HELVARNET PROTOCOL

Connection

To establish a TCP connection and therefore communicate with the router, the third-party device is required to connect to listener port number **50000**. When using the UDP protocol, the third-party device is required to send a message to destination port number **50001** in the router.

Routing entries of the following type allow generic data transmission over Ethernet:

- ETHERNET TRANSMIT triggered by a group / block / scene recall: This causes transmission of a generic string, from a single router .

When the entry is triggered, a connection to the third party device is instigated from the router. The IP address and port to which the connection to the third-party device is made is determined from the routing entry's configuration:

- To send TCP messages from the router to the third-party device, the router connects to a listener port provided in the third-party device. It is recommended that this listener port is in the range of 49152 to 65535.
- To send UDP messages from the router to the third-party device, it is recommended that the destination port in the third-party device is in the range of 49152 to 65535.
- Additionally, the IP address of the router that is responsible for the transmission of the generic string also needs to be configured.

System Access and Message Routing

Messages from the third-party device can be targeted at any router in the system.

If access has not been granted or has been blocked to a particular router, then communications can still be achieved to that router via any other router in the system, provided that you have the IP address of another router and the third-party device is allowed access to it.

If a query message needs to be sent to a router for which access has not been granted, then the query message can be sent to any of the alternative routers, following this the response to the query – the query reply message – will be returned by the router to which the query was originally sent.

Message Format

Any message sent to, or received from, a router can be in either ASCII or raw binary form (see Command Format for more information). Messages must not exceed the maximum length of 1500 bytes. The format of the data contained within messages is defined by the protocol. A query reply message from the router will be in the same format as the query command message sent i.e. if a query message is sent in ASCII form then the reply will also be in ASCII. Throughout

this document, ASCII format examples will be used. **Push Messages** are internally generated messages from routers to external HelvarNet clients. **Device Types in Helvar: Routers (905 Digidim Router, 910 Digidim Router, 920 Imagine Router,** Ballasts, Button Panels (Modular Control Panels), Converters, DALI Controller, Dimmers, HID, Input Units, IR Receiver Panel (170), LED Drivers, Remote Control Handset, Rotary Switch, Sensors, Sliders, Switching Units

Network Topology

A topology is a description of the arrangement of the various elements (nodes, connecting lines, etc.) of a communication network.

There are two types of network topology that can be applied to a router :

- single cluster
- multicluster

The following sections describe what these topologies are and which one you should use.

Single cluster and multicluster

A cluster is a collection of routers that work together or have some common locational element. For example, in a large building with several floors, all routers on a single floor could belong to the same cluster; routers on another floor could belong to another cluster; and so on.

Note: A cluster could also map to a logical network strategy. For example, on a layer 3 network, if routers are assigned on different IP subnets, clusters can be mapped directly on to those subnets. Clients are no longer part of the clustering system. They can be located anywhere on the network.

We recommend that a single cluster should contain no more than 30 routers.

Which topology type to use

First, the type of topology depends on how many routers the system has:

- Use single cluster for systems with no **more than 30 routers**.
- Use multicluster for systems with **30 routers** or more.

Second, the type of topology depends on whether communications between the routers is confined to a logical IP subnet or spans multiple IP subnets.

- If the IP network is a layer 2 network, the router system can constitute a single cluster or multiple clusters.
- If the IP network is a **layer 3** network and the router communications are **confined to a logical IP subnet**, the router system can be made up of a single cluster or multiple clusters.

- If the IP network is a **layer 3** network and the router communications are required to **traverse across logical IP subnets**, the routers system will contain multiple clusters.

Same IP subnet

Members of a cluster must reside on the same IP subnet as the other members of the same cluster.

Defining a cluster and its members

The cluster is determined by allocating a portion of the IP to be the cluster's identifier. This portion, which must lead from the left, is determined by the accompanying setting called 'cluster mask'.

This mask is very similar to the subnet mask and follows the same IP masking rules. The cluster member is determined by the part of the IP address that is masked out by the cluster mask.

