aqua Logic PS/Pro Logic PS is the master of the bus, and devices only transmit when queried. For example, to receive a keypress from any one of the remote controls, the Aqua Logic PS/Pro Logic PS requests pending keys every 100 ms, and then listens for an answer. If any remote control has a pending keypress, it is immediately sent back to the Aqua Logic PS/Pro Logic PS.

The AQ-CO-SERIAL relieves the Home Automation system from having to respond to the Aqua Logic PS/Pro Logic PS timing and command response requirements. It is a simple board with a processor, a ground isolated RS232 interface via DB9 connector, and a terminal strip for connection to the Aqua Logic PS/Pro Logic PS bus. It performs as a slave to Aqua Logic PS/Pro Logic PS and as a bi-directional interface to the Home Automation System. All the commands needed to emulate a remote control are supported: sending a keypress to the Aqua Logic PS/Pro Logic PS, and receiving text and LED status.

The Aqua Logic PS/Pro Logic PS-16 has 16 internal relays. The PS-4 and PS-8-V have 4 relays. The PS-8 and PS-16-V have 8 relays. The "V" models double the AUX buttons for use as macro buttons called "groups". The adjacent image is of a PS-16 remote with all keys un-labeled. The remote is shipped with adhesive labels which allow customization of the keyboard. The same list of labels are available in the system software so that a relay or valve can be more appropriately named.

Shown below is a labeled remote control to a Pro Logic PS pool control. Note that labels have been placed over the generic names to describe the equipment being controlled. In this case, the Pool Filter, Gas Heater, Spa Filter and Water Feature are all turned on.

These names have also been selected in the Aqua Logic PS/Pro Logic PS configuration menu so that when the user presses "Spa Jets", a message saying "Spa Jets Turned On" appears on the display.

Note that buttons may not respond under certain conditions. For example, pressing "Cleaner" while the Pool Filter is OFF, will result in the message "Interlock prevents turn on" being displayed and the LED will not light up. There are many such special features and interlocks in the Aqua Logic PS/Pro Logic PS.

The menu button selects the Aqua Logic PS/Pro Logic PS menus. The navigation keys surrounding the menu button allows movement through sub menus ("<" and ">") and value changes ("+" and "-"). All feedback is via the 2 x 20 alphanumeric display.

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The menus are mainly used to configure the pool and change temperature setpoints. Most user interaction is via the direct-access keys in the lower half of the control.

Command Overview

These are the standard commands which are used for communicating between the Home Automation (HA) and the AQ-CO-SERIAL. To keep this system simple, these commands are very similar to the commands used on the Aqua Logic PS/Pro Logic PS bus.

Hex	Command
01	Update Key Pad Press (HA to AQ-CO-SERIAL)
02	Update Key Pad Release (HA to AQ-CO-SERIAL)
03	Update LEDs (AQ-CO-SERIAL to HA)
04	Update Display (AQ-CO-SERIAL to HA)
05	Beeper (AQ-CO-SERIAL to HA)

Thus, for the home automation system to send a key, a Press and a Release command are required. The Aqua Logic PS/Pro Logic PS will always react to the "Press" command. In some menus where value scrolling is supported, a delay of greater than two seconds between the press and release commands will start the value scrolling. A common use of scrolling is setting the temperature of the heater or the chlorination rate of the chlorine generator.

The AQ-CO-SERIAL will forward an Update LED or Update Display command if a change in content is detected since the previous transmission of such commands. These commands are sent once every 2 seconds, even if no information has changed.

Framing and Rate: Asynchronous serial mode is used with the following character format: 1 start bit, 8 data bits, no parity and 2 stop bits. The data rate is 19.2 kbps. The basic frame structure used is shown below.

Each frame begins with a DLE (10H) and STX (02H) character start sequence, followed by a 2 to 61 byte long Command/Data field, a 2-byte Checksum and a DLE (10H) and ETX (03H) character end sequence.

