g! TechNotes

Revision 5/20/2011

Standards and Reference

Overview:

This document provides standard configurations, pin-outs and settings for the g! system and other wiring/devices you may use and encounter when installing a g! System. Note that this document is intended to be a general guide, and may not include specific detail on all situations. In all cases, see the appropriate Integration Note or Installation Manual for full details on the product you are installing.

IP Standards:

Default Static IP Addresses in a g! System

The following table lists components that may be present in a **g!** installation, and the default IP addresses for each. If you are not using an Elan Network Assembly you may use this table as a guide to configuring your own networking equipment. **Note** that HC Controllers are typically DHCP out of the box, and recommended to be set to static as listed below.

Router	192.168.0.1
Static IPs	192.168.0.100 – 192.168.0.149
DHCP	192.168.0.150 – 192.168.0.250
Controller (e.g.: HC-12)	192.168.0.2
Access Points	Start at 192.168.0.10
Climate – SerialBrick or Ethernet	192.168.0.25
Lighting – SerialBrick or Ethernet	192.168.0.30
SerialBrick - Irrigation	192.168.0.35
SerialBrick - General	192.168.0.40
SerialBrick – Pool / Spa	192.168.0.45
Audio Zone Controllers	Start at 192.168.0.50
MP3 Players	Start at 192.168.0.60
Static IP Tablet / Touch Screen*	Start at 192.168.0.70
Video Cameras	Start at 192.168.0.80

**Note: Typically Touch Screens are configured to DHCP.*
The above range is merely a recommendation if you choose to configure as static.

Standard Ports:

*Default Ports for Port Forwarding in a **g!** System*

Default External Listening Port (HC): 2198* (TCP)
Terminal Server (HC/MultiBrick): 2199 (TCP)
Default External Listening Port (HomeBrick/MultiBrick): 443* (TCP)
Terminal Server (HomeBrick): 5001 (TCP and UDP)

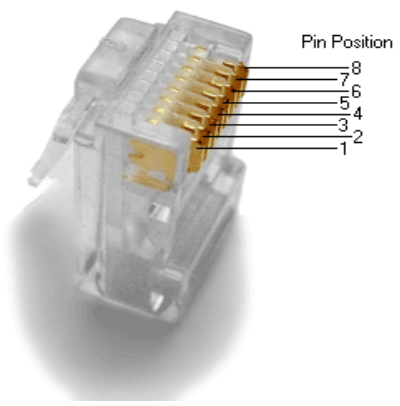
*May be changed on the System>System tab in Configurator.

RJ45 Connector Standards (Ethernet)

For all Ethernet wires, one of the following standards is recommended. Typically, Elan uses 568B standard and will reference 568B standard colors/pin-outs in our documents for all Ethernet and Serial connections. Ensure you wire both ends of the cable to the same standard, and Elan recommends testing all cables with a tester.

568B

568B Color	568B Color	RJ45 Pin
white/orange		1
orange		2
white/green		3
blue		4
white/blue		5
green		6
white/brown		7
brown		8



Clip down, Pin 1 is on the left

568A

RJ45 Pin	568A Color	568A Color
1		white/green
2		green
3		white/orange
4		blue
5		white/blue
6		orange
7		white/brown
8		brown

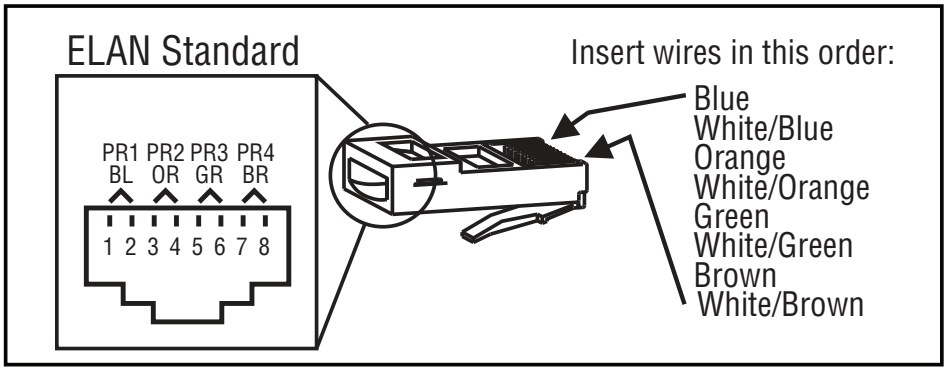
Note: If you require a Crossover cable for direct connection of your computer to an IP device, simply wire a Cat 5 cable with one end 568B standard and the other 568A standard (10/100).

