



ZEISS powerdome® Digital Planetarium

powerdome® Operation and Tutorial



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1 Introduction

Powerdome basically is a computer cluster made by Carl Zeiss, which comprises hardware and software for the production and playback of full-dome presentations including still images, videos and sound. With powerdome you can easily design your own digital planetarium shows.

Powerdome offers a broad spectrum of functions for the straightforward integration of imagery and sound, the animation of objects for dome projection, output as a full-dome show, and its control.

This manual explains the use of the software step by step. See the "Hardware" part in the user manual for a description of the hardware.

By purchasing powerdome you acquire the hardware, plus licenses for using the software. Please note the licensing terms (in the "Hints" part of the user manual).

Due to progressive product improvement, the system supplied may slightly differ from the illustrations and text of this manual. During installation and briefing, our specialists will instruct you in detail about your system and its specific features.

Please note that images, videos, music and other audiovisual contents you want to integrate and present with powerdome may be protected by copyright. The unauthorized use of such contents may infringe legal provisions. Please be sure to obtain all necessary permits before including and presenting such contents in any powerdome shows.

We hope that the use of powerdome will give you much pleasure and success. Do not hesitate to let us know any hints and/or critical remarks on the system and its application. We are keenly interested to share your experience.



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2 Software

The powerdome software consists of several programs, which are listed below. Some of them work in the background, invisibly to the user. The overview below will help you understand the interaction and mode of operation of the programs in case any problem should arise.

powerdome ShowManager and Player

The ShowManager is the program you will use for both designing and presenting a show. It is your most important user interface. It provides access to data filed in a database, allows you to import still images, videos, sound data etc., and to arrange them along a time line. The Player as a constituent part of the ShowManager is responsible for the playback of a show.

powerdome RemoteService

The "RemoteService" program handles communication between ShowManager and Player. The communication parameters required have been preset by the supplier. During the run-up of MS Windows®, this program starts automatically and then works invisibly in the background.

powerdome MPEG Encoder

For full-dome videos, powerdome uses the *.m2v format (MPEG without audio track). Using the separate "MPEG Encoder" program you can produce videos in the m2v format from original image data (sequential frames = "Dome Originals"). This process will compress the image data.

powerdome PDA Control

This optional program allows you to wirelessly control shows, equipment and the major digital planetarium functions from a pocket PC (PDA) via Wireless-LAN.

powerdome LiveVideoServer

With the LiveVideoServer you can visualize video signals of a video camera, a video or DVD player or TV program directly on the dome.

powerdome Configurator

With powerdome Configurator you perform settings required for perfect dome projection, especially for geometric correctness. Such settings include, among others, projector positions, blending diaphragm positions, and gamma adjustments.

Once Carl Zeiss service staff has installed your system under your dome, all parameters are already set. The Configurator is required only for any readjustment in case parameters have changed, e.g., by a change of projectors or other mechanical intervention.

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3 Terms and Typographical Conventions

For better understanding, please consult the Glossary in the Annex (Index), which explains the most important and most frequently used terms in powerdome.

Certain terms, descriptions and explanations used in the text can easily be identified by specific typographical features.

Instructions for user action

are divided into steps to be carried out one after the other. They are described as "Step 1", "Step 2" etc.

Menu items

Menu items, submenu items and menu commands are printed in bold.

Example: menu **File > Open**

Buttons, icons, windows within the software

are put in "quotation marks".

Example: Press the button "Cluster Mode".

Keys of the computer keyboard

are put in pointed brackets.

Example: <Strg>

Entries in the Glossary

are put in French quotation marks.

Example: »Overview Channel«

Explanations

are identified by serif italics.

Example:

Explanations of instructions for user action are set in serif italics.

Symbols

Warnings are marked by a symbol on the page margin. Ignoring the warnings may lead to faulty user action and malfunctions.

Notes and tips, e.g. for simplified handling of powerdome, are identified by a Tip symbol on the page margin.

Screenshots

The user interface of powerdome can be displayed in versions differing by color. A special color setting intended for use in the dark auditorium has a high content of black to minimize stray light originating from the monitor. The screenshots shown in this manual are based on the standard Windows® screen colors.





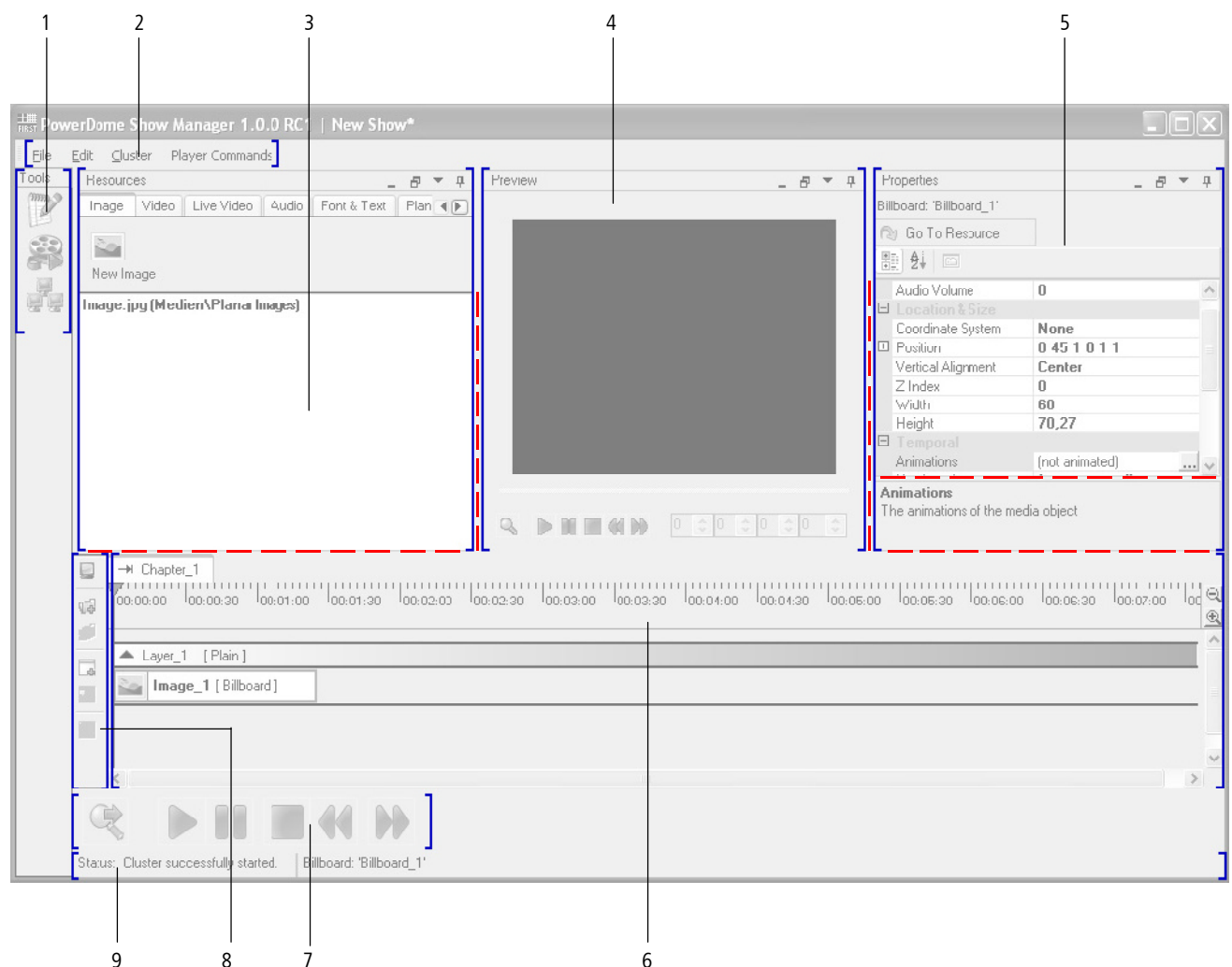
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4 Overview of ShowManager and Player

4.1 The Application window

The ShowManager is the program for show production and playback. It is the most important user interface.

After program start, the following window appears:



[blue lines]
Window areas

[red lines]
Scaleable window areas

- 1 Mode palette
- 2 Menü bar
- 3 Resources window
- 4 Preview window
- 5 Properties window
- 6 Timeline
- 7 Player Control
- 8 Timeline palette
- 9 Status line



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powerdome ShowManager

4.2 Structure of the working areas of the ShowManager

The user interface of the ShowManager is similar to video processing programs; you will soon feel at home with it. A timeline view provides a clearly arranged working area, which enables extremely easy organization and modification of the various »Show objects«.

The ShowManager has four window areas: "Resources", "Preview", "Properties" (at the top) and the timeline (at the bottom). When you move the mouse across the inside edges of the "Resources" and "Properties" areas, the mouse cursor morphs into a "handle" with which you can vary the sizes of the window areas to suit your requirements.

The ShowManager offers three program modes: the Editor, the Player and the Cluster mode. On the start of the ShowManager, invariably the Editor mode will be activated. The mode palette and the menu bar are available in all three modes.

4.3 The menus of the ShowManager

The menu bar contains menus for the execution of commands. The menu bar and the mode palette remain visible during any changes between the program modes.

Menu File

New Show	Creates a new, empty "Show".
Open Show	Opens a saved show.
Last Shows >	Provides a list of the shows last edited, for quick loading.
Open Ressource	Creates a new show, creates a "Layer" with a "Track", and loads the "Resource" directly to the start of the "Timeline". This new menu command allows you to play images, audio and video files in the "Player" without previously importing them via the Resources window and placing them on the timeline.
Save Show	Saves the active show.
Save Show as ...	Saves the active show with a different name.
Revert to Saved Show	Restores the show as saved last.
Close Show	Closes the active show.
Configuration ...	Opens a dialog with options for the ShowManager.
Exit	Quits the ShowManager.

Menu Edit

Undo	Successively undoes any number of commands executed in the ShowManager.
Redo	Re-executes commands undone.

Menu Cluster

Start Cluster	Starts the powerdome "Player" on the "Master PC" and establishes connection with all "Client PCs".
Stop Cluster	Quits the powerdome Player on the Master PC and all Client PCs.
Status	Opens the status window, in which status messages and errors are displayed, if any (see Annex).

Menu Player Commands

Fade On	Turns the "Digital dome light" on and simultaneously turns the show off.
Fade Off	Turns the digital dome light off and simultaneously turns the show on again.
Light Color ...	Color of the digital dome light.
Light On	Turns the digital dome light on, while the show remains visible.
Light Off	Turns the digital dome light off.

Sub menu Player Commands > Show

Calibration Grid	Switches on a grid for projector calibration.
Blue, Red, White	Projects blue, red or white through all channels.
Reload	Reloads the active show once more.

