

## CueStation Universal Network Hub Hardware and Installation Guide

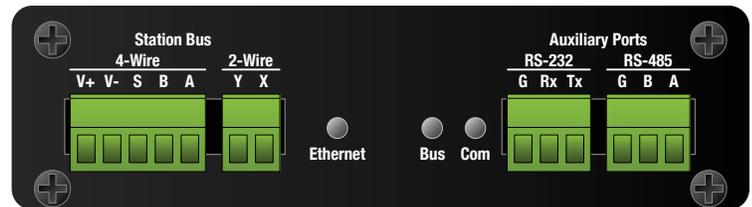
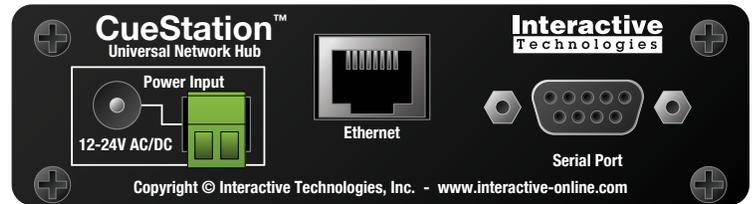
### Introduction

The ST-HUB CueStation Universal Network Hub (the CueStation Hub) is used to power and communicate with an array of digital CueStations (both 2-Wire and 5-Wire types).

The ST-HUB and ST-HUBD communicate with the host controller via an RS-232 serial interface, and the ST-HUB-EN and ST-HUBD-EN (Ethernet option) can communicate with the host controller by either RS-232 Ethernet messages.

**CueServer must be configured to use either RS-232 or Ethernet in order to communicate with the CueStation hub properly (System Preferences > Button Settings).**

Although the CueStation Hub is designed to integrate directly with the CueServer family of lighting control processors, it can also be used for custom projects that do not involve CueServer. The communication protocols are freely available from our web site.



### Connecting the Hardware

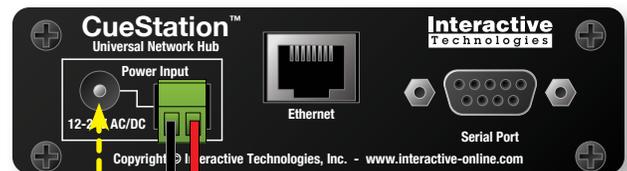
In addition to the main power supply input for the CueStation Hub, there are two host interfaces, two button station interfaces and two auxiliary ports available on the Hub. This section describes the use and configuration of each.

#### Power Supply

The CueStation Hub requires it's own local power supply, from 12 to 24 volts, either AC or DC.

There are two power input jacks on the Hub, a 2.1mm DC Input Jack and a 2-Position Terminal Block. You can use either one, but not both. If the 2.1mm DC Input Jack is used, it electrically disconnects the circuit from the Terminal Block input.

For example, if a power supply outputs 630mA at 24VDC, it is typically enough current to handle up to six 2-Wire or 5-Wire stations connected to the Hub.



**Use either the 2.1mm DC Power Input Jack or the 2-Position Terminal Block**

**The amount of current required can be calculated by using one of the following equations (the current is dependent on the number of CueStations connected to the Hub):**

- **In Watts:** **6 Watts + 1.5 Watts per Station (2-Wire and 5-Wire)**
- **In Milliamps (12VDC):** **500mA + 125mA per per Station (2-Wire and 5-Wire)**
- **In Milliamps (24VDC):** **250mA + 63mA per per Station (2-Wire and 5-Wire)**

## Ethernet Jack

If the Hub is outfitted with the optional Ethernet option (ST-HUB-EN, ST-HUBD-EN), you can connect a standard CAT-5 type Ethernet cable to the Ethernet jack. The opposite end of the Ethernet cable should be connected to the appropriate networking equipment, such as an Ethernet Switch or Router, etc.



