

link. While this would prevent overlapping channels, it would result in wasted channels that could not be used (see Table 1-3).

Table 1-3. Example of Wasted DMX Channels

Fixture location on the link	Fixture name	Number of DMX channels used per fixture	Fixture number: DMX channel range used (to prevent overlapping)	Resulting channels wasted
First	ES-1	20 channels	F 01 : 01-20	
Second	EC-1	12 channels	F 03 : 25-36	4 channels wasted (21-24)
Third	ES-1	20 channels	F 05 : 41-60	4 channels wasted (37-40)
Fourth	ES-1	20 channels	F 07 : 61-80	

Therefore, if you choose to assign fixture numbers to different types of devices (and/or protocols) on the same DMX link, refer to “DMX Start Channels” on page C-4, which shows the channel ranges reserved for ES-1 fixtures. This table will help you determine the next available DMX start channel/fixture number for successive ES-1 fixtures on the link.

Controlling ES-1 With DMX

ES-1 may be controlled by 8- or 16-bit DMX controllers. Chapter 2 discusses ES-1 operation with its protocol in detail. Use Table 1-4 to control ES-1 via DMX.

Note: ES-1’s protocol, software, and documentation are subject to change. Visit the High End Systems web site for the latest updates.

Table 1-4. ES-1 Protocol

Channel	Construct	Description	Value (dec.)	Value (%)	Value (hex)
1	Color Wheel 1 Function	Full Speeds			
		Indexed	0-31	0-12	0-1F
		Forward spin	32-47	13-18	2D-2F
		Reverse spin	48-63	16-24	30-3F
		Continuous	64-79	25-30	40-4F
		Fast scan	80-87	31-33	50-57
		Slow scan	88-95	34-37	58-5F
		Random	96-111	37-43	60-6F
		Blink-indexed	112-127	44-49	70-7F
		MSpeed Controlled			
		Indexed	128-159	50-62	80-9F
		Forward spin	160-175	63-68	A0-AF
		Reverse spin	176-191	69-74	B0-BF
		Continuous	192-207	75-80	C0-CF
		Fast scan	208-215	81-83	D0-D7
		Slow scan	216-223	84-87	D8-DF
		Random	224-239	88-93	E0-EF
		Blink-indexed	240-255	94-100	FO-FF

Table 1-4. ES-1 Protocol (Continued)

Channel	Construct	Description	Value (dec.)	Value (%)	Value (hex)
2	Color Wheel 1 Position	Indexed Mode			
		Color 1	0-19	0-7	0-13
		Color 1 and 2	20-39	8-15	14-27
		Color 2	40-59	16-23	28-3B
		Color 2 and 3	60-78	24-30	3C-4E
		Color 3	79-98	31-38	4F-62
		Color 3 and 4	99-118	39-46	63-76
		Color 4	119-137	47-53	77-89
		Color 4 and 5	138-157	54-61	8A-9D
		Color 5	158-177	62-69	9E-B1
		Color 5 and 6	178-196	70-76	B2-C4
		Color 6	197-216	77-84	C5-D8
		Color 6 and 1	217-236	85-92	D9-EC
		Color 1	237-255	93-100	ED-FF
		Continuously Variable Mode			
		Color 1	0	0	0
		Color 2	43	16	2B
		Color 3	85	33	55
		Color 4	128	50	80
		Color 5	170	66	AA
		Color 6	213	83	D5
		Color 1	255	100	FF
		Continuously Variable Forward Spin Mode			
		Spin stop	0-3	0-1	0-3
		Spin forward slowest	4	2	4
		Spin forward fastest	255	100	FF
		Continuously Variable Reverse Spin Mode			
		Spin stop	0-3	0-1	0-3
		Spin reverse slowest	4	2	4
		Spin reverse fastest	255	100	FF
		Random Mode			
		Random stop	0-3	0-1	0-3
		Random slowest	4	2	4
		Random fastest	255	100	FF
		Combined Mode			
		Color 1	0-6	0-2	0-6
		Color 2	7-13	3-5	7-0D
		Color 3	14-20	6-7	0E-14
		Color 4	21-27	8-10	15-1B
		Color 5	28-34	11-13	1C-22
		Color 6	35-41	14-16	23-29

Table 1-4. ES-1 Protocol (Continued)