Sub menu Player Commands > Control

Play	Plays the show or continues playing after a pause.
Pause	Stops the show for a break, after which the show can be continued.
Stop	Stops the show for good.
Chapter > Prev, Next, First, Last	Jumps to the previous, next, first or last »Chapter« in the active show.

Sub menu Player Commands > Channel

Overview	Displays the »Overview channel« on the Master PC, in which the entire dome scene can be viewed. The same function is activated with the <0> key if the Player is active (click on the window).
1 – n (number keys)	Displays on the Master PC the »Channels« presented by each Client PC. The same function is activated with keys <1> to <n> if the Player is active (click on the window). The number of channels depends on the »Projector configuration«.

Sub menu Player Commands > Calibration

Blending On	Switches »Edge blending« between the channels on.
Blending Off	Switches edge blending between the channels off.
Wireframe On	Switches a »Grid« for geometry checking on.
Wireframe Off	Switches the geometry checking grid off.
Reload Mesh	Reloads the »Meshes« used.



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powerdome ShowManager

4.4 The mode palette

The mode palette remains permanently visible during changes between the program modes. It contains buttons for changing between the program modes. Click on the respective button to activate the Editor mode, the Play mode or the Cluster mode.



Editor-Modus

Play-Modus

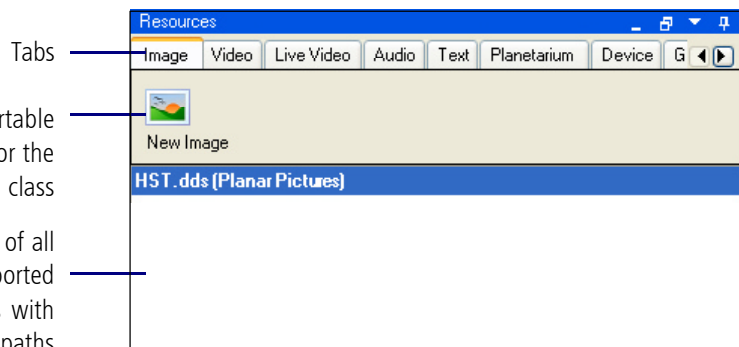
Cluster-Modus

4.5 The Editor mode

In the Editor mode, all tools for producing a show are available.

The Resources window

In the Resources window you will find tabs indicating the audiovisual components that can be integrated into a show («Resource classes») and provide access to the desired resources. The Resources window further lists all files imported into the active show.



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The Resources window

The following resource classes are available:

Image: Used for the insertion of images and artwork (*.jpg, *.bmp, *.png, *.tga, *.dds). These can be presented as plane image, panorama or full-dome image.

Video: Powerdome supports the video formats *.mpg, *.m2v, *.avi, *.vob and *.wmv. A video can be integrated as plane video, panorama or full-dome video.

Live Video: Use this tab to present a video on the dome in real time. The incoming video signal may be supplied by a video camera, a TV set, a video recorder or a DVD player.

Audio: with powerdome you can integrate audio files (music, narration, etc.) into a show. Permissible audio formats are: *.mp3, *.ac3 and *.wav.

Text: Text layers are used, e.g., for adding text labels to astronomical objects. For text output you may use all fonts installed on the Master and Client PCs with their formats (bold, italics, etc.).*

Planetarium: This tab makes a digital planetarium available. It contains astronomical elements such as stars, constellation figures, scales, motions, etc.

Devices: This tab allows you to control external devices, e.g., the dome illumination within a show produced with powerdome.



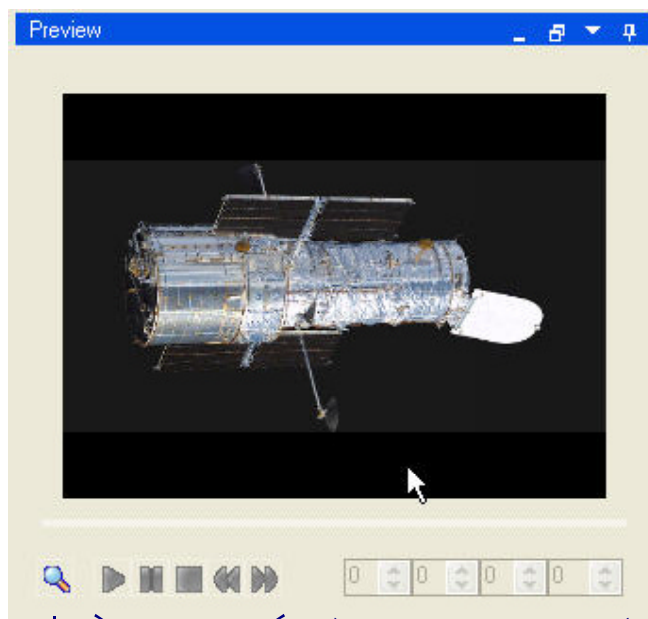
* If you want to use fonts other than the standard Windows fonts, these fonts have to be installed on all Client PCs and the Master PC. Mind the license terms applicable to such fonts.

Lines: This resource class allows you to create individual circles, scales, grids and connecting lines.

For a detailed description of how to use the various tab items, see the Tutorials below (chapter 5).

The Preview window

The Preview window provides a preview of the images and videos imported to the Resources window. You can also intro-scan audio files. The preview allows you to check whether you have imported the correct resource, or to select from a number of them.



Loading the selected resource to the Preview window

Control bar for playing videos and sound

Input boxes for jumping within video and audio files (in h, min, s, ms)

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The Properties window

The Properties window shows the parameters, e.g., position, duration, color, opacity and their values, for a selected object. Objects with properties are:

- Resource
- Layer
- Show object
- Show
- Bookmark
- Trigger
- External Command

In the Properties window you can modify the properties and parameters of all objects.

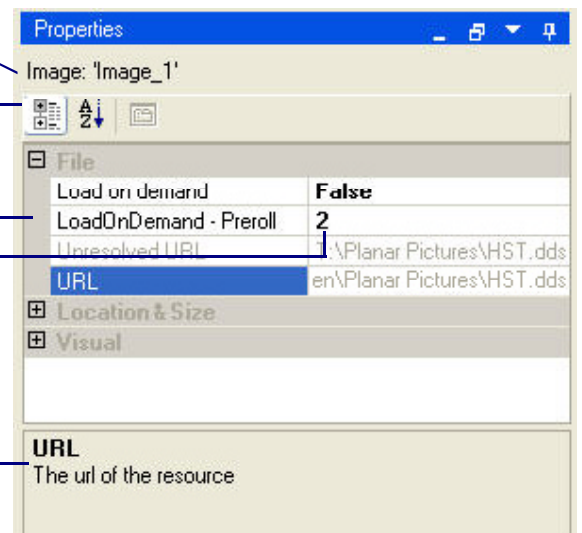
Name of the selected object

Commands for arranging parameters (by categories and alphabetically)

Parameters

Parameter values

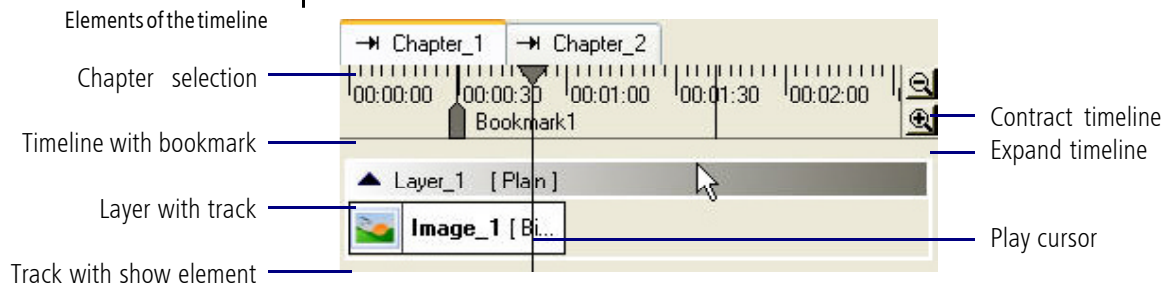
Name of selected parameter and explanation



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The timeline

By means of the timeline you can include the desired »Show objects« from the Resources window into the show per drag & drop. Within the layers of the timeline, the show objects are represented by bars (»Show elements«). By means of the mouse, every element can be shifted to any point of time within the show, and its duration in playback can be expanded or contracted.



"Add Layer" button for adding another layer



Layers and their properties

At least one layer is required for producing a show. As soon as you produce a chapter, the first layer is created automatically (see chapter 5.2, Step 1). To create further layers, click on the respective icon in the timeline palette. With one layer, powerdome also automatically creates an associated track for placing the show elements.

Powerdome allows you to create any number of layers. You should not, however, create more layers than you actually require. The more layers are used, the greater is the strain on the graphics cards. It is advantageous to create several tracks in a layer. Powerdome assigns layers several properties, which you can select and edit in the "Properties" window. For information on the settings required, see the Tutorials (chapter 5). The following properties are particularly important for playback:

Type	"Standard" for plane images, videos, audio "Dome" for full-dome images and videos
Z-Index	Floating point number as a parameter. A layer having a greater Z index is presented on the dome before a layer with a smaller Z index; i.e. the former will overlap or even completely cover the latter.
Blend Mode	For presentations of the digital planetarium, always select "Max".

You can show or hide tracks of a layer by clicking on the small triangle in front of the layer name.

To select a layer with all tracks, click the left mouse button on the header line of the layer having the respective layer name.