The DLE, STX and Command/Data fields are added together to provide the 2-byte Checksum. If any of the bytes of the Command/Data Field or Checksum are equal to the DLE character (10H), a NULL character (00H) is inserted into the transmitted data stream immediately after that byte. That NULL character must then be removed by the receiver.

The Command and Data Fields for the various commands and expected responses are as follows:

(10H) DLE	(02H) STX	Command/Data	Checksum MSB	Checksum LSB	(10H) DLE	(03H) ETX

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Command Update Key Pad Press (From: HA, To: AQ-CO-SERIAL)

Use this command to simulate the user pressing a button. Upon receipt of a Key Press, the AQ-CO-SERIAL first reports the press action, and then reports that the key is being held down until a Key Pad Release is received. Note, if any "pressed" keys are not released within 20 seconds the AQ-CO-SERIAL assumes loss of communication and clears all the key presses.

(01H) Command	Data

Data (in Hexadecimal)
01	">"
02	Menu
03	"<"
04	Service/System off
05	"-"
06	"+"
07	Pool/Spa/Spillover
08	Filter
09	Lights
10	Aux1
11	Aux2
12	Aux3
13	Aux4
14	Aux5
15	Aux6
16	Aux7
17	Valve3
18	Valve4/Heater2
19	Heater1
20	Aux8
21	Aux9
22	Aux10
23	Aux11
24	Aux12
25	Aux13
26	Aux14
27	Super Chlorinate
28	Unlock Configuration Menu*

Note: In order to unlock Configuration menu, the display has to show "Configuration Menu-Locked", otherwise the unlock command will be ignored.

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Command Update Key Pad Release (From: HA, To: AQ-CO-SERIAL)
Use this command to simulate the user releasing a button.

(02H) Command	Data

Data (in Hexadecimal)
```
01      ">"
02      Menu
03      "<"
04      Service/System off
05      "-"
06      "+"
07      Pool/Spa/Spillover
08      Filter
09      Lights
10      Aux1
11      Aux2
12      Aux3
13      Aux4
14      Aux5
15      Aux6
16      Aux7
17      Valve3
18      Valve4/Heater2
19      Heater1
20      Aux8
21      Aux9
22      Aux10
23      Aux11
24      Aux12
25      Aux13
26      Aux14
27      Super Chlorinate
28      Unlock Configuration Menu
```

Example: When the ">" key is released, the command is:

10H	02H	02H	01H	00H 15H	10H	03H
DLE	STX	CMD	DATA	Checksum	DLE	ETX

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Command Update LEDs (From: AQ-CO-SERIAL To: HA)

The AQ-CO-SERIAL will send this command whenever a change of any LED state occurs.

(03H) Command	LEDs 1	LEDs 2	LEDs 3	Blink LEDs 4	Blink LEDs 1	Blink LEDs 2	Blink LEDs 3	Blink LEDs 4

Byte	Bit	LED	Byte	Bit	LED
LEDs 1	0	Heater1	LEDs 2	0	Aux2
LEDs 1	1	Valve3	LEDs 2	1	(Service)
LEDs 1	2	Check System	LEDs 2	2	Aux3
LEDs 1	3	Pool	LEDs 2	3	Aux4
LEDs 1	4	Spa	LEDs 2	4	Aux5
LEDs 1	5	Filter	LEDs 2	5	Aux6
LEDs 1	6	Lights	LEDs 2	6	Valve4/Heater2
LEDs 1	7	Aux1	LEDs 2	7	Spillover

Byte	Bit	LED	Byte	Bit	LED
LEDs 3	0	System off	LEDs 4	0	Aux14
LEDs 3	1	Aux7	LEDs 4	1	Super Chlorinate
LEDs 3	2	Aux8	LEDs 4	2	
LEDs 3	3	Aux9	LEDs 4	3	
LEDs 3	4	Aux10	LEDs 4	4	
LEDs 3	5	Aux11	LEDs 4	5	
LEDs 3	6	Aux12	LEDs 4	6	
LEDs 3	7	Aux13	LEDs 4	7	

If an LED bit is a 1, then that LED is on. If the LED bit is a 1 and it's associated Blink LED bit is a 1, then that LED should blink at a rate of once per second (half second on/half second off).
Response: None

Command Update Display (From: AQ-CO-SERIAL To: HA)

The AQ-CO-SERIAL will send this command whenever a change of display text occurs. This command is sent once every 2 seconds, even if no information has changed.