RJ45 Connector Standards (Serial)

When using Cat-5 cables for serial connections (typically in conjunction with RJ45 to DB9 adapters), a particular wiring standard is not important. However, you must ensure that all cables have 8 conductors terminated and that both ends are wired to the same standard. Serial connections will utilize the cable in a pin-to-pin method, so it is important that both ends match. As a general rule of thumb, Elan recommends using 568B standard for all Cat-5 cabling so cables may be swapped from Ethernet use to Serial use if needed.

Wiring Standard – ELAN Cat5 Standard Code

The color code for the TS2 wiring follows the ELAN standard code as follows. The ELAN Standard cable is required only for **VIANET** connections.



Cat-5 Cable Lengths

Whether used for Ethernet, or PoE transmission, Cat-5 cable is recommended for runs up to 100m (330ft). For longer Ethernet or PoE runs, you may insert a powered switch in the middle of your connection in order to repeat the signal and allow a longer run.

For RS-232 Serial runs, the RS232 standard states cable length equal to a capacitance of 2500 pF (usually about 50ft with a standard Serial cable) as a maximum run. Serial over Cat-5 typically has lower capacitance and can be used for longer runs; possibly as high as 100+ft (this will vary due to cable differences and baud rate). Note that all Cat-5 is not equal, and as a general rule of thumb 50-100ft should be considered the range you want to stay in for Serial over Cat5. For longer Cat-5 runs for Serial connections, it is recommended you use an IP to Serial device such as a Elan SerialBrick, Moxa NPort, or Global Cache Com Port to achieve the distance required; using powered switches to boost the length of your Ethernet run as needed. Bear in mind with an Ethernet to Serial device like the SerialBrick, you get up to 100m (~333ft) of Ethernet run before you factor in any serial length. **Note: Always check the Integration Note for any special wiring length considerations for your device.**

For RS-485 Serial runs, the length of the main data path should in general not exceed 1000m (3300ft). In some installations, there may be additional considerations. Elan recommends seeking detailed documentation from the sub-system manufacturer for complete details.

For Elan Standard VIANET: Any single run may be as long as 1000ft, but the combined wire length between all legs of the VIANET is 2000ft Max. If the combined run must exceed 2000ft, VIANET Repeaters may be used to extend the max run length, but each leg still has a max of 1000ft. See Elan docs, such as the SC-4 manual for full details.

A Note on "Doubling-Up":

In some instances, it may be possible to "double-up" the conductors to achieve a longer run, but this is not recommended. If attempting to "double-up" conductors, note that this technique is NOT to be used with PoE as the extra 4 wires are used for power transmission in PoE. Likewise, "doubling-up" will not be effective in RS232 connections that use flow-control, or Full Duplex RS-485 connections, as this wiring types use 5 conductors. In all cases, verify the communication standard and conductors required before "doubling-up".

A Note on Serial Port Sharing:

There are some devices available on the market, which purport to allow the combination of multiple serial connections into one port in order to "share" the port. Integration of such devices is untested, unsupported, and unlikely to function. Elan does not recommend attempting to include any serial port sharing or combining devices and will not provide support in installations featuring them.

Other Special Cat-5 cable Pin Outs You May Encounter

The following are charts of a few common situations where you may pin each end of a Cat-5 differently to avoid using special/multiple RJ45-to-DB9 adapters:

SC1 RJ45 Serial to Standard Serial:

COM RJ45	to Position	SC1 RJ45
White/Orange	1	White/Orange
Orange	2	No Connection
White/Green	3	No Connection
Blue	4	Blue
White/Blue	5	Green
Green	6	White/Blue
White/Brown	7	Brown
Brown	8	White/Brown

ViaMigo RJ45 Serial to Standard Serial:

Com Port RJ45 Position	Color	Via!Migo RJ45 Position
1	White/Orange	
2	Orange	
3	White/Green	
4	Blue	5
5	White/Blue	2
6	Green	3
7	White/Brown	
8	Brown	