**For more information about the Ethernet communications protocol, please refer to the CueStation Network Communications Protocol document.**

## Serial Port

If the Hub is to be used with a serial device (CueServer or other host device), it can be connected in one of two different ports, a standard Female DB-9 connector on the front of the device as well as a 3-Position Terminal Block on the rear of the device. Either one of these ports may be used, but not both at the same time (the two ports are internally connected directly together and cannot accept signals from two different devices simultaneously).

**Null Modem Cable is required for DB-9 connection.**

The following diagram shows the pinout of the Female DB-9 as well as the corresponding position of the RS-232 Terminal Block:

Signal	DB-9 Pin	RS-232 Port Pin	Note
Serial Transmit - Tx (to external device)	2	Tx	Connect to Receive (Rx) position on host device.
Serial Receive - Rx (from external device)	3	Rx	Connect to Transmit (Tx) pin on host device.
Ground	5	G	Connect to Ground pin on host device.



**For more information about the Serial communications protocol, please refer to the CueStation Network Communications Protocol document.**

## CueStation Bus

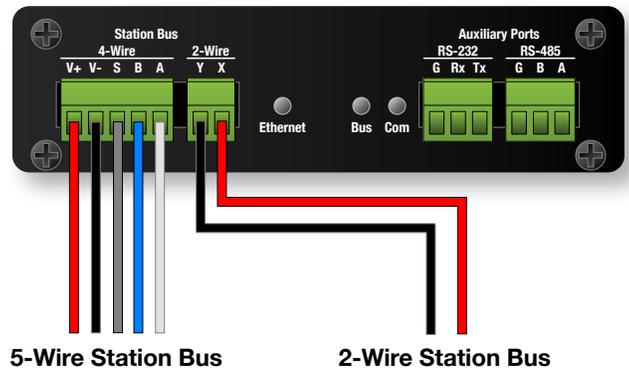
CueStations of both the 2-Wire and 5-Wire type can be connected to the Hub simultaneously. They are connected to the 2-Position and 5-Position Terminal Blocks available on the rear of the unit.

Each station has a station address, which is set by a group of dip switches on the back of each station. **Each station must have a unique address.** Please see the documentation for each station type to determine the appropriate dip switch settings.

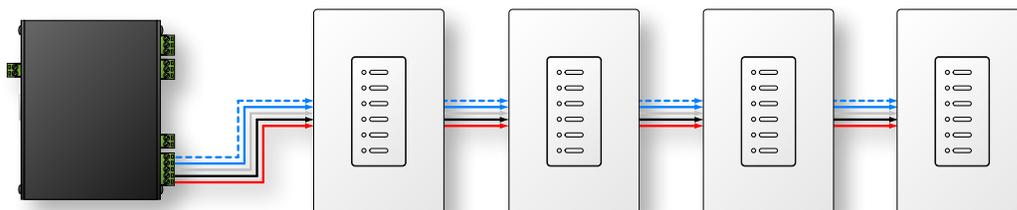
### 5-Wire Station Bus Wiring

The 5-Wire CueStation Bus uses a 5-conductor 22/18 AWG Multi-Media Cable (Belden 1502, AMX AXLINK-P or similar). The network topology may be run in "daisy-chain" style **only** and all five conductors must be wired through without reversing polarity of the data lines.

A maximum of fifty (50) 5-Wire stations can be connected to a single CueStation Hub. The maximum distance from the Hub to the farthest 5-Wire Station is 4000 feet (1220m).