Examples:

- A router with an IP address of 192.168.1.1 with a cluster mask of 255.255.255.0 has a cluster identifier of 192.168.1.0 and a cluster member identifier of 0.0.0.1.
- A router with an IP address of 172.28.228.10 with a cluster mask of 255.255.255.0 has a cluster identifier of 172.28.228.0 and a cluster member identifier of 0.0.0.1.
- A router with an IP address of 172.28.228.10 with a cluster mask of 255.255.0.0 has a cluster identifier of 172.28.0.0 and a cluster member identifier of 0.0.228.10.
- A router with an IP address of 10.254.0.1 with a cluster mask of 255.255.255.0 has a cluster identifier of 10.254.0.0 and a cluster member identifier of 0.0.0.1.
- A router with an IP address of 10.254.0.1 with a cluster mask of 255.255.0.0 has a cluster identifier of 10.254.0.0 and a cluster member identifier of 0.0.0.1.
- A router with an IP address of 10.254.0.1 with a cluster mask of 255.0.0.0 has a cluster identifier of 10.0.0.0 and a cluster member identifier of 0.254.0.1.

Note: The default cluster mask of 255.255.255.0 will suffice for most network addressing strategies.

Command Table

Commands can be sent in either ASCII (text) or raw format. In ASCII format, the commands are split into parameters and in raw format the commands are split into binary Words which contain the parameters.

Each command contains:

- a command number.
- parameters that address devices or lighting operations.
- parameters that are required to accompany the commands.

ASCII Format

The ASCII format requires that certain rules concerning special characters, parameter identifiers, and delimiters be adhered to. These rules are as follows:

1. The ASCII string must begin with the command character '>' and end with the Terminator character '#'.
2. Replies to queries begin with the character '?' and the data concerning a query's response is separated from the query string using the character '='. Similarly, the whole query response string is terminated with the character '#' that signals the end of the reply, or '$' that signals the end of a partial response. For example, a response that contains more data than the maximum message size would be split into 2 responses. The first partial response would be terminated by '$', and the second partial response would be terminated by '#'.

3. Error / Diagnostic messages begin with the character '!' and, again, end in '#'.

4. Unless they are optional, all of the parameters required for the command must be included; otherwise the message is rejected and discarded.

5. The ASCII parameters are not required to be ordered.

6. The parameter identifiers are to be included as shown in the following table, i.e. all alphabetic identifiers should be in upper case.

Description	**Character**	**Optional**	**Hex**	**Character Type**
Command	>	No	0x3E	Message Type
Internal Command	<	No	0x3C	Message Type
Reply	?	No	0x3F	Message Type
Error / Diagnostic	!	No	0x21	Message Type
Terminator	#	No	0x23	Special
Partial reply terminator	$	No	0x24	Special
Answer	=	No	0x3D	Special
Delimiter	,	No	0x2C	Delimiter
Parameter ID Delimiter	:	No	0x3A	Delimiter
Address Delimiter	.	No	0x2E	Delimiter

Sequence Number	Q	For internal commands only	0x51	Parameter ID
HelvarNet Version	V	Version 1 only (assumes version 1)	0x56	Parameter ID
Command	C	No	0x43	Parameter ID
Acknowledgment	A	Yes (assumes a value of 0)	0x41	Parameter ID
Address	@	No	0x40	Parameter ID
Group	G	Yes (assumes a value of 1)	0x47	Parameter ID
Scene	S	Yes (assumes a value of 1)	0x53	Parameter ID
Block	B	Yes (assumes a value of 1)	0x42	Parameter ID
Fade Time	F	Yes (assumes 700ms)	0x46	Parameter ID
Level	L	No	0x4C	Parameter ID
Proportion	P	No	0x50	Parameter ID
Display Screen	D	No	0x44	Parameter ID
Time	T	No	0x54	Parameter ID
Latitude	N	No	0x4E	Parameter ID
Longitude	E	No	0x45	Parameter ID

Time Zone Difference	Z	No	0x5A	Parameter ID
Daylight Saving Time (DST)	Y	No	0x59	Parameter ID
Constant Light Scene	K	Yes (assumes false)	0x4B	Parameter ID
Force Store Scene - Intensity	O	Yes (assumes false)	0x4F	Parameter ID
Force Store Scene - Colour	H	Yes (assumes false)	0x48	Parameter ID
Colour X	CX	Yes (assumes false)	0x4358	Parameter ID
Colour Y	CY	Yes (assumes false)	0x48	Parameter ID
Mireds	M	Yes (assumes false)	0x4D	Parameter ID
Colour Ignore	CI	Yes (assumes false)	0x4349	Parameter ID
Device Category	DC	Yes (assumes false)	0x4443	Parameter ID