(04H) Command	LCD Line 1 (16/20)	LCD Line 2 (16/20)	Display Flags

The Display Flags are defined as follows:

Bit 0:	Blink Display Selection (P-4 Only)	(0=No, 1=Yes)
Bit 1:	Display Revision	(0=No, 1=Yes)
Bits 2:	Display Backlight Time	(0=No, 1=Yes)
Bits 3:	Display Beeper Status	(0=No, 1=Yes)
Bits 4-7:	Reserved	

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Bit 0   Not used currently.

Bit 1   The Revision has to be filled in by the Home Automation System if Bit 1 is set. For example: In the Diagnostics Menu, when "Display Software" is selected, the Update Display Command is sent as below, (with Bit 1 set to 1):

> Display Software
> Revision

The revision of the whole display can be replaced by the HA Developer. The Aqua Logic PS Pro Logic PS display will show its software revision as shown below:

> Display Software
> Local-08 r4.00

Bit 2   This is an Aqua Logic PS/Pro Logic PS feature only. Following is a description of how it is used on these pool controls. In Settings Menu, when "Display Light" is selected, the Update Display Command is sent as:

> Display Light

Note that the second line is blank. And the Bit 2 will be set to 1. The actual Aqua Logic PS Pro Logic PS display will show its current mode:

> Display Light   or   Display Light
> Always ON   on for 60 seconds

Bit 3   This is also an Aqua Logic PS/Pro Logic PS feature only. Following is a description of how it is used on these pool controls. In Settings Menu, when "Beeper" is selected, the Update Display Command is always sent as:

> Beeper
> Enabled

Bit 3 is set to 1. The actual Aqua Logic PS/Pro Logic PS display will show its current mode:

> Beeper   or   Beeper
> Enabled   Disable

Note: Bits 1, 2 and 3 can be implemented if desired.

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Response: None
For PS Models, in order to make a character blink, the eighth bit of the corresponding character is set. Refer to the following example:
'1' = 31H = 00110001, '1' does not blink
'1' = B1H = 10110001, '1' blinks

Command Beeper (From: AQ-CO-SERIAL To: HA)

(05H)
Command Beep Time

Response: None
After the Configuration Menu is unlocked, Aqua Logic PS/Pro Logic PS sends the Beeper command indicating the occurrence. The Update Key Pad Release command for the Unlock Configuration Menu has to be sent at this point.

Special Characters
The symbol "Degree" is sent as an "underscore _". The "Degree", being 0xDF, has the eighth bit set and to make sure that it's not mistaken as blinking, it's being sent as Underscore (0x5F). For example: To display "Air Temp 99°F", the packet will be "Air Temp   99_F".

Error Conditions
If the AQ-CO-SERIAL is not communicating with Aqua Logic PS/Pro Logic PS a Display command will be sent stating "Pro Logic Comm Bus Communication Lost".

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FCC Statement
This device complies with part 15 of the FCC rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Changes or modifications not expressly approved by Hayward could void the user's authority to operate this equipment.

NOTE: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

— Reorient or relocate the receiving antenna.
— Increase the separation between the equipment and receiver.
— Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
— Consult the dealer or an experienced radio/TV technician for help.

Industry Canada Statement
This Class B digital apparatus complies with Canadian ICES-003.

Cet appareil numérique de la classe B est conforme à la norme NMB-003 du Canada.

The term "IC" before the certification/registration number only signifies that the Industry Canada technical specifications were met.

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For further information or consumer
technical support, visit our website at
www.hayward.com

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