### 5-Wire Station Bus Wiring Example



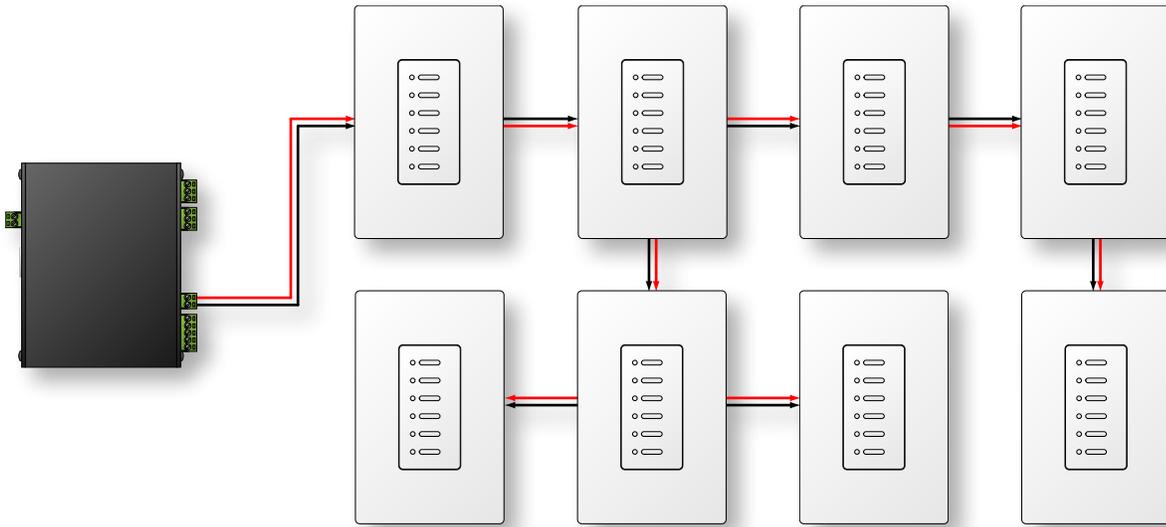
**For more information about 5-Wire station configuration and wiring, please refer to 5-Wire CueStation Specification Sheet document.**

## 2-Wire Station Bus Wiring

The 2-Wire CueStation Bus uses a 2-conductor 16AWG or 18AWG cable (see 2-Wire Specification Sheet for details) to carry both power and data to and from each station location. The network is both topology free (meaning a random combination of “star” and “daisy-chain” connections may be used) and polarity free (meaning it does not matter if the conductors are reversed at any station).

A maximum of ten (10) 2-Wire stations can be connected to a single CueStation Hub. The maximum distance from the Hub to the farthest 2-Wire Station is 500 feet (150m).

### 2-Wire Station Bus Wiring Example



**For more information about 2-Wire station configuration and wiring, please refer to 2-Wire CueStation Specification Sheet document.**

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## RS-485 Port

The terminal block port marked “RS-485” is not used at this time. Do not connect anything to this port.

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## Configuring Stations

Each station must be configured by setting a series of DIP Switches on the back of the station. These switches set various options as well as assign the station address. Each station connected to the same hub must be given a unique station address.



**Please refer to the specific 2-Wire or 5-Wire CueStation Specification Sheets for information on how to set the DIP Switches on each station.**

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## Connecting one or more CueStation Hubs to one or more CueServers

There can be several scenarios when connecting multiple CueStation Hubs and one or more CueServers on the same LAN network:

	One Hub	Multiple Hubs
One CueServer	Default settings are used. (Hub Group ID = 0 on both the Hub and CueServer)	Button stations with the same Station ID across all hubs will mimic each other.  Button stations with different Station IDs across all hubs will be unique.
Multiple CueServers	Button stations can trigger actions on all CueServers that are set up to communicate with this Group ID.	CueServer(s) will only communicate with Hub(s) that have their Hub Group ID set to the same values. There can be multiple combinations of CueServer/Hub clusters present on the network.

### Changing Hub Group ID in CueServer

In CueServer's web interface, navigate to Main > User Preferences > Button Settings. Change the Hub Group ID field to desired value and click the Save button.

### Changing Hub Group ID on CueStation Hub

1. Remove power from the CueStation Hub (not necessary on the DIN Rail version of the Hub).
2. Remove CueStation Hub main board from its housing (not necessary on the DIN Rail version of the Hub).
3. Locate dip switch bank marked "SW1". The Group ID is set using a binary combination of seven dip switches. Default is 0 (all dip switches are set to off). Set the dip switches to the desired combination.
4. Reassemble the CueStation Hub (if applicable).

## Indicator Values

Each indicator on a station can be set to one of 8 different colors (including black), with 4 intensity levels and 8 flashing patterns (including "Off" and "On" states). These parameters are combined to provide 256 possible combinations, which can be expressed as a single 8-bit number.