Channel	Construct	Description	Value (dec.)	Value (%)	Value (hex)		
2	Color Wheel 1 Position	Color 7	42-47	17-18	2A-2F		
		Color 8	48-54	19-21	30-36		
		Color 9	55-61	22-23	37-3D		
		Color 10	62-68	24-26	3E-44		
		Color 11	69-75	27-29	45-4B		
		Color 12	76-82	30-32	4C-52		
		Color 13	83-89	33-34	53-59		
		Color 14	90-96	35-37	5A-60		
		Color 15	97-103	38-40	61-67		
		Color 16	104-110	41-42	68-6E		
		Color 17	111-117	43-45	6F-75		
		Color 18	118-124	46-48	76-7C		
		Color 19	125-130	49-50	7D-82		
		Color 20	131-137	51-53	83-89		
		Color 21	138-144	54-56	8A-90		
		Color 22	145-151	57-58	91-97		
		Color 23	152-158	59-61	98-9E		
		Color 24	159-165	61-64	9F-A5		
		Color 25	166-172	65-67	A6-AC		
		Color 26	173-179	68-69	AD-B3		
		Color 27	180-186	70-72	B4-BA		
		Color 28	187-193	73-75	BB-C1		
		Color 29	194-200	76-78	C2-C8		
		Color 30	201-207	79-80	C9-CF		
		Color 31	208-213	81-83	D0-D2		
		Color 32	214-220	84-85	D3-D9		
		Color 33	221-227	86-88	DA-E3		
		Color 34	228-234	89-91	E4-EA		
		Color 35	235-241	92-94	EB-F1		
		Color 36	242-248	95-96	F2-F8		
		Color 1	249-255	97-100	F9-FF		
		Combined Continuous Mode					
		Color 1		0	0	0	
		Color 2		8	3	8	
		Color 3		15	5	0F	
		Color 4		22	8	16	
		Color 5		29	11	1D	
		Color 6		36	14	24	
		Color 7		43	16	2B	
		Color 8		50	19	32	
		Color 9		57	22	39	
		Color 10		64	25	40	
Color 11		72	28	48			

Table 1-4. ES-1 Protocol (Continued)

Channel	Construct	Description	Value (dec.)	Value (%)	Value (hex)
2	Color Wheel 1 Position	Color 12	79	30	4F
		Color 13	86	33	56
		Color 14	93	36	5D
		Color 15	100	39	64
		Color 16	107	41	6B
		Color 17	114	44	72
		Color 18	121	47	79
		Color 19	128	50	80
		Color 20	136	53	88
		Color 21	143	55	8F
		Color 22	150	58	96
		Color 23	157	61	9D
		Color 24	164	64	A4
		Color 25	171	66	AB
		Color 26	178	69	B2
		Color 27	185	72	B9
		Color 28	193	75	C1
		Color 29	200	78	C8
		Color 30	207	80	CF
		Color 31	214	83	D3
		Color 32	221	86	DA
		Color 33	228	89	E4
		Color 34	235	91	EB
		Color 35	242	94	F2
Color 36	249	97	F9		
3	Color Wheel 2 Function	Full Speeds			
		Combined Operation	0-15	0-5	0-F
		Indexed	16-31	6-12	10-1F
		Forward spin	32-47	13-18	2D-2F
		Reverse spin	48-63	19-24	30-3F
		Continuous	64-79	25-30	40-4F
		Fast scan	80-87	31-33	50-57
		Slow scan	88-95	34-37	58-5F
		Random	96-111	37-43	60-6F
		Blink (indexed)	112-127	44-49	70-7F
		MSpeed Controlled			
		Indexed	128-159	50-62	80-9F
		Forward spin	160-175	63-68	A0-AF
		Reverse spin	176-191	69-74	B0-BF
		Continuous	192-207	75-80	C0-CF
		Fast scan	208-215	81-83	D0-D7
		Slow scan	216-223	84-87	D8-DF

Table 1-4. ES-1 Protocol (Continued)

Channel	Construct	Description	Value (dec.)	Value (%)	Value (hex)
3	Color Wheel 2 Function	Random	224-239	88-93	E0-EF
		Blink (indexed)	240-255	94-100	FO-FF
4	Color Wheel 2 Position	Indexed Mode			
		Color 1	0-19	0-7	0-13
		Color 1/2	20-39	8-15	14-27
		Color 2	40-59	16-23	28-3B
		Color 2/3	60-78	24-30	3C-4E
		Color 3	79-98	31-38	4F-62
		Color 3/4	99-118	39-46	63-76
		Color 4	119-137	47-53	77-89
		Color 4/5	138-157	54-61	8A-9D
		Color 5	158-177	62-69	9E-B1
		Color 5/6	178-196	70-76	B2-C4
		Color 6	197-216	77-84	C5-D8
		Color 6/1	217-236	85-92	D9-EC
		Color 1	237-255	93-100	ED-FF
		Continuously Variable Mode			
		Color 1	0	0	0
		Color 2	43	16	2B
		Color 3	85	33	55
		Color 4	128	50	80
		Color 5	170	66	AA
		Color 6	213	83	D5
		Color 1	255	100	FF
		Continuously Variable Forward Spin Mode			
		Spin stop	0-3	0-1	0-3
		Spin forward slowest	4	2	4
		Spin forward fastest	255	100	FF
		Continuously Variable Reverse Spin Mode			
		Spin stop	0-3	0-1	0-3
		Spin reverse slowest	4	2	4
		Spin reverse fastest	255	100	FF
		Random Mode			
		Random stop	0-3	0-1	0-3
		Random slowest	4	2	4
Random fastest	255	100	FF		
5	Litho Wheel 1 Function	Full Speed			
		Indexed	0-15	0-5	0-0F
		Forward rotate	16-31	6-12	10-1F
		Reverse rotate	32-47	13-18	20-2F
		Wheel spin	48-63	19-24	30-3F