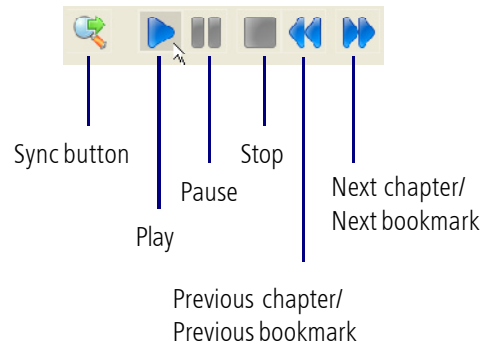
Available parameters in the Properties window for "Layer":

Name	Explanation	Recommended range or settings
Enabled	All objects in layers having the property "False" are not shown.	True (Standard), False
Type	Type of layer. Layers to contain full-dome images or videos must be of the "Dome" type, all others of the "Plain" type.	Plain, Dome
Z Index	Indicates the order in which layers are to be presented. The greater the index, the closer to the front is the layer. Floating point numbers are possible, to allow insertion of further layers between such already arranged in sequence.	≥ 0
Background Color	A hue applied to the dome as background not for objects but for the entire layer. To make this color visible, "Background Opacity" must > 0 .	Color value in the RGB format, e.g., 255, 0, 0 for Red
Background Opacity	Opacity of the background color of the layer.	[0...1]
Blend Mode	Mode in which overlapping objects of the layer with transparency are blended; The default setting "AlphaBlend" is o.k. in most cases. For layers containing a planetarium object, the Blend Mode should be set to "Max".	Add, AlphaBlend, ColorBlend, ColorMask, DestAlphaBlend, Max, Min, Replace, ReverseSubtract, Subtract
Color	Color additionally applied to all objects of the layer. Default: "white"; all colors are unchanged.	Color value in the RGB format, e.g., "255, 0, 0" for Red
Opacity	Opacity for all objects of the layer: 0 means completely transparent = invisible. 1 means completely opaque = completely visible. Any value between 0 and 1 is possible.	[0...1]

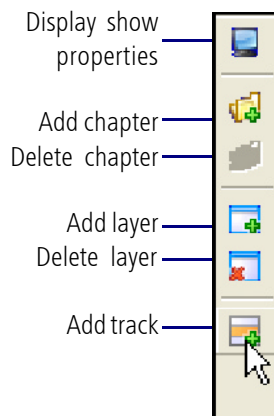
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Player Control

With Player Control you control the show using common control commands (Play, Pause, Stop, Previous chapter/Previous »Bookmark«, Next chapter/Next bookmark). In the Editor mode, only the Sync and Play buttons are active. All other control commands can only be used in the »Play mode«. Use the Sync button to load the »Resources« for playback and to save the show.



The time line palette



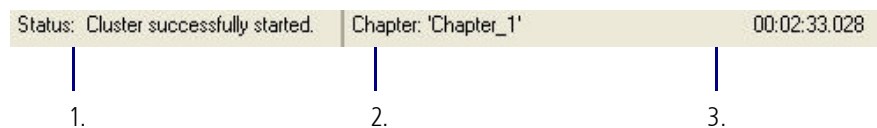
The time line palette

This palette contains a button for displaying the show properties, and commands for actions within the timeline, e.g., for adding a chapter ("Add chapter") or a layer ("Add layer"), etc.

The status line

The status indicates

1. which action is currently being executed by the program,
2. which object has been currently selected, and
3. which point in time the play cursor is currently set to.



The status line

Context menus

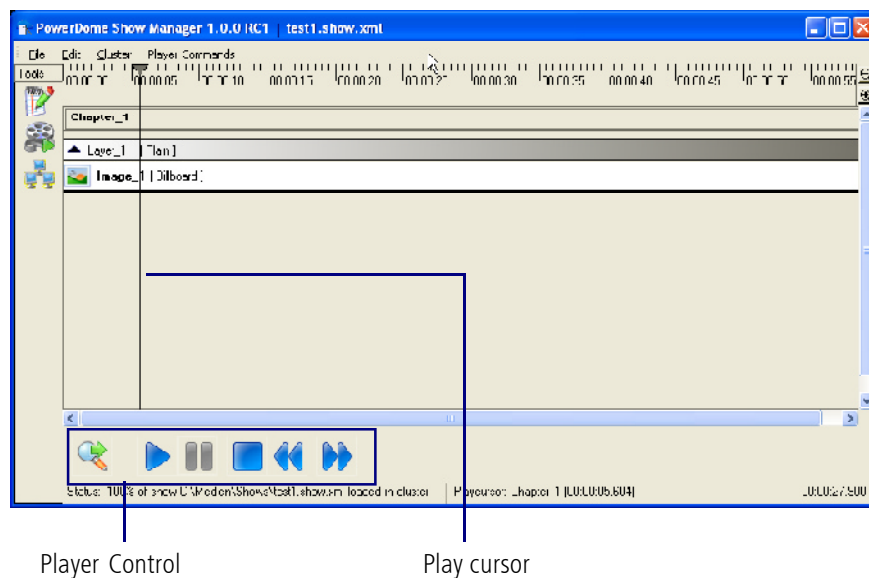
In addition to the menu line context menus contain further commands relevant to the currently selected show object.

To view context menus, put the mouse pointer on the respective show element.
Click the right mouse button on the element to open the context menu, and select the desired command.

Move to play-cursor	Shifts the element to the play cursor position (= start time for the element)
Edit Animations	Opens the animation editor
Copy Animations	Copies animations
Paste Animations	Inserts animations
Group selected objects	Groups selected objects
Remove object from group	Removes an object from a group
Remove Object(s)	Removes selected object(s) from the timeline

4.6 The Play mode

In the Play mode, the »Timeline« and the Player Control are available. Use Player Control to effect show playback and navigation in the show. During the playback of a show, the »Player« (see 4.8) operates, which displays the show as an full-dome view in a separate window on the Master PC, and the individual channels on the Client PCs. Navigation in the show is also possible by setting the »Play cursor« with the mouse. The Player will then jump to the time thus set.





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
4.7 The Cluster mode




























The Cluster mode provides a list of all PCs connected (Master PC and Client PCs). Icons indicate the statuses of each PC. For further details, see the Tutorial (chapter 5.1).

PowerDome Show Manager 1.0.0 RC7 | New Show

FileEditClusterPlayer Commands

Tools



Master							
	192.168.10.60	SRX-MASTER			FPS CPU	RT TTV	VL
Client							
	192.168.10.68	SRX-NODE8			FPS CPU	RT TTV	VL
	192.168.10.67	SRX-NODE7			FPS CPU	RT TTV	VL
	192.168.10.66	SRX-NODE6			FPS CPU	RT TTV	VL
	192.168.10.65	SRX-NODE5			FPS CPU	RT TTV	VL
	192.168.10.64	SRX-NODE4			FPS CPU	RT TTV	VL
	192.168.10.63	SRX-NODE3			FPS CPU	RT TTV	VL
	192.168.10.62	SRX-NODE2			FPS CPU	RT TTV	VL
	192.168.10.61	SRX-NODE1			FPS CPU	RT TTV	VL

4.8 The Player

The Player handles the playback of the shows produced with the ShowManager. When you start the Player, the system first establishes communication between the Master PC and the Client PCs ("Cluster start"), reads in the projector configuration, defines audio signal processing, activates the interfaces for synchronization and external communication, before the Player window opens.

The Player runs both on the Master PC and on the Client PCs.

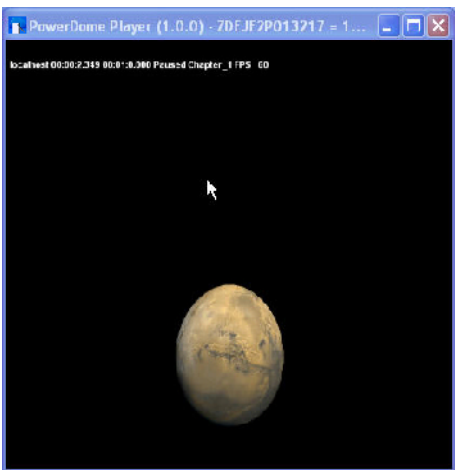
To start the Player:

- Select **Start Cluster** in the **Cluster** menu.

The above actions of the Player take place in the background. The player is only visible to the operator by a new window overlaying the ShowManager. On the Master PC, the Player offers a view of the entire scene projected onto the dome.

Note:

Objects situated in the main viewing direction (in front) are shown by the Player at the bottom.



Player with full-dome view
(Master)

5 Tutorial

5.1 Creating a new show

Step 1:

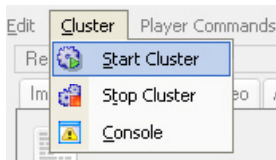
Open the powerdome ShowManager with a double click on the ShowManager icon on your desktop.



Now you are in the Editor mode (see 4.5).

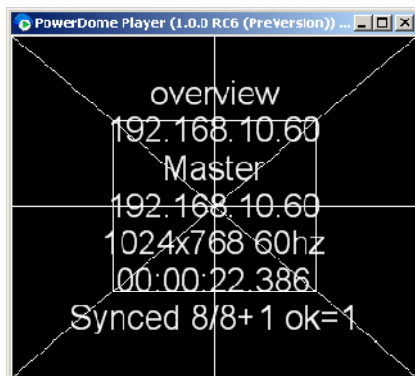
Step 2:

Select **Cluster** in the menu bar and click on **Start Cluster**.



This command starts the Player in the cluster and synchronizes the Cluster PCs.

In the Player you can watch the progress of synchronization of the cluster PCs. The illustration shows the start screen of the Player. The line „Synced 8/8+1“ means that 8 of 8 Client PCs and the Master PC are synchronized. (These numbers may vary with the number of Client PCs installed.)



Start window of the Player

The Player positions itself in the foreground, i.e. in front of the ShowManager. Click into the window of the ShowManager to get the ShowManager into the foreground again.

Step 3:

Click on the "Cluster mode" icon on the mode palette.



The ShowManager changes to the Cluster mode. It presents information about the status of the entire cluster, about which PCs have already been started/synchronized, and whether and where there is any problem. The following icons are used:



A red button with a diagonal cross indicates that the cluster PC is not ready (e.g., not switched on).



Each cluster PC is marked with a yellow icon as soon as connection to the Master has been established.



A green icon means that the computer is synchronized and ready to load and play a show.



The cluster PC has reported back and is ready for use.



The PC is synchronized, and communication between Master PC and Client PC is established.



Icons of the mode palette



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Step 4:

Click on the Play icon in the mode palette.



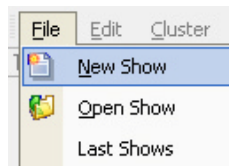
This gets you to the Play mode of the ShowManager. The ShowManager automatically changes into this view as soon as you start a show. The Play mode displays the complete show, and a »Play cursor« shows the current position within the show.

Step 5:

Click on the Editor icon on the mode palette to change back to the Editor mode.



On the menu bar, select **File > New Show**.



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When you start the ShowManager, a new show is opened automatically. You only need the command if you already worked with another show during the current session.



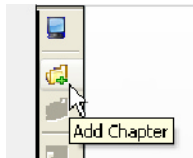
You can work in the Editor mode while a show is running, but editing may affect the playback of the running show. Proceed with care, or avoid editing while a show is running.

*Do not save changes to a show via the Sync button until the running show is finished. A running show will be aborted as soon as you effect synchronization and saving!
For stopping and terminating a show, use »Player Control« in the Play mode.*

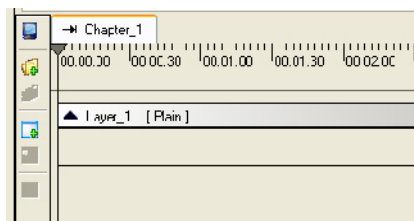
5.2 Inserting an image

Step 1 (Creating a chapter):

To import a plane image into the new show, proceed as follows. Create a chapter on the »Timeline«. To do this, click on the "Add Chapter" button on the Timeline palette.