RJ45 to DB9 Connecter Pin-outs

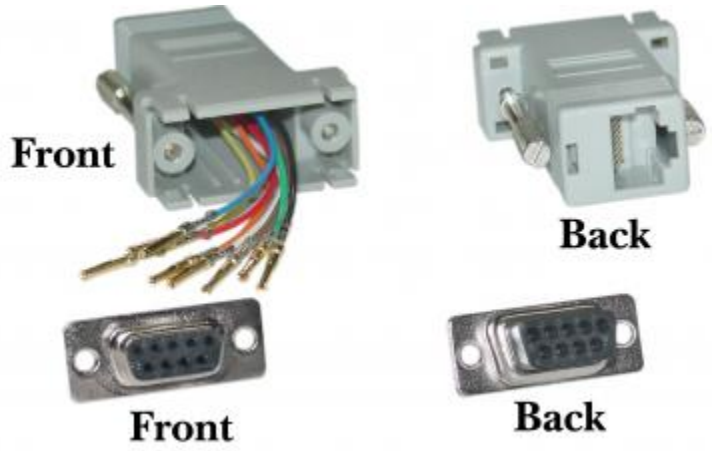
The following are the standard pin-outs for Elan DB9 to RJ45 adapters. Pin-outs should be identical whether your DB9 connector is Male or Female. Using these pin-outs you can build your own adapters from unassembled RJ45 to DB9 adapters available at many electronics stores.

DB-9 TO RJ-45 ADAPTER (Elan Part #: HA-CB-307/308)

RJ-45 Pin	Signal	DB9 Pin Number	Cat5 Color (568B)
1	RI	9	White w/ Orange Stripe
2	DCD	1	Orange
3	DTR	4	White w/ Green Stripe
4	GND	5	Blue
5	RX	2	White w/ Blue Stripe
6	TX	3	Green
7	CTS	8	White w/ Brown Stripe
8	RTS	7	Brown

DB-9 TO RJ-45 NULL MODEM ADAPTER (Elan Part #: HA-CB-328)

RJ-45 Pin	Signal	DB9 Pin Number	Cat5 Color (568B)
1	RI	9	White / Orange Stripe
2	N/C		Orange
3	DSR	6	White / Green Stripe
4	GND	5	Blue
5	TX	3	White / Blue Stripe
6	RX	2	Green
7	RTS	7	White / Brown Stripe
8	CTS	8	Brown



Above: an example of a "build your own" RJ-45/DB9 adapter.

MOXA NPORT RJ45 X DB9 PIN OUT:

The following tables show the pin out required to connect a serial device to the NPort. Refer to the integration note for the specific device to be controlled to determine which pin out (straight or null) to use.

RJ45 NPort to DB-9 Male or Female Straight-Thru connector: This DB9 Male (or female) plugs into the majority of serial controlled devices and is the Moxa pin equivalent of a HA-CB-307/308.

RJ-45 Pin	Signal	DB9M/F Pin Number	Cat5 Color (568B)
1	DSR	6	Orange/White
2	RTS	7	Orange
3	GND	5	Green/White
4	TX	3	Blue
5	RX	2	Blue/White
6	DCD	1	Green
7	CTS	8	Brown/White
8	DTR	4	Brown

RJ45 NPort to DB-9 Null Modem Female connector: This DB9 Female plugs into serial devices that require a Null Modem cable and is the Moxa pin equivalent to the HA-CB-328.

RJ-45 Pin	Signal	DB9F (Null) Pin Number	Cat5 Color (568B)
1	DSR	4	Orange/White
2	RTS	8	Orange
3	GND	5	Green/White
4	TX	2	Blue
5	RX	3	Blue/White
6	DCD	1	Green
7	CTS	7	Brown/White
8	DTR	6	Brown

Power Cable Lengths

The following provides some tables which show the maximum recommended cable length for sub-systems which typically require long cable runs, such as In-Wall Touch Screens and video surveillance cameras.

When electrical current flows through a long wire, there is naturally a voltage drop along the length of the wire because the wire has resistance. As the wire size (diameter) gets larger, the resistance of the wire drops, which means that the cable runs can be longer.

WARNING: When you measure the voltage at the end of a long wire make sure the load is connected and powered up. If you measure the voltage with no current flowing you will measure no voltage drop!

Wire size is measured in AWG, which stands for American Wire Gauge (or Gage). The table below provides the resistance and size for various wires. The "Diameter Mils" is the diameter of the wire in thousandths of an inch. The "Circular Mils" is the cross sectional area of the wire, where one Circular Mil is the cross sectional area of a wire one thousandth of an inch in diameter.