For example, in the command Recall Group 1234, Block 5, Scene 6, Fade Time 32 s, the string is sent as follows, including the delimiters and the start character '>' and stop character '#':

>V:1,C:11,G:1234,B:5,S:6,F:3200#

Configuration Commands

201 - Store Scene (Group)

// will be implemented

202 - Store Scene (Channel)

// will be implemented

203 - Store As Scene (Group)

// will be implemented

204 - Store As Scene (Channel)

// will be implemented

205 - Reset Emergency Battery and Total Lamp Time (Group)

// will be implemented

206 - Reset Emergency Battery and Total Lamp Time (Device)

// will be implemented

Control Commands

11 - Recall Scene (Group)

// will be implemented

12 - Recall Scene (Device)

// will be implemented

13 - Direct Level (Group)

// will be implemented

14 - Direct Level (Device)

// will be implemented

Proportion Control Commands

15 – Direct Proportion (Group)

// will be implemented

16 - Direct Proportion (Device)

// will be implemented

17 - Modify Proportion (Group)

// will be implemented

18 - Modify Proportion (Device)

// will be implemented

Emergency Test Control Commands

19 - Emergency Function Test (Group)

// will be implemented

20 - Emergency Function Test (Device)

// will be implemented

21 - Emergency Duration Test (Group)

// will be implemented

22 - Emergency Duration Test (Device)

// will be implemented

23 - Stop Emergency Tests (Group)

// will be implemented

24 - Stop Emergency Tests (Device)

// will be implemented

Command Type	Command Number	Target	Additional Parameters	Fade Time
Recall Scene (Group)	11	Group 1..16383	CL 1 or 0, Block 1..8, Scene 1..16	0..6553.5s
Recall Scene (Device)	12	Cluster 1..253, Router 1..254	Subnet 1..4, Device 1..255, Block 1..8, Scene 1..16	0..6553.5s
Direct Level (Group)	13	Group 1..16383	Level 0..100%	0..6553.5s
Direct Level (Device)	14	Cluster 1..253, Router 1..254	Subnet 1..4, Device 1..255, Level 0..100%	0..6553.5s
Direct Proportion (Group)	15	Group 1..16383	Proportion 0..100%	0..6553.5s
Direct Proportion (Device)	16	Cluster 1..253, Router 1..254	Subnet 1..4, Device 1..255, Proportion 0..100%	0..6553.5s
Modify Proportion (Group)	17	Group 1..16383	Proportion Change -100..100%	0..6553.5s
Modify Proportion (Device)	18	Cluster 1..253, Router 1..254	Subnet 1..4, Device 1..255, Proportion Change -100..100%	0..6553.5s
Emergency Function Test (Group)	19	Group 1..16383		

// will be implemented

Command Type	Command Number	Target	Additional Parameters	Fade Time
Emergency Function Test (Device)	20	Cluster 1..253, Router 1..254	Subnet 1..4, Device 1..255	
Emergency Duration Test (Group)	21	Group 1..16383		
Emergency Duration Test (Device)	22	Cluster 1..253, Router 1..254	Subnet 1..4, Device 1..255	
Stop Emergency Tests (Group)	23	Group 1..16383		
Stop Emergency Tests (Device)	24	Cluster 1..253, Router 1..254	Subnet 1..4, Device 1..255	

Query Commands

General Query Commands

101 - Query Clusters

// will be implemented

102 - Query Routers

// will be implemented

103 - Query Last Scene In Block (LSIB)

// will be implemented

109 - Query Last Scene In Group (LSIG)