Table 1-4. ES-1 Protocol (Continued)

Channel	Construct	Description	Value (dec.)	Value (%)	Value (hex)
5	Litho Wheel 1 Function	Scan	64-79	25-30	40-4F
		Random	80-95	31-37	50-6F
		Blink wheel (indexed)	96-111	38-42	60-6F
		Blink aperture (indexed)	112-127	43-49	70-7F
		MSpeed Controlled			
		Indexed	128-143	50-55	80-8F
		Forward rotate	144-159	56-62	90-9F
		Reverse rotate	160-175	63-68	A0-AF
		Wheel spin	176-191	69-74	B0-BF
		Scan	192-207	75-80	C0-CF
		Random	208-223	81-87	D0-DF
		Blink wheel (indexed)	224-239	88-93	E0-EF
		Blink aperture (indexed)	240-255	94-100	F0-FF
		6	Litho Wheel 1 Position	Position 0	0-36
Position 1	37-73			15-28	25-49
Position 2	74-109			29-42	4A-6D
Position 3	110-146			43-57	6E-92
Position 4	147-182			58-71	93-B6
Position 5	183-219			72-85	B7-D8
Position 0	220-255			86-100	D9-FF
7	Litho Wheel 1 Rotation High Byte	Indexed Mode	0-255	0-100	0-FF
		Variable Forward Rotate Mode			
		Rotate stop	0-3	0-1	0-3
		Rotate forward slowest	4	2	4
		Rotate forward fastest	225	100	FF
		Variable Reverse Rotate Mode			
		Rotate stop	0-3	0-1	0-3
		Rotate reverse slowest	4	2	4
		Rotate reverse fastest	225	100	FF
		Continuously Variable Wheel Spin Mode			
		Fastest forward spin	0	0	0
		Slowest forward spin	127	49	7F
		Slowest reverse spin	128	50	80
		Fastest reverse spin	255	100	FF
		Scan Mode			
		Scan slowest	0	0	0
		Scan fastest	255	100	FF
		Random Mode			
		Random stop	0-3	0-1	0-3
Random slowest	4	2	4		
Random fastest	255	100	FF		

Table 1-4. ES-1 Protocol (Continued)

Channel	Construct	Description	Value (dec.)	Value (%)	Value (hex)
8	Litho Wheel 1 Rotation Low Byte	Indexed Mode	0-255	0-100	0-FF
9	Litho Wheel 2 Function	Full Speed			
		Indexed	0-15	0-5	0-0F
		Forward rotate	16-31	6-12	10-1F
		Reverse rotate	32-47	13-18	20-2F
		Wheel spin	48-63	19-24	30-3F
		Scan	64-79	25-30	40-4F
		Random	80-95	31-37	50-6F
		Blink wheel (indexed)	96-111	38-42	60-6F
		Blink aperture (indexed)	112-127	43-49	70-7F
		MSpeed Controlled			
		Indexed	128-143	50-55	80-8F
		Forward rotate	144-159	56-62	90-9F
		Reverse rotate	160-175	63-68	A0-AF
		Wheel spin	176-191	69-74	B0-BF
		Scan	192-207	75-80	C0-CF
		Random	208-223	81-87	D0-DF
		Blink wheel (indexed)	224-239	88-93	E0-EF
		Blink aperture (indexed)	240-255	94-100	F0-FF
10	Litho Wheel 2 Position	Position 0	0-36	0-14	0-24
		Position 1	37-73	15-28	25-49
		Position 2	74-109	29-42	4A-6D
		Position 3	110-146	43-57	6E-92
		Position 4	147-182	58-71	93-B6
		Position 5	183-219	72-85	B7-D8
		Position 0	220-255	86-100	D9-FF
11	Litho Wheel 2 rotation High Byte	Indexed Mode	0-255	0-100	0-FF
		Variable Forward Rotate Mode			
		Rotate stop	0-3	0-1	0-3
		Rotate forward slowest	4	2	4
		Rotate forward fastest	225	100	FF
		Variable Reverse Rotate Mode			
		Rotate stop	0-3	0-1	0-3
		Rotate reverse slowest	4	2	4
		Rotate reverse fastest	225	100	FF
		Continuously Variable Wheel Spin Mode			
		Fastest forward spin	0	0	0
		Slowest forward spin	127	49	7F
		Slowest reverse spin	128	50	80
		Fastest reverse spin	255	100	FF
		Scan Mode			