The three parameters can be combined in a binary fashion to produce a value from 0 to 255 as expressed by the following chart. Add the values (in parenthesis) of each parameter together to calculate the desired indicator value. For example, the value 0 is "Off", the value 255 is "Full White", the value 139 is Fast Flashing Red at 75% brightness.

Bit Position	Bit Value	Function	Parameter
7	128	<b>LED Intensity</b>	00 ( 0) = Intensity 25% 01 ( 64) = Intensity 50% 10 (128) = Intensity 75% 11 (192) = Intensity 100%
6	64		
5	32	<b>LED Color</b>	000 ( 0) = Black 001 ( 8) = Red 010 ( 16) = Green 011 ( 24) = Blue 100 ( 32) = Yellow 101 ( 40) = Magenta 110 ( 48) = Cyan 111 ( 56) = White
4	16		
3	8		
2	4	<b>LED Flash Pattern</b>	000 ( 0) = Off 001 ( 1) = Slow Flash 010 ( 2) = Rev. Slow Flash 011 ( 3) = Fast Flash 100 ( 4) = Rev. Fast Flash 101 ( 5) = Wink 110 ( 6) = Rev. Wink 111 ( 7) = On
1	2		
0	1		

Alternatively, you can use the complete table on the next page that shows all possible combinations of LED indicator values.

Dec	Hex	Intensity	Color	Flash
0	00	25%	Black	Off
1	01	25%	Black	Slow
2	02	25%	Black	Rev. Slow
3	03	25%	Black	Fast
4	04	25%	Black	Rev. Fast
5	05	25%	Black	Wink
6	06	25%	Black	Rev. Wink
7	07	25%	Black	On
8	08	25%	Red	Off
9	09	25%	Red	Slow
10	0A	25%	Red	Rev. Slow
11	0B	25%	Red	Fast
12	0C	25%	Red	Rev. Fast
13	0D	25%	Red	Wink
14	0E	25%	Red	Rev. Wink
15	0F	25%	Red	On
16	10	25%	Green	Off
17	11	25%	Green	Slow
18	12	25%	Green	Rev. Slow
19	13	25%	Green	Fast
20	14	25%	Green	Rev. Fast
21	15	25%	Green	Wink
22	16	25%	Green	Rev. Wink
23	17	25%	Green	On
24	18	25%	Blue	Off
25	19	25%	Blue	Slow
26	1A	25%	Blue	Rev. Slow
27	1B	25%	Blue	Fast
28	1C	25%	Blue	Rev. Fast
29	1D	25%	Blue	Wink
30	1E	25%	Blue	Rev. Wink
31	1F	25%	Blue	On
32	20	25%	Yellow	Off
33	21	25%	Yellow	Slow
34	22	25%	Yellow	Rev. Slow
35	23	25%	Yellow	Fast
36	24	25%	Yellow	Rev. Fast
37	25	25%	Yellow	Wink
38	26	25%	Yellow	Rev. Wink
39	27	25%	Yellow	On
40	28	25%	Magenta	Off
41	29	25%	Magenta	Slow
42	2A	25%	Magenta	Rev. Slow
43	2B	25%	Magenta	Fast
44	2C	25%	Magenta	Rev. Fast
45	2D	25%	Magenta	Wink
46	2E	25%	Magenta	Rev. Wink
47	2F	25%	Magenta	On
48	30	25%	Cyan	Off
49	31	25%	Cyan	Slow
50	32	25%	Cyan	Rev. Slow
51	33	25%	Cyan	Fast
52	34	25%	Cyan	Rev. Fast
53	35	25%	Cyan	Wink
54	36	25%	Cyan	Rev. Wink
55	37	25%	Cyan	On
56	38	25%	White	Off
57	39	25%	White	Slow
58	3A	25%	White	Rev. Slow
59	3B	25%	White	Fast
60	3C	25%	White	Rev. Fast
61	3D	25%	White	Wink
62	3E	25%	White	Rev. Wink
63	3F	25%	White	On