// will be implemented

104 - Query Device Type

// will be implemented

DALI Device Type Information

Device Type	Byte3–Byte1 (MSBytes)	Byte0 (LSByte)
Fluorescent Lamps	0x00	0x01
Self-contained emergency lighting	0x01	0x01
Discharge lamps (excluding fluorescent lamps)	0x02	0x01
Low voltage halogen lamps	0x03	0x01
Incandescent lamps	0x04	0x01
Conversion into D.C. voltage (IEC 60929)	0x05	0x01
LED modules	0x06	0x01
Switching function (i.e., Relay)	0x07	0x01
Colour control	0x08	0x01
Sequencer	0x09	0x01
Undefined	0x0B – 0xFE	0x01

Digidim Control Device Type Information

Device Type	Byte3 (MSB)	Byte2	Byte1	Byte0 (LSB)
100 – Rotary	0x00	0x10	0x08	0x02
110 – Single Sider	0x00	0x11	0x07	0x02
111 – Double Sider	0x00	0x11	0x14	0x02
121 – 2 Button On/Off + IR	0x00	0x12	0x13	0x02
122 – 2 Button Modifier + IR	0x00	0x12	0x20	0x02
124 – 5 Button + IR	0x00	0x12	0x44	0x02
125 – 5 Button + Modifier + IR	0x00	0x12	0x51	0x02
126 – 8 Button + IR	0x00	0x12	0x68	0x02
170 – IR Receiver	0x00	0x17	0x01	0x02
312 – Multisensor	0x00	0x31	0x25	0x02
410 – Ballast (1-10V Converter)	0x00	0x41	0x08	0x02
416S – 16A Dimmer	0x00	0x41	0x60	0x02
425S – 25A Dimmer	0x00	0x42	0x52	0x02
444 – Mini Input Unit	0x00	0x44	0x43	0x02
450 – 800W Dimmer	0x00	0x45	0x04	0x02
452 – 1000W Universal Dimmer	0x00	0x45	0x28	0x02
455 – 500W Thruster Dimmer	0x00	0x45	0x59	0x02
458/DIMB – 8-Channel Dimmer	0x00	0x45	0x80	0x02
459/CTRB – 8-Ch Ballast Controller	0x74	0x45	0x81	0x02
459/SWB – 8-Ch Relay Module	0x04	0x45	0x83	0x02
460 – DALI-to-SDIM Converter	0x00	0x46	0x03	0x02

Device Type	Byte3 (MSB)	Byte2	Byte1	Byte0 (LSB)
472 – Din Rail 1-10V/DS/8 Converter	0x00	0x47	0x26	0x02
474 – 4-Ch Ballast (Output Unit)	0x00	0x47	0x40	0x02
474 – 4-Ch Ballast (Relay Unit)	0x00	0x47	0x41	0x02
490 – Blinds Unit	0x00	0x49	0x00	0x02
494 – Relay Unit	0x00	0x49	0x48	0x02
498 – Relay Unit	0x00	0x49	0x66	0x02
804 – Digidim 4	0x00	0x80	0x45	0x02
924 – LCD TouchPanel	0x00	0x82	0x40	0x02
935 – Scene Commander (6 Buttons)	0x00	0x93	0x56	0x02
939 – Scene Commander (10 Buttons)	0x00	0x93	0x94	0x02
942 – Analogue Input Unit	0x00	0x94	0x24	0x02
459/CPT4 – 4-Ch Options Module	0x00	0x45	0x86	0x02

Imagine (SDIM) Device Type Information

Device Type	Byte3 (MSB)	Byte2	Byte1	Byte0 (LSB)
No device present	0x00	0x00	0x00	0x04
474 – 4 Channel Ballast Controller - Relay Unit	0x00	0x00	0xF1	0x04
474 – 4 Channel Ballast Controller - Output Unit	0x00	0x00	0xF2	0x04
458/SW8 – 8-Channel Relay Module	0x00	0x00	0xF3	0x04
458/CTR8 – 8-Channel Ballast Controller	0x00	0x00	0xF4	0x04
458/OPT4 – Options Module	0x00	0x00	0xF5	0x04
498 – 8-Channel Relay Unit	0x00	0x00	0xF6	0x04
458/DIM8 – 8-Channel Dimmer	0x00	0x00	0xF7	0x04
HES92060 – Sine Wave Dimmer	0x00	0x00	0xF8	0x04
Ambience4 Dimmer	0x00	0x00	0xF9	0x04
HES92020 – SCR Dimmer	0x00	0x00	0xFA	0x04
HES98020 – Output Unit	0x00	0x00	0xFB	0x04
HES92220 – Transistor Dimmer	0x00	0x00	0xFC	0x04
HES98180-98291 – Relay Unit	0x00	0x00	0xFE	0x04
Dimmer (old style, type undefined)	0x00	0x00	0xFF	0x04