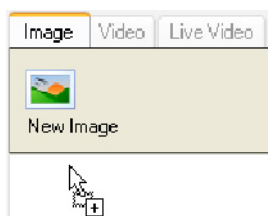
This creates a new chapter including a new »Layer« ("Layer_1") on the timeline, which contains a new »Track«. Now you can insert »Show objects« into the track.



*In powerdome you can create any number of layers with any number of tracks. * It is reasonable to place show objects of the same kind in a common layer, e.g., all full-dome videos in one layer, and all audio files in another.*

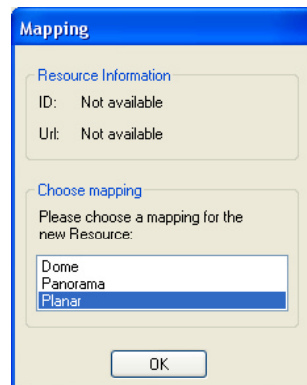
Step 2 (Importing an image):

To import an image, select the tab "Image" in the Resources window. With the left mouse button kept depressed, drag the "New Image" icon into the empty box in the Resources window.



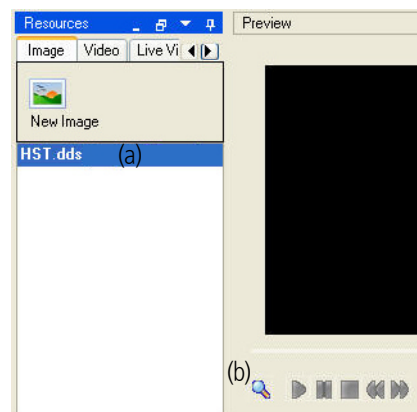
When you release the mouse button, the dialog box for file selection opens automatically. Select the image "HST.dds" (Path T:\Planar Pictures\HST.dds), and click on "Open".

In the second dialog box "Mapping" that opens, you can select from among the presentation modes "Dome", "Panorama" and "Planar". Select "Planar", and confirm with "OK".



Step 3 (Preview):

The imported image is listed as a file in the Resources window. Highlight the file by clicking on it (a), and click on the magnifier button in the Preview window (b). The image is displayed in the Preview window.



Step 4 (Integrating the image):

To integrate the image into the full-dome show, select it in the Resources window, and drag it onto the track in the first layer, using the depressed left mouse button. The image is now automatically presented as a »Show element« ("Image_1") within the track.

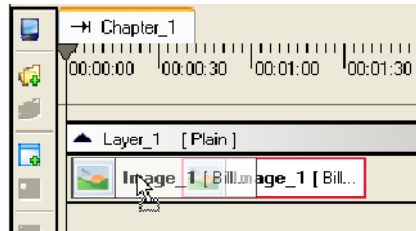
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* Do not create more layers than you really need. The more layers you use, the greater is the strain on the graphics cards. It is advantageous to create several tracks on a layer.

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Click on the element ("Image_1") and drag it to the start of the timeline with the mouse button depressed. The image now starts at 00:00:00. The default setting for its end is 1 minute (playback time).

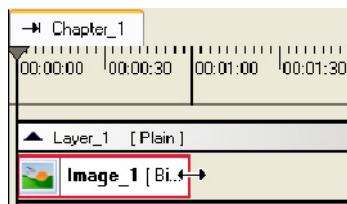


In the Properties window you can, at the "Name" parameter, enter your desired name of the »Show element« on the timeline. This name (e.g., "HST") will then appear on the timeline in place of the default name "Image_1".

An image (as any other show object) can be inserted into the timeline directly. To do this, drag the "New Image" icon (see Step 2) directly onto the timeline with the left mouse button depressed. The image will then also be listed in the Resources window.

Step 5 (Setting the playback time):

To shorten the playback time of the image, drag the end of the bar representing the show element ("Image_1") to the left to the desired end point in time, say 00:00:30.000 (= 30 seconds).



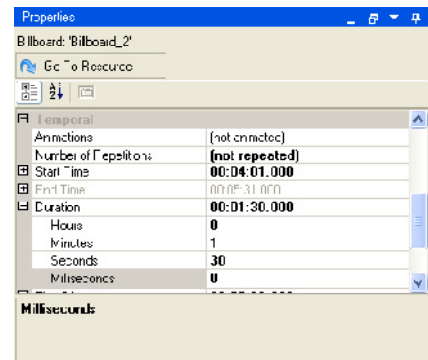
To prolong the playback time, drag the end of the bar to the right.

Step 6 (Editing the times):

To have the image end after exactly 30 seconds, click on the image element. In the "Properties" window you will find the default settings. To change the end time, define the playback duration ("Duration") in the "Temporal" section. Then click on the plus sign in front of the „Duration“ parameter.

Set the seconds value ("Seconds") to 30, the milliseconds value ("Milliseconds") to 0. The value for the end point of the image ("End time") will be adjusted automatically.

Another way to change the values for "Duration" is to edit the values in the parameter field of the "Duration" line: Digits 1 and 2 are intended for hours, 3 and 4 for minutes, 5 and 6 for seconds, and 7, 8, 9 for milliseconds.



Step 7 (Saving):

Before you can look at the image (or the show, respectively) you need to save the show. Click on the Sync button (magnifier + arrow) in Player Control.



In the dialog box that opens, enter the name "Tutorial" and the storage location "T:\Shows". The program automatically saves the sequence as a show file with the file name extension ".show.xml".

Actuating the Sync button saves the changes made to the show and loads the resources from the Resources window. If the show has already been saved before, repeated actuation of the Sync buttons will not open a Save dialog. With every click on the Sync button, the show will be saved automatically under its existing name.

Step 8 (Playback):

During saving and during loading the current show to the Client PCs (which takes a few seconds), »Player Control« is inactive. After synchronization you can see the show.

Click on the Play button in Player Control. The program automatically changes to the Play mode. Click into the Player window to get it to the foreground. Now you will see your first self-compiled show a plane still image on the dome.

In the Play mode you only find the timeline with the show elements used and the play cursor, which moves as the show runs, indicating the current time within the show.

You can control the show with the following commands:



Play



Pause



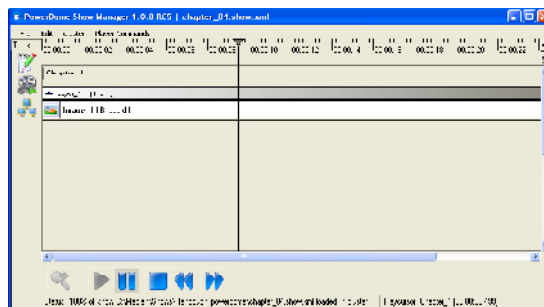
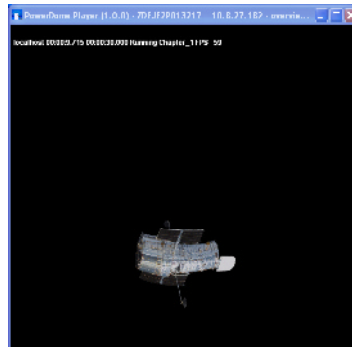
Stop/Back to Editor mode



Previous chapter/Previous bookmark



Next chapter/Next bookmark



Step 9:

Click on Stop to halt the show and to return to the Editor mode.



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Available parameters for "Image" in the Properties window:

Name	Explanation	Recommended range or settings
Audio Volume	No effect	--
Name	Name of image	any
Type (for panorama only)	Defines whether the panoramic image is presented cylindrically (tangentially to the dome) or spherically.	Cylindrical, Spherical
Alignment (for plane image only)	Default setting: Center, i.e. the specified position (see "Position") refers to the center of the image. Instead, you can make this position refer to the top or bottom edge of the image.	Center, Top, Bottom
Horizontal Shift (for panorama only)	Rotates the panorama about the vertical axis	
Vertical Shift (for panorama only)	Shifts the panorama up or down along the vertical axis.	> -Latitude/2
Coordinate System (for plane image only)	For images to be used with the digital planetarium, you can define the astronomical motions you want the "Image" to take part in.	None, AZI, DIUR, POL, PREC
Position (for plane image only)	Defines the position of the image center on the dome in terms of longitude and latitude, rotation about its own axis ("Roll"), the distance from the observer ("Radius"), and a scaling factor each for the width and height of the image ("ScaleWidth", "ScaleHeight").	Longitude: [0...360] Latitude: [-90...90] Roll: [0...360] Values for Longitude, Latitude and Roll may be > 360 and < 0 Radius: > 0 ScaleWidth: > 0 ScaleHeight: > 0
Radius (for plane image only)	Virtual distance of the plane image from the dome. The image changes in size, while the aspect ratio remains the same.	> 0
Z Index	Defines the sequence of presentation of all objects on the same layer. The greater the Z Index, the further in the foreground is the image. You can enter floating point numbers to be able to insert any number of further objects in between the objects already arranged.	>= 0
Width (not for full-dome image)	Width of the image on the dome in terms of degrees	Planar image: 0<a<=150 Panorama: 0<a<=360
Height (not for full-dome image)	Height of the image on the dome in terms of degrees	Planar image: 0<b<=150 Panorama: 0<b<=90

Available parameters for "Image" in the Properties window:

Name	Explanation	Recommended range or settings
Animations	A click on the "..." button opens the Animation Editor.	
Number of Repetitions	The image (with or without animations) can be repeated any number of times. The repetition multiplies the playback duration accordingly.	not repeated, repeated n times with n being an integer > 0, repeated infinitely
Start Time	Start time of the image in the current chapter	>= 00:00:00.000
End Time	End time of the image in the current chapter, computed automatically from "Start time" + "Duration"	> 00:00:00.000
Duration	Length in time of the object on the timeline	> 00:00:00.000
Play Offset	Has no effect on images, only on videos	-
Color	Hue with which the image can be tinted. Default: white, i.e. all colors of the image remain unchanged.	Color value in the RGB format, e.g., 250,0,0 for Red
Opacity	Opacity of the image: 0 means the image is completely transparent, i.e. invisible; 1 means the image has no transparency, i.e. it is completely visible. Any values between 0 and 1 are possible.	[0...1]

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In addition to the parameters available for an image object on the [Timeline](#), more parameters are available in the [Resource](#) to which the image object refers. These are displayed in the Properties window as soon as the resource has been highlighted in the Resources window. In the Properties window you can edit these parameters.