Table 1-4. ES-1 Protocol (Continued)

Channel	Construct	Description	Value (dec.)	Value (%)	Value (hex)
11	Litho Wheel 2 rotation High Byte	Scan slowest	0	0	0
		Scan fastest	255	100	FF
		Random Mode			
		Random stop	0-3	0-1	0-3
		Random slowest	4	2	4
		Random fastest	255	100	FF
12	Litho Wheel 2 Rotation Low Byte	Indexed Mode	0-255	0-100	0-FF
13	Frost	No frost	0	0	0
		Variable frost	1-127	1-49	1-7F
		Full frost	128-143	50-55	80-8F
		Periodic frost strobes	144-159	56-62	90-9F
		Random frost strobes	160-175	63-68	A0-AF
		Ramp open/ snap shut	176-191	69-74	B0-BF
		Snap open/ ramp shut	192-207	75-80	C0-CF
		Random ramp/ snap	208-223	81-87	D0-DF
		Random snap/ ramp	224-239	88-93	E0-EF
		Open	240-255	94-100	FO-FF
14	Focus	Focus image closer	0	0	0
		Focus image farther	256	100	FF
15	Iris	Closed	0	0	0
		Variable	1-127	1-49	1-7F
		Open	128-143	50-55	80-8F
		Periodic strobes	144-159	56-62	90-9F
		Random strobes	160-175	63-68	A0-AF
		Ramp open/ snap shut	176-191	69-74	B0-BE
		Snap open/ ramp shut	192-207	75-80	BF-CF
		Random ramp/ snap	208-223	81-87	DD-DC
		Random snap/ ramp	224-239	88-93	E0-EF
		Open	240-255	94-100	FO-FF
16	Shutter	Closed	0-31	0-12	0-1F
		Periodic strobes	32-63	13-24	20-3F
		Random strobes	64-95	25-37	40-5F
		Ramp open/ snap shut	96-127	38-49	60-7F
		Snap open/ ramp shut	128-159	50-62	80-9F
		Random ramp open/ snap shut	160-191	63-74	A0-BF
		Random snap open/ ramp shut	192-223	75-87	C0-DF
		Open	224-255	88-100	E0-FF
17	Dim	Closed	0	0	0
		Open	255	100	FF
18	MSpeed	Controller crossfade	0-3	0-1	0-3
		longest (252.7 sec.)	4	2	4
		shortest (0.15 sec.)	255	100	FF

Table 1-4. ES-1 Protocol (Continued)

Channel	Construct	Description	Value (dec.)	Value (%)	Value (hex)
19	Factory Macros	No macro	0-7	0-2	0-7
		Macro 1	8-15	3-5	8-0F
		Macro 2	16-23	6-9	10-17
		Macro 3	24-31	10-12	18-1F
		Macro 4	32-39	13-15	20-27
		Macro 5	40-47	16-18	28-2F
		Macro 6	48-55	19-21	30-37
		Macro 7	56-63	22-24	38-3F
		Macro 8	64-71	25-27	40-47
		Macro 9	72-79	28-30	48-4F
		Macro 10	80-87	31-34	50-57
		Macro 11	88-95	35-37	58-5F
		Macro 12	96-103	38-40	60-67
		Macro 13	104-111	41-43	68-6F
		Macro 14	112-119	44-46	70-77
		Macro 15	120-127	47-49	78-7F
		Macro 16	128-135	50-52	80-87
		Macro 17	136-143	53-55	88-8F
		Macro 18	144-151	56-59	90-97
		Macro 19	152-159	60-62	98-9F
		Macro 20	160-167	63-65	A0-A7
		Macro 21	168-175	66-68	A8-AF
		Macro 22	176-183	69-71	B0-B7
		Macro 23	184-191	72-74	B8-BF
		Macro 24	192-199	75-77	C0-C7
		Macro 25	200-207	78-80	C8-CF
		Macro 26	208-215	81-84	DD-D4
Variable speed random macros	216-247	85-96	D5-F7		
No macro	248-255	97-100	F8-FF		
20	Control ¹	Safe	0-9	0-3	0-9
		Disable MSpeed for pan and tilt <i>Note: this menu item has no functionality for ES-1 fixtures</i>	10-19	4-7	0A-13
		Display off	20-28	8-11	14-1C
		Display dim	30-38	12-14	1E-26
		Display bright	40-48	15-18	28-30
		Home	60-68	23-26	3C-44
		Lamp on	80-88	31-34	50-58
		Lamp off	90-98	35-38	5A-62
		Shutdown	120-130	46-50	78-82
Reserved	131-255	51-100	83-FF		

¹ Note: DMX channel 16 (shutter) must be closed to access the control channel.