DMX Device Type Information

Device Type	Byte3 (MSB)	Byte2	Byte1	Byte0 (LSB)
DMX No device present	0x00	0x00	0x00	0x08
DMX Channel In	0x00	0x00	0x01	0x08
DMX Channel Out	0x00	0x00	0x02	0x08

Digidim Control Key Type Information

Key Type	Byte3 (MSB)	Byte2	Byte1	Byte0 (LSB)
SinglePress	0x00	0x00	0x00	0x01
TimedPress	0x00	0x00	0x00	0x02
ToggleSolo	0x00	0x00	0x00	0x03
ToggleBlock	0x00	0x00	0x00	0x04
TouchDimBlock	0x00	0x00	0x00	0x05
TouchDimSolo	0x00	0x00	0x00	0x06
Modifier	0x00	0x00	0x00	0x07
EdgeMode	0x00	0x00	0x00	0x08
Slider	0x00	0x00	0x00	0x09
AnalogueInput	0x00	0x00	0x00	0x0A
Rotary	0x00	0x00	0x00	0x0B
PIR	0x00	0x00	0x00	0x0C
ContantLight	0x00	0x00	0x00	0x0D
SliderInputUnit	0x00	0x00	0x00	0x0E

100 - Query Device Types and Addresses

// will be implemented

105 - Query Description Group

// will be implemented

106 - Query Description Device

// will be implemented

Discovery Query Commands

The following set of commands are extensions to version 1 and are designed to allow for the discovery of a Helvar router system.

107 - Query Workgroup Name - UDP Broadcast

// will be implemented

108 - Query Workgroup Membership

// will be implemented

165 - Query Groups

// will be implemented

164 - Query Group

// will be implemented

166 - Query Scene Names

// will be implemented

167 - Query Scene Info

// will be implemented

Device State Query Commands

110 - Query Device State

// will be implemented

Device State Flags Table

State	Description	Flag Value
NSDisabled	Device or subdevice has been disabled	0x00000001
NSLampFailure	Unspecified lamp problem	0x00000002
NSMissing	Device previously existed but is not currently present	0x00000004
NSFaulty	Address issues / unknown control device / DALI load responding with multireplies	0x00000008
NSRefreshing	Device is being discovered	0x00000010
NSReserved	Internal use	0x00000020
NSReserved		0x00000040
NSReserved	Internal use	0x00000080
NSEM_Resting	Load is off while powered by emergency supply	0x00000100
NSEM_Reserved		0x00000200
NSEM_InEmergency	No mains power supplied	0x00000400
NSEM_InProlong	Mains restored, still using emergency power	0x00000800
NSEM_FTInProgress	Functional Test is running	0x00001000
NSEM_DTInProgress	Duration Test is running	0x00002000
NSEM_Reserved		0x00004000
NSEM_Reserved		0x00008000
NSEM_DTPending	Duration Test requested but not started	0x00010000
NSEM_FTPending	Functional Test requested but not started	0x00020000
NSEM_BatteryFail	Battery failure	0x00040000
NSReserved	Internal use	0x00080000

State	Description	Flag Value
NSReserved	Internal use	0x00100000
NSEM_Inhibit	Prevents emergency mode	0x00200000
NSEM_FTRequested	Functional Test has been requested	0x00400000
NSEM_DTRequested	Duration Test has been requested	0x00800000
NSEM_Unknown	Initial state	0x01000000
NSOverTemperature	Load is overheating	0x02000000
NSOverCurrent	Load drawing too much current	0x04000000
NSCommsError	Communications error	0x08000000
NSSevereError	Over temperature and/or over current	0x10000000
NSBadReply	Malformed reply received	0x20000000
NSReserved		0x40000000
NSDeviceMismatch	Actual load type doesn't match expected	0x80000000