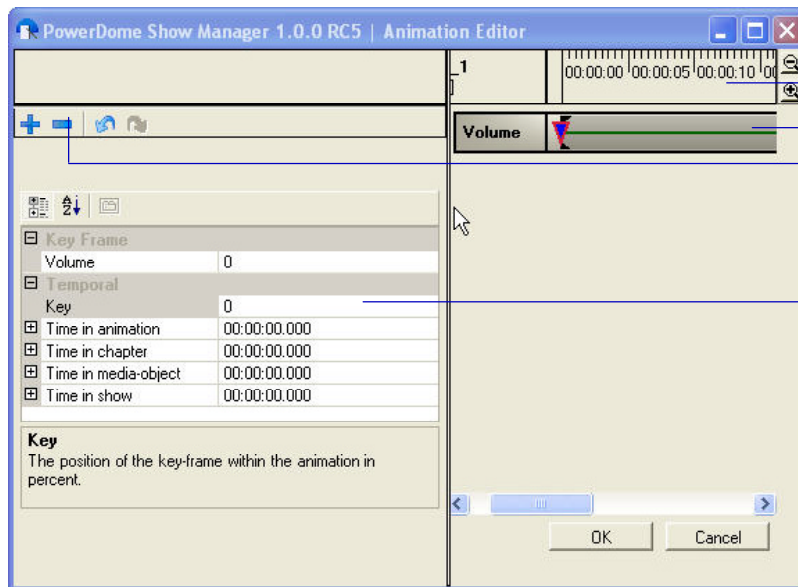
Available parameters of the "Image" resource:

Name	Explanation	Recommended range or settings
Load on demand	Defines whether the resource will be loaded at the start of the chapter (Load on demand=False), or only when it is used on the timeline (=True)	True, False (Default = False)
Preroll	If "Load on demand = True": Resource is loaded to the timeline the specified number of seconds before the start time of the image. (Enables "Load on demand" while loading the resource in time).	>= 0 (Default: 2)
Unresolved URL	Absolute path to the resource	(Is set automatically)
URL	Relative path to the resource	(Is set automatically)
Width	Width of the image in pixels	(Is set automatically)
Height	Height of the image in pixels	(Is set automatically)
Format	Color format of the image	(Is set automatically)
Gamma	Color format of the image	[1,0...2,6], Default: 1,8
Mapping	Defines whether an image is to be presented as a planar, full-dome or panoramic image.	Planar, Dome, Panorama
Miplevels	Number of MIP map levels of the image. (Available only with dds files.)	>= 1
Transparent color	Color to be made transparent in an image.	Color value in the RGB format, e.g., 255, 255, 255 for White

5.3 Creating simple animations

Expand the show you created in chapter 5.2 by two »Animations«.
If you enter the tutorial here, open the following show: Chapter_04.show.xml.

Let the present aim be to fade the image in and then revolve it around the dome through 360° (azimuth revolution). For this you need the Animation Editor.



10

11

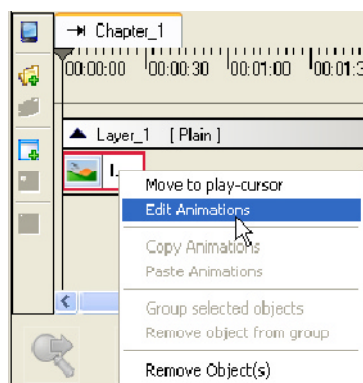
12

13

- 10 Timeline of the animation
- 11 Animation bar
- 12 Commands for adding and removing animations
- 13 Animation parameters

Step 1:

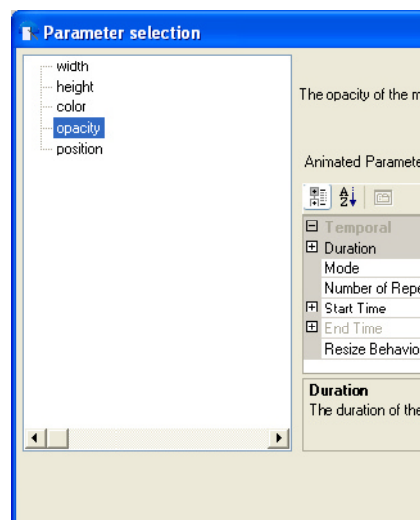
Click the right mouse button on the »element« on the timeline of "Image_1" created in 5.2. In the context menu that opens, select the command **Edit Animations**.



The Animation Editor opens. To add animations to the image, on the plus sign in the top left area of the window.

Step 2:

To create an animation of the "Opacity" of the image, select the "Opacity" parameter in the "Parameter Selection" dialog box. Neglect the parameter fields for the moment, and click on "OK". (The table on page 30 provides information on the parameters selectable in the Animation Editor.)



If you minimize the Player during the creation of an animation or during work in the Editor mode, the performance of the system improves, as the Player is not busy rendering then. If, during the creation of a show, you have the impression that the system is too slow, minimize the player for speeding up response to your actions.

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The »Keyframes« created by the system at the start and end of an animation should not be shifted, as this would lead to undesirable effects. When required, always insert additional keyframes between the start and end keyframes.

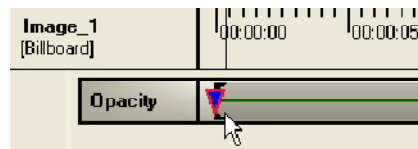
30

In the top right area of the Animation Editor there is a bar representing the animation. At the left end of the bar, the parameter to which this animation refers is indicated (here: "Opacity"). The length of the animation corresponds to the length of the image on the timeline (30 seconds).

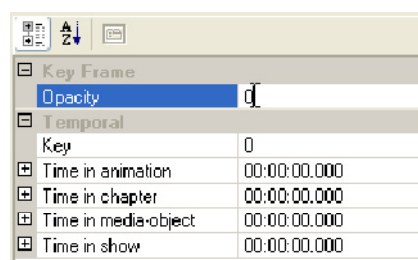
On the animation bar there are two blue triangles. These represent two »Keyframes«: the start and the end keyframe. For each keyframe you can set the desired transparency value (reduced opacity). The default setting for both keyframes is 1, i.e. the image remains without transparency as long as it is projected.

Step 3:

To vary the opacity of the image, click on the first keyframe of the animation bar (11).

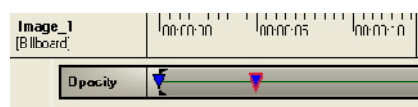


Set the "Opacity" value in the Properties window to 0. This means that the image is invisible at first (Opacity = 0).



Step 4:

To make the image completely visible after 5 seconds ("faded in"), set a keyframe on the animation bar at about 5 seconds with a double click of the left mouse button in the respective position.



Step 5:

The new keyframe also has the value 0, as it adopts the same value as the previous keyframe. Now set the "Opacity" value in the Properties window to 1 and click on OK to close the Animation Editor.

A clock symbol on the show element indicates that this element is animated.



Step 6:

To see the animation in projection, click on the Sync button. This saves the animation and loads the modified show into the Player.

Step 7:

Click on the Play button in Player Control and activate the Player (with a click into the Player window).

In the Player window you can now see the animated image. The image is faded in during the first 5 seconds and remains visible till the end of the animation at 30 seconds.

Step 8:

To get back to the Editor window, click either on the Stop button (if the show is still running) or on the Editor icon in the mode palette.

To fade the image out again at the end of the animation, open the Animation Editor again (context menu above the element "Image_1" on the timeline > **Edit Animations**).

Add another keyframe approximately at the 25th second (double click with the left mouse button). The "Opacity" parameter is preset to 1, as it adopts the value of the previous keyframe. Select the last keyframe at second 30 by a single click of the left mouse button, and set the "Opacity" parameter in the Properties window to 0. Now the image will be faded out during the last five seconds of the animation.

Step 9:

Close the Animation Editor. Click on the Sync button. Another click on the Play button starts the show in the Player. Watch the show up to the end to see the animation created last (fading the image out).

Step 10:

Next, let us move the image around the dome in a full 360° revolution. Therefore, go back to the Animation Editor. Create a new animation (click on the plus sign in the left area of the window). In the "Parameter Selection" dialog box, select the parameter "Position", and close the window with "OK". On the right-hand area of the Animation Editor, a second animation bar appears for "Position". This also has preset keyframes at the start and the end.

Step 11:

To move the image position only after 5 seconds when the image is fully faded in, create two new keyframes with double clicks approximately on seconds 5 and 25.

Step 12:

According to the default setting, the image is in the South and at half the dome height (position "Longitude"=0° and "Latitude"=45°, see Properties window). Let us assume you want the image to retain this position up to second 5 and then revolve once around the dome (to "Longitude" =360°).

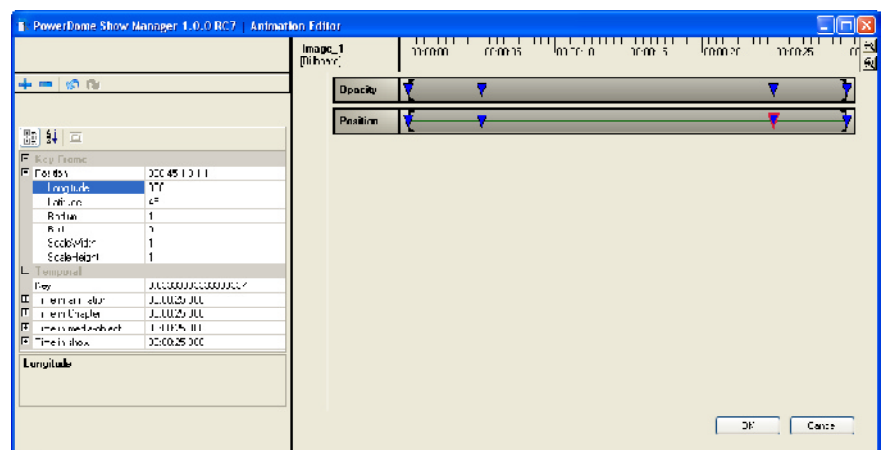
Step 13:

Click on the keyframe at second 25. Open "Position" in the Properties window (13) of the Animation Editor with a click on the plus sign next to it. Set the "Longitude" value to 360. Repeat this step for the end keyframe at second 30 (set "Longitude" = 360°).

Step 14:

Close the Animation Editor. Click on the Sync button and then on the Play button, and put the Player window into the foreground. Now you see the show you created. The image is faded in first, then revolves around the dome, and finally is faded out again.

Now you have already learned the essence of what there is to learn about the ShowManager. Once you know how to create objects and animations, you can use almost all capabilities offered by the ShowManager. You may experiment some more and create animations with other parameters for images (e.g., "Width", "Altitude" or "Color"), to see the effects of these (see the table on page 30).