Dec	Hex	Intensity	Color	Flash
64	40	50%	Black	Off
65	41	50%	Black	Slow
66	42	50%	Black	Rev. Slow
67	43	50%	Black	Fast
68	44	50%	Black	Rev. Fast
69	45	50%	Black	Wink
70	46	50%	Black	Rev. Wink
71	47	50%	Black	On
72	48	50%	Red	Off
73	49	50%	Red	Slow
74	4A	50%	Red	Rev. Slow
75	4B	50%	Red	Fast
76	4C	50%	Red	Rev. Fast
77	4D	50%	Red	Wink
78	4E	50%	Red	Rev. Wink
79	4F	50%	Red	On
80	50	50%	Green	Off
81	51	50%	Green	Slow
82	52	50%	Green	Rev. Slow
83	53	50%	Green	Fast
84	54	50%	Green	Rev. Fast
85	55	50%	Green	Wink
86	56	50%	Green	Rev. Wink
87	57	50%	Green	On
88	58	50%	Blue	Off
89	59	50%	Blue	Slow
90	5A	50%	Blue	Rev. Slow
91	5B	50%	Blue	Fast
92	5C	50%	Blue	Rev. Fast
93	5D	50%	Blue	Wink
94	5E	50%	Blue	Rev. Wink
95	5F	50%	Blue	On
96	60	50%	Yellow	Off
97	61	50%	Yellow	Slow
98	62	50%	Yellow	Rev. Slow
99	63	50%	Yellow	Fast
100	64	50%	Yellow	Rev. Fast
101	65	50%	Yellow	Wink
102	66	50%	Yellow	Rev. Wink
103	67	50%	Yellow	On
104	68	50%	Magenta	Off
105	69	50%	Magenta	Slow
106	6A	50%	Magenta	Rev. Slow
107	6B	50%	Magenta	Fast
108	6C	50%	Magenta	Rev. Fast
109	6D	50%	Magenta	Wink
110	6E	50%	Magenta	Rev. Wink
111	6F	50%	Magenta	On
112	70	50%	Cyan	Off
113	71	50%	Cyan	Slow
114	72	50%	Cyan	Rev. Slow
115	73	50%	Cyan	Fast
116	74	50%	Cyan	Rev. Fast
117	75	50%	Cyan	Wink
118	76	50%	Cyan	Rev. Wink
119	77	50%	Cyan	On
120	78	50%	White	Off
121	79	50%	White	Slow
122	7A	50%	White	Rev. Slow
123	7B	50%	White	Fast
124	7C	50%	White	Rev. Fast
125	7D	50%	White	Wink
126	7E	50%	White	Rev. Wink
127	7F	50%	White	On

Dec	Hex	Intensity	Color	Flash
128	80	75%	Black	Off
129	81	75%	Black	Slow
130	82	75%	Black	Rev. Slow
131	83	75%	Black	Fast
132	84	75%	Black	Rev. Fast
133	85	75%	Black	Wink
134	86	75%	Black	Rev. Wink
135	87	75%	Black	On
136	88	75%	Red	Off
137	89	75%	Red	Slow
138	8A	75%	Red	Rev. Slow
139	8B	75%	Red	Fast
140	8C	75%	Red	Rev. Fast
141	8D	75%	Red	Wink
142	8E	75%	Red	Rev. Wink
143	8F	75%	Red	On
144	90	75%	Green	Off
145	91	75%	Green	Slow
146	92	75%	Green	Rev. Slow
147	93	75%	Green	Fast
148	94	75%	Green	Rev. Fast
149	95	75%	Green	Wink
150	96	75%	Green	Rev. Wink
151	97	75%	Green	On
152	98	75%	Blue	Off
153	99	75%	Blue	Slow
154	9A	75%	Blue	Rev. Slow
155	9B	75%	Blue	Fast
156	9C	75%	Blue	Rev. Fast
157	9D	75%	Blue	Wink
158	9E	75%	Blue	Rev. Wink
159	9F	75%	Blue	On
160	A0	75%	Yellow	Off
161	A1	75%	Yellow	Slow
162	A2	75%	Yellow	Rev. Slow
163	A3	75%	Yellow	Fast
164	A4	75%	Yellow	Rev. Fast
165	A5	75%	Yellow	Wink
166	A6	75%	Yellow	Rev. Wink
167	A7	75%	Yellow	On
168	A8	75%	Magenta	Off
169	A9	75%	Magenta	Slow
170	AA	75%	Magenta	Rev. Slow
171	AB	75%	Magenta	Fast
172	AC	75%	Magenta	Rev. Fast
173	AD	75%	Magenta	Wink
174	AE	75%	Magenta	Rev. Wink
175	AF	75%	Magenta	On
176	B0	75%	Cyan	Off
177	B1	75%	Cyan	Slow
178	B2	75%	Cyan	Rev. Slow
179	B3	75%	Cyan	Fast
180	B4	75%	Cyan	Rev. Fast
181	B5	75%	Cyan	Wink
182	B6	75%	Cyan	Rev. Wink
183	B7	75%	Cyan	On
184	B8	75%	White	Off
185	B9	75%	White	Slow
186	BA	75%	White	Rev. Slow
187	BB	75%	White	Fast
188	BC	75%	White	Rev. Fast
189	BD	75%	White	Wink
190	BE	75%	White	Rev. Wink
191	BF	75%	White	On