111 - Query Device Is Disabled

// will be implemented

112 - Query Lamp Failure

// will be implemented

113 - Query Device Is Missing

// will be implemented

114 - Query Device Is Faulty

// will be implemented

129 - Query Emergency Battery Failure

// will be implemented

150 - Query Measurement

// will be implemented

151 - Query Inputs

// will be implemented

152 - Query Load Level

// will be implemented

Power Consumption Query Commands

160 - Query Power Consumption

// will be implemented

161 - Query Group Power Consumption

// will be implemented

Emergency Test Query Commands

170 - Query Emergency Function Test Time

// will be implemented

171 - Query Emergency Function Test State

// will be implemented

Emergency State Values

State	Value
Pass	0
Lamp Failure	1
Battery Failure	2
Faulty	4
Failure	8
Test Pending	16
Unknown	32

172 - Query Emergency Duration Test Time
// will be implemented
173 - Query Emergency Duration Test State
// will be implemented
174 - Query Emergency Battery Charge
// will be implemented
175 - Query Emergency Battery Time
// will be implemented
176 - Query Emergency Total Lamp Time
// will be implemented

System Query Commands

185 - Query Time
188 - Query Time Zone
189 - Query Daylight Saving Time
190 - Query Software Version
191 - Query HelvarNet Version

Query Command Table

Name	Command Number	Parameters
Query Lamp Running Hours	70	—
Query Ballast Running Hours	71	—
Query Maximum Voltage	72	—
Query Minimum Voltage	73	—
Query Maximum Temperature	74	—
Query Minimum Temperature	75	—
Query Clusters	101	—
Query Routers	102	Cluster: 1–253
Query LSIB	103	Group: 1–16383 Block: 1–8
Query Device Type	104	Cluster: 1–253 Router: 1–254 Subnet: 1–4 Device: 1–255
Query Description Group	105	Group: 1–16383
Query Description Device	106	Cluster: 1–253 Router: 1–254 Subnet: 1–4 Device: 1–255
Query Device State	110	Cluster: 1–253 Router: 1–254 Subnet: 1–4 Device: 1–255

Name	Command Number	Parameters
Query Device Is Disabled	111	Cluster: 1–253 Router: 1–254 Subnet: 1–4 Device: 1–255
Query Lamp Failure	112	Cluster: 1–253 Router: 1–254 Subnet: 1–4 Device: 1–255
Query Device Is Faulty	113	Cluster: 1–253 Router: 1–254 Subnet: 1–4 Device: 1–255
Query Device Is Missing	114	Cluster: 1–253 Router: 1–254 Subnet: 1–4 Device: 1–255
Query Emergency Battery Failure	129	Cluster: 1–253 Router: 1–254 Subnet: 1–4 Device: 1–255
Query Measurement	150	Cluster: 1–253 Router: 1–254 Subnet: 1–4 Device: 1–255 Subdevice: 0 or 1–16
Query Inputs	151	Cluster: 1–253 Router: 1–254 Subnet: 1–4 Device: 1–255 Subdevice: 0 or 1–16
Query Load Level	152	Cluster: 1–253 Router: 1–254 Subnet: 1–4 Device: 1–255
Query Power Consumption	160	Cluster: 1–253 Router: 1–254 Subnet: 1–4 Device: 1–255
Query Group Power Consumption	161	Group: 1–16383
Query Emergency Function Test Time	170	—
Query Emergency Function Test State	171	—
Query Emergency Duration Test Time	172	—

Name	Command Number	Parameters
Query Emergency Duration Test State	173	—
Query Emergency Battery Charge	174	—
Query Emergency Battery Time	175	—
Query Emergency Total Lamp Time	176	—
Query Time	185	—
Query Time Zone	188	—
Query Daylight Saving Time	189	—
Query Software Version	190	—
Query HelvarNet Version	191	—