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Available parameters in the Properties window of the Animation Editor:

Name	Explanation	Recommended range or settings
Duration	Duration of the animation	> 00:00:00.000; End time - Start time
Mode	Animation mode	Linear: linear animation; Set: no animation, keyframes are set only; Smooth: soft animation; Spline: animation along a curve
Number of Repetitions	Number of repetitions of an animation	not repeated; repeated fixed times: repeated specified number of times; repeated infinitely: = loop
Start Time	Start time of animation within the associated show object. (Start time of the show object = start time 00:00:00.000 of the animation)	>= 00:00:00.000
End Time	End time of animation within the associated show object, is computed automatically from "Start time" + "Duration".	> 00:00:00.000
Resize Behavior	Defines how to handle keyframes if the length of the animation is varied.	AutoResizing: Keyframes are automatically scaled; Unmodifiable: Keyframes cannot be changed any longer. Show element cannot be made shorter than the last keyframe; FixedInTime: Keyframes are not scaled, but animation can be made shorter than the show element.

5.4 Inserting full-dome videos

5.4.1 Inserting an full-dome video

The task described below is to import an »Full-dome video« in the dome format into the ShowManager and to project it onto the dome.

Use the show you already created in chapters 5.2 and 5.3, and insert the full-dome video behind the existing image.

If you enter the tutorial here, open the following show: Chapter_05.show.xml.

Step 1:

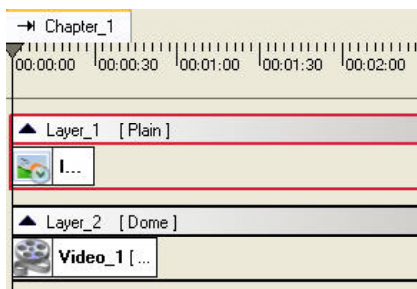
Add a new layer for the video by clicking on the "Add Layer" button on the timeline palette.



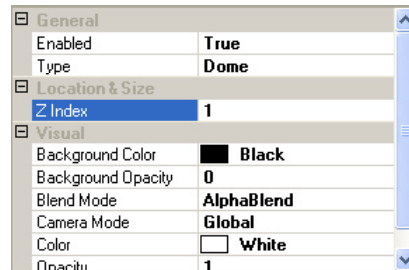
The new layer ("Layer_2") is automatically activated, and its properties are displayed in the Properties window. In the Properties window, change the Type from "Standard" to "Dome". As you want to insert an full-dome video on this layer, you need to assign the property "Dome" to it!

Step 2:

For the image to come before the full-dome video, its Z index must be greater than that of the full-dome video. To set the Z index, first click on "Layer_1" on the timeline.



Then set the "Z Index" of this layer to 1 in the Properties window. With a value greater than 0, the Z index of "Layer_2", you ensure that the image comes before the full-dome video.



Z indices can be set for each individual object of the same layer, as well as for each layer. All objects on the same layer are arranged according to their Z indices. The Z index of another layer can again influence the rendering, though. If the Z index of a layer is greater than that of another, all objects on the layer having the greater Z index are rendered before all objects of the other layer (the one having the smaller Z index).

Step 3:

To import the video, select the "Video" tab in the Resources window. With the left mouse button depressed, drag "New video" icon to the new track of the previously created layer ("Layer_2").



The Open dialog box appears. Select the file "powerdome_3k.m2v", to be found under "T:\Dome videos\powerdome Logo".

Step 4:

In the following dialog box "TextureMapping", select the property "Dome" under "Choose Mapping". This is important to ensure that the full-dome video will be presented correctly. Confirm with "OK".

For each full-dome video there must also exist a preview video. The preview video corresponds to the full-dome video, save that it has a lower resolution (preferably 512x512 pixels). Apart from the file name extension, the file name of the preview video must be

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exactly identical to that of the full-dome video. The file name extension of a preview video is ".preview.m2v". For the video used in this chapter, the following video files must exist: "powerdome_3k.m2v" and "powerdome_3k.preview.m2v". Both files must be stored in the same directory.

The preview video is used for previews in powerdome's ShowManager. If a preview video should not yet exist, you can generate it with the powerdome MPEG Encoder (see chapter 6).

Further, for both videos there must exist »Index files«, which are used for »Seeking« (jumping) within the videos. Index files are also stored in the same directory as the full-dome video and the preview video. If you want to create index files for newly encoded videos, click on the respective video file in the Windows® Explorer with the right mouse button, and select from the context menu "Send to > SeekIndexCreator".

Step 5:

As probably the video element "Video_1" is not exactly at the beginning of the show, drag it to the very start of the timeline (with the left mouse button kept depressed), or set the "Start Time" in the Properties window to 00:00:00.000.

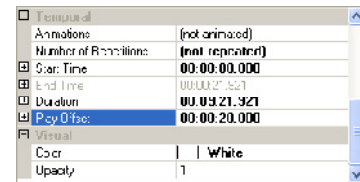
Step 6:

Click on the Sync button to load the modified show, and then on the Play button to see it. While the video is running, set the »Play cursor« to different positions within the show. To do this, in the Player window, click the left mouse button on any position on the timeline. This interrupts the playing of the show and continues it in that position. This permits quick and easy jumping back and forth within a video (Seeking).

Step 7:

If you want to skip the beginning of the video you are using, you can change the parameter "Play Offset" in the Properties window.

Set the value of this parameter for "Video_1" e.g., to 00:00:20.000, and play the show thus modified (Sync button, then Play button). The video will now be played without its leading end, i.e. it starts from second 20 of the original video.



5.4.2 Show with several full-dome videos

If you have created a show containing several full-dome video sequences, you need to note two things:

- 1.) You need to set "Load on demand=True" in the Properties window for each video, to prevent overloading the graphics card memory. Click on the video resource and set "Load on demand" to "True" in the Properties window.

This setting ensures that the videos are only loaded shortly before they start running on the timeline. With the parameter "LoadOnDemand - Preroll" you can define how many seconds before the beginning of the video you want the loading process to start. If this value is set to 5 (s), e.g., and if the video starts at 00:02:00.000, powerdome will begin to load the video at 00:01:55.000.

- 2.) Between two full-dome video sequences, you need to set a pause of at least 2 seconds, as powerdome requires this time to initialize the next video. If this pause is too short, it may happen that the following video is not presented correctly. If you have two videos that must follow in immediate succession ("End Time" video 1 = "Start Time" video 2), you have to assemble the two videos into one by copying before.



Read chapter 6.4 "Handling several full-dome videos in a show".

If you want to play two videos with a break smaller than 2 seconds, create a short video of a number of black frames with the same resolution as Video1 and Video2 before assembling the videos. Then assemble the three videos (Video1 + VideoBlack + Video2) into a single video file.

5.4.3 Verification of image splitting to different channels

There are two possibilities to look at what a single channel presents in the powerdome system:

- 1.) While the full-dome video is running (you may have to start it again), change to the Client PCs. To do this, hit the <Scroll> key of the keyboard* twice in rapid succession. A menu appears in which you can select all Client PCs, the Master PC and the NAS data server with the cursor keys (arrow up/down). To get to the computer selected, hit <Enter>. As long as a video is running, you see, on each Client PC, the very image it sends to the dome. Activating the menu by rapidly hitting <Scroll> twice is possible from each PC. Subsequently, change back to the Master PC in the same way.

DAXTEN.COM		SPACEGATE	
		MAIN	
	NAME		TYPE
01	SGQ NODE 1		C
02	SGQ NODE 2		C
03	SGQ NODE 3		C
04	SGQ NODE 4		C
05	SGQ NODE 5		C
06			C
07	SGQ MASTER		C
08	SGQ NAS		C
F1 - HELP		F2 - SETTINGS	

- 2.) The second way to look at the partial images sent by the Client PCs is to use standard number keys on the computer keyboard that correspond to the channel numbers (not the keys of the numeric keypad), e.g., 1 through 5 for the projectors 1 through 5 of SPACEGATE QUINTO.

Hit key <1>. The window for the full-dome preview now shows the image of channel 1. In that way, look at all channels existing in your system. To get back to the full-dome view, hit key <0>.

5.4.4 Increasing or decreasing the brightness of an full-dome video

Adapting the brightness of the video may be sensible if you include encoded videos into your show or if you want to experiment with generating your own full-dome videos.

The show you compiled should still be opened in the powerdome ShowManager. Click on that video resource in the Resources window which you inserted in Step 3 (chapter 5.4.1). In the Properties window for this resource, the gamma value is set to 1.8 (default). Change the value to 1.0 and look at the video (Sync and Play buttons). You will find the video brighter now.

Gamma values smaller than 1.8 will brighten the video up; values smaller than 1.8 will dim it down.

* Note: Changing to other computers of the cluster may possibly require a different sequence of keyboard keys. Our service staff will instruct you accordingly during installation and briefing.



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Available parameters in the Properties window for "Video":

Name	Explanation	Recommended range or settings
Audio Volume	Controls the sound volume of the video if the file includes sound (e.g., video in the mpeg format). Audio Volume can be animated, e.g., to slowly turn up the volume at the beginning of a show.	[0...1]
Name	Name of the video	any
Alignment (for plane video only)	Default setting: Center, i.e. the specified position (see "Position") refers to the center of the image. Instead, you can make this position refer to the top or bottom edge of the image.	Center, Top, Bottom
Coordinate System (for plane video only)	For planetarium objects you can define the astronomical motion you want the plane video to take part in.	None, AZI, DIUR, POL, PREC
Position (for plane video only)	Defines the position of a plane video on the dome in terms of longitude and latitude, rotation about its own axis ("Roll"), the virtual "distance" from the observer ("Radius"), and a scaling factor each for the width and height of the video ("ScaleWidth", "ScaleHeight"; values <1 decrease, >1 increase).	Longitude: [0...360] Latitude: [-90...90] Roll: [0...360] Values for Longitude, Latitude and Roll may be > 360 and < 0 Radius: > 0 ScaleWidth: > 0 ScaleHeight: > 0
Z Index	Defines the sequence of presentation of all objects on the same layer. The greater the Z Index, the further in the foreground is the video. You can enter floating point numbers to be able to insert any number of further objects in between the objects already arranged.	>= 0
Width (not for full-dome video)	Width of a planar video on the dome in terms of degrees	Planar video: $0 < a \leq 150$
Height (not for full-dome video)	Height of a planar video on the dome in terms of degrees	Planar video: $0 < a \leq 150$ Panorama video: $0 < a \leq 360$

Available parameters in the Properties window for "Video":

Name	Explanation	Recommended range or settings
Animations	A click on the "..." button in the parameter field opens the Animation Editor.	see Animation Editor
Number of Repetitions	The video (with or without animations) can be repeated any number of times.	not repeated, repeated n times with n being an integer > 0, repeated infinitely
Start Time	Start time of the video in the current chapter	>= 00:00:00.000
End Time	End time of the video in the current chapter, computed automatically from "Start time" + "Duration"	> 00:00:00.000
Duration	Length in time of the object on the timeline	> 00:00:00.000
Play Offset	If you want a video to be played not from its beginning but from somewhere later, here you can define a point of time in the video at which video playback is to start.	> 00:00:00.000
Color	Hue with which the video can be tinted. Default: white, i.e. all colors of the video remain unchanged.	Color value in the RGB format, e.g., 255,0,0 for Red
Opacity	Opacity of the video: 0 means the video is completely transparent, i.e. invisible; 1 means the video has no transparency, i.e. it is completely visible. Any values between 0 and 1 are possible.	[0...1]



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In addition to the parameters available for a video object on the timeline, more parameters are available in the Resource in powerdome. These are displayed in the Properties window as soon as the resource has been highlighted in the Resources window. In the Properties window you can edit these parameters.