American Wire Gauge (AWG)	Diameter (Mils)	Circular Mils (CM)	Resistance (Ohms per 1,000 ft)
4/0	460.0	211,592	0.05
3/0	410.0	167,800	0.06
2/0	365.0	133,072	0.08
0	325.0	105,531	0.10
1	289.0	83,690	0.12
2	258.0	66,369	0.16
3	229.0	52,633	0.20
4	204.0	41,740	0.25
5	182.0	33,101	0.32
6	162.0	26,251	0.41
7	144.0	20,818	0.51
8	128.0	16,509	0.65
9	114.0	13,092	0.82
10	102.0	10,383	1.00
11	90.7	8,234	1.30
12	80.8	6,530	1.65
13	72.0	5,178	2.08
14	64.1	4,107	2.60
15	57.1	3,257	3.30
16	50.8	2,583	4.10
17	45.3	2,048	5.20
18	40.3	1,620	6.60
19	35.9	1,288	8.30
20	32.0	1,022	10.50
21	28.5	810	13.30
22	25.3	642	16.80
23	22.6	510	21.10
24	20.1	404	26.60
25	17.9	320	33.60

Each table below is organized in the same way. The device model number is shown at the top of the table, along with the device power requirements.

The table then shows various wire sizes and lengths, such as 24-2 for a 24 gauge, two conductor wire. The cable type 24-8 is a 24 gauge, eight conductor wire, with four wires tied together for power, and the other four wires tied together for ground.

The following table provides suggested maximum cable lengths for standard In-Wall Touch Screens:

Note: The P700 Chart can be used for TS10/TS7 wiring length as well.

	HW-ITS-102 - Profile 700	HW-ITS-100 8.4 Inch In-Wall Touch Screen
Power Supply Volts	15	12
Watts	7	22
Cable Type	**Maximum Wire Length (ft)**	
24-2	66	6
24-4	133	11
24-6	199	17
24-8	265	22
22-2	103	9
22-4	205	17
22-6	308	26
22-8	410	34
20-2	168	14
20-4	336	28
20-6	504	42
20-8	672	56
18-2	266	22
18-4	532	44
18-6	798	67
18-8	1065	89
16-2	424	35
16-4	848	71
16-6	1272	106
16-8	1695	142
14-2	675	56
14-4	1350	113
14-6	2026	169
14-8	2701	225
12-2	1073	90
12-4	1609	134
12-6	3218	269
12-8	4291	358

The following table provides suggested maximum cable lengths for various network cameras.

If you have a camera that is not listed, check the power supply for the voltage and power rating. Locate a camera in the list that has the same or slightly higher values, and use those suggested lengths.

Network Cameras

Power Supply Volts	9	12	12	12	12	12	12	12
Watts	8	3	3.5	6.4	6.5	7.5	10	12
Cable Type								
24-2	14	51	44	24	24	20	15	13
24-4	29	102	88	48	47	41	31	26
24-6	43	153	131	72	71	61	46	38
24-8	57	204	175	96	94	82	61	51
22-2	22	79	68	37	36	32	24	20
22-4	44	158	135	74	73	63	47	39
22-6	67	237	203	111	109	95	71	59
22-8	89	316	271	148	146	126	95	79
20-2	36	129	111	61	60	52	39	32
20-4	73	259	222	121	119	103	78	65
20-6	109	388	332	182	179	155	116	97
20-8	145	517	443	242	239	207	155	129
18-2	58	205	176	96	95	82	61	51
18-4	115	410	351	192	189	164	123	102
18-6	173	615	527	288	284	246	184	154
18-8	231	820	703	384	378	328	246	205
16-2	92	326	280	153	151	131	98	82
16-4	184	653	560	306	301	261	196	163
16-6	275	979	839	459	452	392	294	245
16-8	367	1306	1119	612	603	522	392	326
14-2	146	520	446	244	240	208	156	130
14-4	292	1040	891	487	480	416	312	260
14-6	439	1560	1337	731	720	624	468	390
14-8	585	2080	1783	975	960	832	624	520
12-2	232	826	708	387	381	330	248	207
12-4	349	1239	1062	581	572	496	372	310
12-6	697	2478	2124	1162	1144	991	743	620
12-8	929	3304	2832	1549	1525	1322	991	826