Query Replies Table

Cmd No	Name	Reply Description
101	Query Clusters	List of Cluster IDs
102	Query Routers	List of Router IDs
103	Query LSIB	LSIB, 1..16
104	Query Device Type	Device Type
105	Query Description Group	ASCII group description
106	Query Description Device	ASCII device description
110	Query Device State	Bitmask state value
111	Query Device Is Disabled	1 = Disabled, 0 = OK
112	Query Lamp Failure	1 = Failed, 0 = OK
113	Query Device Is Faulty	1 = Faulty, 0 = OK
114	Query Device Is Missing	1 = Missing, 0 = Present
129	Query Emergency Battery Failure	1 = Failed, 0 = OK
150	Query Measurement	0-200 or 1–100 (%)
151	Query Inputs	Input bitmask
152	Query Load Level	Load level 1–100 (%)
160	Query Power Consumption	Power (W)
161	Query Group Power Consumption	Power (W)
170	Query Emergency Function Test Time	Time (Epoch Seconds)
171	Query Emergency Function Test State	Bitmask test status
172	Query Emergency Duration Test Time	Time (Epoch Seconds)
173	Query Emergency Duration Test State	Bitmask test status
174	Query Emergency Battery Charge	0–100 (%)
175	Query Emergency Battery Time	0–255 hours

Cmd No	Name	Reply Description
176	Query Emergency Total Lamp Time	Total time (decimal)
185	Query Time	Epoch time (seconds)
188	Query Time Zone	Seconds from GMT
189	Query Daylight Saving Time	1 = On, 0 = Off
190	Query Software Version	Hexadecimal breakdown
191	Query HelvarNet Version	Version string

GENERAL CONTEXT INFORMATION FROM VARIOUS PARTS

Workgroups

Within the context of a lighting system , a Workgroup is a collection of routers that work together and communicate with each other. Every lighting system must contain at least one Workgroup.

A lighting system is normally just a single Workgroup. However, on some sites there may be more than one Workgroup. For example, each building on a campus could be a separate Workgroup.

Addresses

An address is a number or sequence of numbers used to identify a router , subnet , device or subdevice in a lighting system . Each item has a unique address that is either defined automatically (by Designer or the router), or defined manually (by the user with Designer or at the physical device).

Address Structure for Items

Each address is made up of up to five numbers in the format:

Cluster ID.Cluster Member ID.Subnet.Device.Subdevice

Router Address Format

Routers have an address in the format of **Cluster ID.***Cluster Member ID*

Subnet Address Format

Subnets have an address in the format of **Cluster ID.***Cluster Member ID***.Subnet**

Device Address Format

Devices have an address in the format of **Cluster ID.***Cluster Member ID***.Subnet.Device**

Subdevice Address Format

Subdevices have an address in the format of **Cluster ID.***Cluster Member ID*.**Subnet.Device.Subdevice**

DALI Subnet

A DALI subnet is a collection of DALI devices, all connected on one cable, which are connected to a router . Each router can support two DALI subnets.

The DALI protocol is used to communicate between DALI devices on a DALI subnet. DALI device addresses are automatically set by the router system.

Up to 64 devices can be connected to each DALI subnet

SDIM Subnet

An SDIM subnet allows the Imagine 920 Router to drive control gear such as the Imagine range of dimmers, relay units and ballast controllers, or Digidim loads with SDIM capability. The router has one SDIM subnet which can support up to 128 SDIM devices, within the limits of 252 SDIM addresses. SDIM is an internal Helvar protocol used to communicate between SDIM devices (control gear) on an SDIM subnet. Unlike DALI devices, whose addresses are automatically set by the router system, SDIM addresses are set at the device by a DIL switch or menu selection. There can be one or more addresses, depending on how many channels the device has.

DMX Subnet

Note: Only the Imagine 920 Router has a DMX subnet connector and can therefore support one DMX subnet

DMX (*D*immer *M*ultiple*X*) is a communications protocol developed by USITT (United States Institute for Theatre Technology), commonly used to control stage lighting and effects.

The standard is intended for lighting system and entertainment system designers who want to integrate systems of lighting equipment and accessories, including dimmers, with controllers made by different manufacturers.

DMX Subnet Communication

DMX512 is designed to carry repetitive control data from a single controller to one or more receivers. This protocol is intended to be used to control dimmers, other lighting devices and related non-hazardous effects equipment.