Available parameters of the "Video" resource (Resource):

Name	Explanation	Recommended range or settings
Audio channel	Defines through which audio channel*) in this video the sound (if any) is to be played.	≥ 0
Use Audio	Defines whether an audio track existing in the video file is to be played or not.	True, False
Load on demand	Defines whether the resource will be loaded at the start of the chapter (Load on demand=False), or only when it is used on the timeline (=True)	True, False
Preroll	If "Load on demand = True": Resource is loaded to the timeline the specified number of seconds before the start time of the video. (Enables "Load on demand" while loading the resource in time).	≥ 0
Unresolved URL	Absolute path to the resource	(Is set automatically)
URL	Relative path to the resource	(Is set automatically)
Width	Width of the video image in pixels	(Is set automatically)
Height	Height of the video image in pixels	(Is set automatically)
Duration	Duration of the video	(Is set automatically)
Gamma	Gamma value of the video	[1,0; 2,6], Default: 1,8
Mapping	Defines whether a video is to be presented as a plane, full-dome or panoramic video.	Planar, Dome, Panorama

*) In the Config file of powerdome, one audio channel per Client can be defined. Thus you can play a show in several languages by having one client each playing one of the existing different language tracks.

5.5 Live video

With powerdome you can present videos from external sources on your dome live.

You can execute this tutorial only if a live video source (video camera, TV signal, video or DVD player) is connected to powerdome.

If you enter the tutorial here, open the following show: Chapter_06.show.xml.

Step 1:

Start the powerdome VideoServer via the link on the desktop of the Master PC.



Click on the "Start Streaming" button.

The VideoServer now supplies data from your video source, and you can integrate this source into powerdome at any time.

Step 2:

Go back to the ShowManager (Editor mode), and obscure the full-dome video by setting the parameter "Opacity" of "Video_1" in the Properties window to 0.

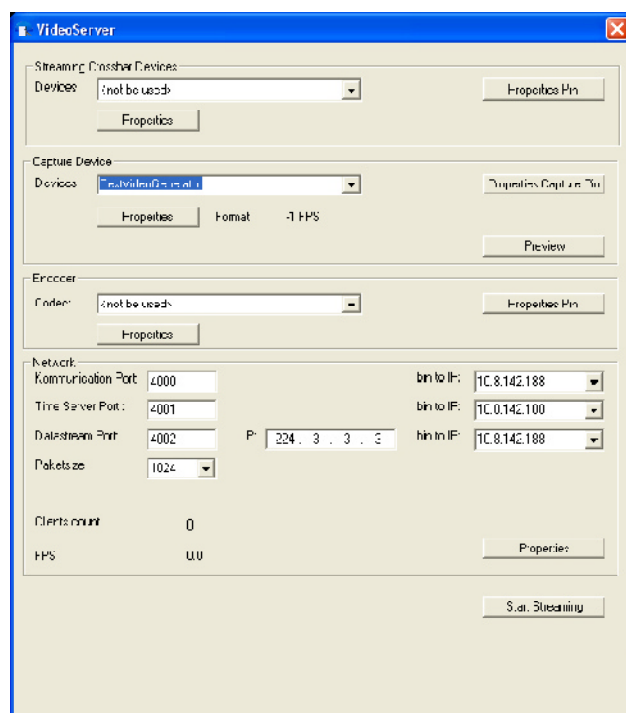
Step 3:

Next, insert a new »Track« into "Layer_1". To do this, select "Layer_1" in the timeline, and click on the button "Add Track" in the Timeline palette. (Alternatively, you can click the right mouse button on "Layer_1" and select Add new Track in the context menu.)



Step 4:

Activate the "Live video" tab in the Resources window, and drag the "New Live Video" icon (keeping the left mouse button depressed) into the newly created track.





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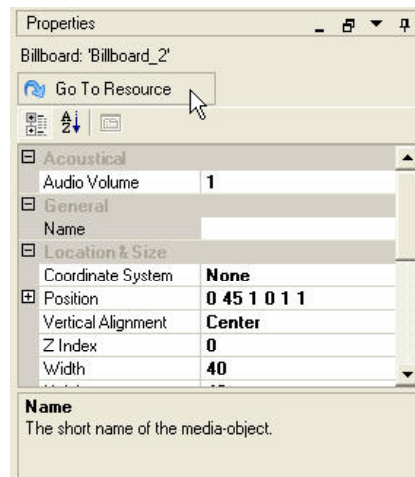
Select "Planar" in the "Mapping" dialog box, and position the show element "LiveVideo_1" to the very start of the timeline.



A live video element is always square, i.e. it is presented in a square „window“ on the dome. Adjust "Width" and "Altitude" in the Properties window so that both values correspond to the resolution of your input format (e.g., "Width"=40, "Altitude"=30).

Step 5:

Select "Live video_1" on the timeline, and then click on the "Go To Resource" button in the Properties window.



Under "URL" enter the following:
net:TCP_SVIP_192.168.10.50_4000.net

URL **net: TCP_SVIP_192.168.10.50_4000.net**

Step 6:

Click on the Sync and then on the Play button. A plane element with the current content of your live video data stream is shown on the dome.

You can animate this plane video just as any other video element (e.g., fade in).

Step 7:

Finally, terminate the streaming by clicking on the "Stop Streaming" button in the powerdome VideoServer.

Available parameters in the Properties window for "Live video":

Name	Explanation	Recommended range or settings
Audio Volume	Controls the sound volume of the live video, if the live video supplies sound. Audio Volume can be animated, e.g., to slowly turn up the volume at the beginning of a show.	[0...1]
Name	Name of the live video	any
Alignment (for plane video only)	Default setting: Center, i.e. the specified position (see "Position") refers to the center of the image. Instead, you can make this position refer to the top or bottom edge of the image.	Center, Top, Bottom
Coordinate System (for plane video only)	For objects to be used with the digital planetarium, you can define the astronomical motion you want the plane video to take part in.	None, AZI, DIUR, POL, PREC
Position (for plane video only)	Defines the position of a plane video on the dome in terms of Azimuth and Altitude, rotation about its own axis ("Roll"), the "distance" from the observer ("Radius"), and a scaling factor each for the width and height of the video ("ScaleWidth", "ScaleHeight"; values <1 decrease, >1 increase).	Longitude: [0...360] Latitude: [-90...90] Roll: [0...360] Values for Longitude, Latitude and Roll may be > 360 and < 0 Radius: > 0 ScaleWidth: > 0 ScaleHeight: > 0
Z Index	Defines the sequence of presentation of all objects on the same layer. The greater the Z Index, the further in the foreground is the video. You can enter floating point numbers to be able to insert any number of further objects in between the objects already arranged.	>= 0
Width	Width of the object on the dome in terms of degrees	Planar video: 0<a<=150
Height	Height of the live video object on the dome in terms of degrees	Planar video: 0<b<=150

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Not:
With a live video, only select
"Planar" mapping!



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Available parameters in the Properties window for "Live video":

Name	Explanation	Recommended range or settings
Animations	A click on the "..." button in the parameter field opens the Animation Editor.	
Number of Repetitions	The video (with or without animations) can be repeated any number of times.	not repeated, repeated n times with n being an integer > 0, repeated infinitely
Start Time	Start time of the live video in the current chapter	>= 00:00:00.000
End Time	End time of the live video in the current chapter, computed automatically from "Start time" + "Duration"	> 00:00:00.000
Duration	Length in time of the object on the timeline	> 00:00:00.000
Play Offset	Has no effect on a live video.	-
Color	Hue with which the live video can be tinted. Default: white, i.e. all colors of the video remain unchanged.	Color value in the RGB format, e.g., 255,0,0 for Red
Opacity	Opacity of the video: 0 means the video is completely transparent, i.e. invisible; 1 means the video has no transparency, i.e. it is completely visible. Any values between 0 and 1 are possible.	[0; 1]

In addition to the parameters available for a live video object on the timeline, more parameters are available in the Resource in powerdome. These are displayed in the Properties window as soon as the resource has been highlighted in the Resources window. In the Properties window you can edit these parameters.

Available parameters of the "Live video" resource:

Name	Explanation	Recommended range or settings
Unresolved URL	Absolute path to the resource	(Is set automatically)
URL	Relative path to the resource	(Is set automatically)
Gamma	Gamma value of the video	[1.0...2.6], Default: 1.8
Mapping	Defines whether a video is to be presented as a planar, full-dome or panoramic video.	Planar, Dome, Panorama

Note:

With a live video, only select "Planar" mapping!

5.6 Audio

Continue with the status of the show you have reached at the end of chapter 5.4. To do this, open this file: chapter_07.show.xml.

The task is to add sound to the full-dome video in this show. Powerdome supports the following audio formats: wav, mp3, ac3, as well as any sound contained in mpeg, avi, vob and wmv files.

Step 1:

First it is necessary to set the "Play Offset" parameter in the Properties window from "Video_1" back to 00:00:00.000 (it was shifted to second 20 at the end of chapter 5.4.1). To do this, click on "Video_1" in "Layer_2" of the timeline, and set "Play Offset" in the Properties window back to zero.

Step 2:

Create a new »Track« in "Layer_2" (button "Add Track" on the Timeline palette, or select **Add new Track** in the context menu of "Layer_2"). This adds a new track to Layer_2.

If you want to delete a track, click the right mouse button on the track (not on an element), and select "Remove Track" in the context menu.



Caution!

This will also remove all elements of this track, including such outside the visible segment of the timeline.

Step 3:

Activate the "Audio" tab in the Resources window, and drag the "New Audio" icon (keeping the left mouse button depressed) onto the new track.

Step 4:

In the "Open" dialog box, select the audio file "Paradise Island.mp3" under "T:\Audio". A new element ("Audio_1") is created on the timeline. With the left mouse button depressed, drag it to the

very start of the track. To equal the length of the sound to that of the video, set the "Duration" of "Audio_1" in the Properties window to 53 seconds (00:00:53.000).

When the file is loaded, the length of the audio file will be recognized and automatically taken over by the ShowManager. The same applies to videos, by the way. If you prolong the audio element on the timeline, the length of the sound remains as it is; if you shorten the element, some of the length of the sound may be curtailed.