Dec	Hex	Intensity	Color	Flash
192	C0	100%	Black	Off
193	C1	100%	Black	Slow
194	C2	100%	Black	Rev. Slow
195	C3	100%	Black	Fast
196	C4	100%	Black	Rev. Fast
197	C5	100%	Black	Wink
198	C6	100%	Black	Rev. Wink
199	C7	100%	Black	On
200	C8	100%	Red	Off
201	C9	100%	Red	Slow
202	CA	100%	Red	Rev. Slow
203	CB	100%	Red	Fast
204	CC	100%	Red	Rev. Fast
205	CD	100%	Red	Wink
206	CE	100%	Red	Rev. Wink
207	CF	100%	Red	On
208	D0	100%	Green	Off
209	D1	100%	Green	Slow
210	D2	100%	Green	Rev. Slow
211	D3	100%	Green	Fast
212	D4	100%	Green	Rev. Fast
213	D5	100%	Green	Wink
214	D6	100%	Green	Rev. Wink
215	D7	100%	Green	On
216	D8	100%	Blue	Off
217	D9	100%	Blue	Slow
218	DA	100%	Blue	Rev. Slow
219	DB	100%	Blue	Fast
220	DC	100%	Blue	Rev. Fast
221	DD	100%	Blue	Wink
222	DE	100%	Blue	Rev. Wink
223	DF	100%	Blue	On
224	E0	100%	Yellow	Off
225	E1	100%	Yellow	Slow
226	E2	100%	Yellow	Rev. Slow
227	E3	100%	Yellow	Fast
228	E4	100%	Yellow	Rev. Fast
229	E5	100%	Yellow	Wink
230	E6	100%	Yellow	Rev. Wink
231	E7	100%	Yellow	On
232	E8	100%	Magenta	Off
233	E9	100%	Magenta	Slow
234	EA	100%	Magenta	Rev. Slow
235	EB	100%	Magenta	Fast
236	EC	100%	Magenta	Rev. Fast
237	ED	100%	Magenta	Wink
238	EE	100%	Magenta	Rev. Wink
239	EF	100%	Magenta	On
240	F0	100%	Cyan	Off
241	F1	100%	Cyan	Slow
242	F2	100%	Cyan	Rev. Slow
243	F3	100%	Cyan	Fast
244	F4	100%	Cyan	Rev. Fast
245	F5	100%	Cyan	Wink
246	F6	100%	Cyan	Rev. Wink
247	F7	100%	Cyan	On
248	F8	100%	White	Off
249	F9	100%	White	Slow
250	FA	100%	White	Rev. Slow
251	FB	100%	White	Fast
252	FC	100%	White	Rev. Fast
253	FD	100%	White	Wink
254	FE	100%	White	Rev. Wink
255	FF	100%	White	On