Note: A DMX Lighting Control Console (or Lighting Desk) controls the levels of channels in the range from 0 to 255. When the DMX subnet is in DMX 'Out' operation, if you send a command to set a DMX channel to 100 % then the channel goes to 255 on the DMX device (all other levels are scaled proportionally). When in DMX 'In' operation, and you send a command to set a DMX channel to 100 %, the controlled SDIM channel goes to 100 %.

DMX 'In'

If the subnet is in this operation, then the SDIM and/or DALI devices are controlled channels (inputs) on their controlled SDIM and/or DALI subnets. These subnets can support up to 512 channels in from one DMX source.

DMX 'Out'

If the subnet is in this operation, then the DMX devices on the subnet operate as loads (control gear). This subnet can drive up to 512 DMX output channels.

Scenes

In its simplest sense, a scene is a set of levels. A scene can be assigned to a control panel button so that, when the button is pressed, the levels defined in the scene are set

Discovery

Before you configure the router 's network settings or lighting settings, the following is necessary:

- The client computer running Designer needs to be able to discover the routers.
- The routers need to discover one another.

This is achieved by the discovery mechanism, which involves the transmission of a discovery message.

Discovery message

The discovery message is transmitted via a UDP broadcast or UDP multicast. The ability to receive the message depends on the type of network on which the routers and client reside.

- If the network is a layer 2 network, the client and all routers will receive the UDP broadcast message.
- If the network is a layer 3 managed network, the UDP broadcast may not be sufficient for the client or all routers to receive the message. The reason is that UDP broadcasts are not always permitted to travel through managed switches due to concerns regarding network packet flooding. Therefore, the routers allow for the discovery message to be transmitted via a UDP multicast. The type of protocol used for transmitting the discovery message can be selected using the two properties 'Broadcast Discovery Message' and 'Multicast Discovery Message'. These allow each type to be enabled or disable.

Note: When testing whether the multicast discovery message works, it can be helpful to use both UDP broadcast and UDP broadcast messages. If you have to use multicast discovery messages, enable them leaving the broadcast method enabled until you are satisfied that it is working properly. One of both methods needs to be enabled at any one time, because the router will not allow both the broadcast and multicast methods to be disabled.

Broadcast Discovery Address

In certain cases, it may be appropriate to change the broadcast address. This is an advanced topic and should only be carried out by someone with a good understanding of IP networks and IP subnetting. It is recommended to leave the default setting of 255.255.255.255 as it is.

Multicast Discovery Address

If you decide to adopt the multicast discovery mechanism, your network administrator will advise on the correct settings to use. The address must be in the range from 224.0.0.0 to 239.255.255.255.

Network Administration

If the network is a layer 3 managed network, it will be administered by an IT professional. Therefore, it is important to work closely with the administrator to determine:

- the course of action to take regarding the discovery mechanism; and
- what the IP addressing strategy will be.

In any case, the discovery message must be permitted to travel through the managed network unhindered

Names and Conventions

Router, Subnet and Device Names

Every router , subnet , device and subdevice has a default name (the item name), followed by the item's unique address.

It can be useful to rename important items to indicate their location or function in the system. This helps you to organise the workgroup design. For example, if a router controls the lighting for a restaurant, renaming it to **Restaurant** makes its function more obvious.

Names can be up to 43 characters long, and may contain any characters.

Scene Names

By default, each scene in a lighting system has a unique name, composed of the group to which it belongs and the scene block and scene number to which it relates. Scene names can be edited to make them easier for you to identify and remember their purpose in the lighting system. Names can be up to 43 characters long, and may contain any characters. See *Rename a Scene*.

Naming Conventions

A variety of naming conventions are used in the lighting design. These vary from simple numbering of devices to using codes that identify a component, its location, power, and so on. If you are working with a lighting design that has been provided to you, it makes sense to use the chosen convention.

If you have the opportunity to choose a naming convention, we suggest you use an acronym or abbreviation for each item in the lighting system. For example, use the letter ‘D’ to indicate a **Downlight**, ‘P’ to indicate a **Panel**, and so on. By using such a code with a sequential numbered suffix for each item, you can identify items in a way that makes it easy to cross-reference your workgroup design with the various floor plans and specifications for the project.