Step 5:

Save the »Show« under a different name so as not to overwrite the existing tutorial show ("chapter_07.show.xml"). Use, e.g., the name "Tutorial Audio". A click on the Sync and then on the Play button will cause the show to be played with pictures and sound.

Step 6:

The only parameter for audio elements in powerdome is "Volume". To slowly fade the sound in and out again, click the right mouse button on the element "Audio_1", and select **Edit Animations** in the context menu.

Step 7:

Click on the plus sign (+) in the Animation Editor to create a new animation for the audio element. In the "Parameter selection" dialog box, click on the "Volume" parameter, and close the window by clicking on "OK".

Step 8:

In the Animation Editor, an animation bar for "Volume" is inserted, which contains two keyframes. To set the animation values of these two keyframes to 0, click on each keyframe, and in the properties of the keyframes enter the value 0 for "Volume".

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The "Add Track" button on the Timeline palette

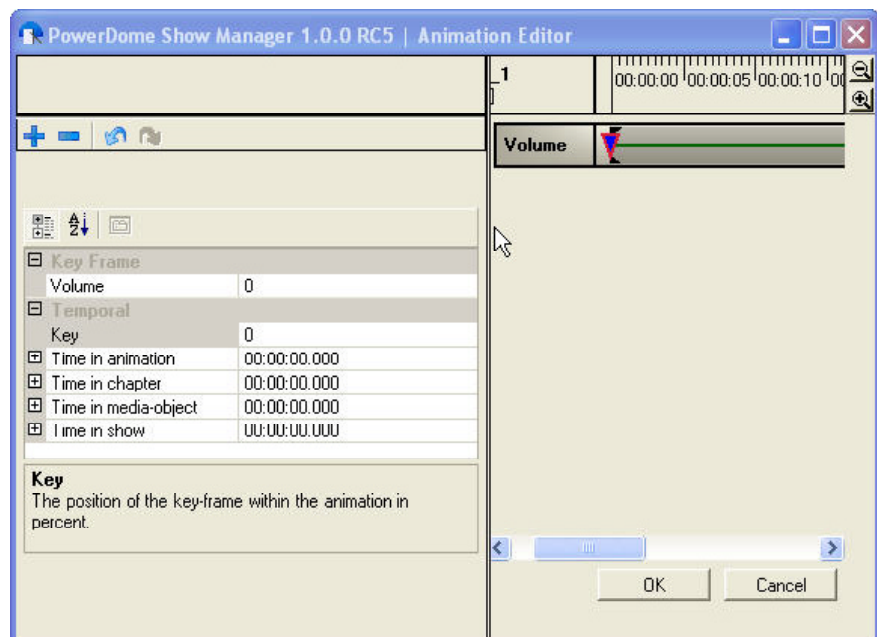
Step 9:

Create a new keyframe at about 10 seconds on the animation bar with a double click on the timeline in the respective position. Set its "Volume" value to 1. Then create another keyframe at second 43. The "Volume" of this keyframe is already 1, as it has adopted the value of the previous keyframe.

Step 10:

Close the Animation Editor with "OK", load the modified show into the Player with the Sync button, and click on the Play button to see the result.

You have created an animation which fades the sound in at the beginning of the show (turning the volume up from 0 to 1 during the first ten seconds) and fades it out again at the end of the video (turning the volume down from 1 to 0 between second 43 and 53).



Available parameters in the Properties window for "Audio":

Name	Explanation	Recommended range or settings
Volume	Control of volume	[0...1]
Name	Name of the element "Audio"	any
Animations	A click on the "..." button in the parameter field opens the Animation Editor.	
Number of Repetitions	The audio file can be repeated any number of times.	not repeated, repeated n times with n being an integer > 0, repeated infinitely
Play Offset	If you want an audio file to be played not from its beginning but from somewhere later, here you can define a point of time in the audio file at which playback is to start.	> 00:00:00.000
Start Time	Start time of the audio file in the current chapter	>= 00:00:00.000
End Time	End time of the audio file in the current chapter, computed automatically from "Start time" + "Duration"	> 00:00:00.000
Duration	Length in time of the audio object on the timeline	> 00:00:00.000



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In addition to the parameters available for an audio object on the timeline, more parameters are available in the Resource in powerdome. These are displayed in the Properties window as soon as the resource has been highlighted in the Resources window. In the Properties window you can edit these parameters.

Available parameters of the "Audio" resource:

Name	Explanation	Recommended range or settings
Audio Renderer ID	Specifies the audio channel*) through which you want the audio file to be played.	Predefined AudioRenderers from Config.xml
Channel index	Lets you select languages by means of the channel index in audio files of the *.vob format.	>= 0
Load on demand	Defines whether the resource will be loaded at the start of the chapter (Load on demand=False), or only when it is used on the timeline (=True)	True, False
Preroll	If "Load on demand = True": Resource is loaded to the timeline the specified number of seconds before the start time of the audio object. (Enables "Load on demand" while loading the resource in time).	>= 0
Unresolved URL	Absolute path to the resource	(Is set automatically)
URL	Relative path to the resource	(Is set automatically)

*) In the Config file of powerdome, one audio channel per Client can be defined. Thus you can play a show in several languages by having one client each playing one of the existing different language tracks.

5.7 Text (Labels)

Here, let the task be the placing of a line of text below the animated image ("Image_1") created in chapters 5.2 and 5.3.

To do this, open the show you have created, or the file "chapter_08.show.xml".

Step 1:

The text must be inserted into a new track within the layer containing the image ("Layer_1"). Create a new track in "Layer_1".

Step 2:

Activate the "Text" tab in the Resources window and drag the icon "New Font/Text" (keeping the left mouse button depressed) to the new track.



Step 3:

The "Font" dialog box for selecting the desired font and format opens. Select "Arial" as a font, and "38" as a font size. Select any font style you like.

Step 4:

A click on "OK" opens the "Edit Text" dialog box. Enter the text you want to be shown together with the image (e.g., "Hubble Space Telescope").



Click on "OK". A new object "Text_1" is created on the timeline, and a new resource is listed in the Resources window (Arial; 36).

Step 5:

Drag the object to the start of the timeline, and change the value for "Duration" in the Properties window to 30 seconds. Thus, the text will remain visible just as long as the image. Next, under the "Position" parameter, enter the value 15 for "Latitude". This ensures that the text appears below the image. (The image has a height ["Latitude"] of 45.)

Step 6:

Next, let us animate the text so that it behaves in the same way as the image. This requires two animations. One animation fades the text in between seconds 0 and 5 and out again between seconds 25 and 30. Another animation revolves the text around the dome by 360° between seconds 5 and 25.

To do this, open the Animation Editor and create the two animations as described in chapter 5.3. Instead of the object "Image_1", use the text object "Text_1". Animations of text objects are created in the same way as animations of images. Now when you play your completed animation, the text will be faded in, revolved around the dome, and faded out simultaneously with the image.

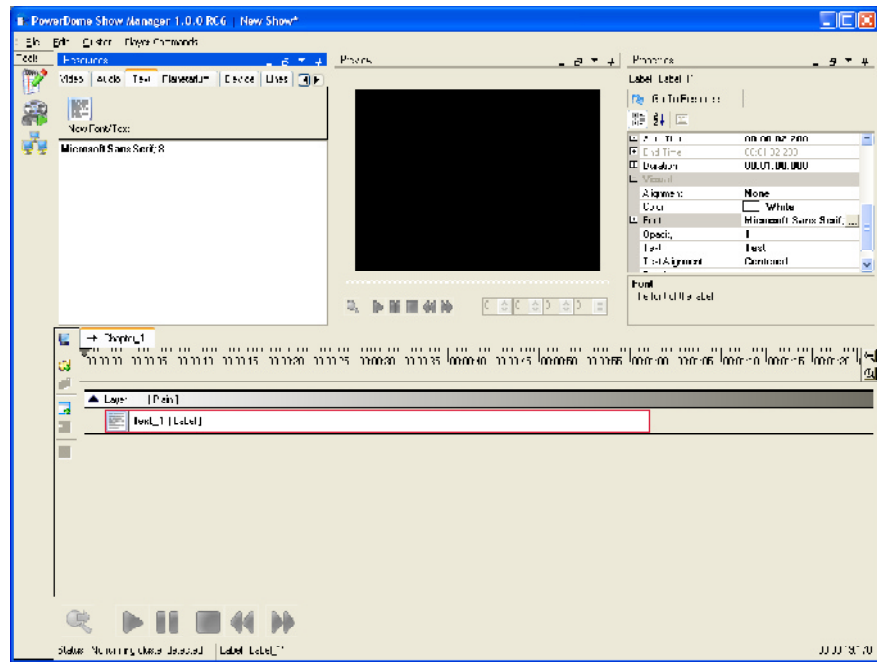
If you are uncertain as to how the two animated objects should look like, open "chapter_09.show.xml" and start the example show.

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ShowManager with selected text element

Available parameters in the Properties window for "Text":

Name	Explanation	Recommended range or settings
Name	Name of the text element	any
Coordinate System	For planetarium objects you can define the astronomical motion you want the text to take part in. Select PREC to include all revolutions.	None, AZI, DIUR, POL, PREC
Horizontal Shift	Shifts a plane text on a plane tangential to the dome to the right or left; shifts a spherical text in parallel to the dome.	[-90...90] Default: 0
Vertical Shift	Shifts a plane text on the tangential plane up or down; shifts a spherical text in parallel to the dome.	[-Height...180-Height] Default: 0
Planar	Defines whether the text is to be placed tangentially to the dome or spherically onto the dome (Default: "False" = spherical).	True, False
Position	Defines the position of the text on the dome in terms of longitude and latitude, rotation about its own axis ("Roll"), the distance from the observer ("Radius"), and a scaling factor each for the width and height of the image ("ScaleWidth", "ScaleHeight"; values <1 decrease, >1 increase).	Longitude: [0; 360] Latitude: [-90;90] Roll: [0; 360] Values for Longitude, Latitude and Roll may be > 360 and < 0 Radius: > 0 Radius: > 0 ScaleWidth: > 0 ScaleHeight: > 0
Z Index	Defines the sequence of presentation of all objects on the same layer. The greater the Z Index, the further in the foreground is the text object. You can enter floating point numbers to be able to insert any number of further objects in between the objects already arranged.	>= 0
Animations	A click on the "..." button in the parameter field opens the Animation Editor.	
Number of Repetitions	Text (with or without animations) can be repeated any number of times.	not repeated, repeated n times with n being an integer >0, repeated infinitely
Start Time	Start time of the text in the current chapter	>= 00:00:00.000
End Time	End time of the text in the current chapter, computed automatically from "Start time" + "Duration"	> 00:00:00.000
Duration	Length in time of the text object on the timeline	> 00:00:00.000

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Available parameters in the Properties window for "Text":

Name	Explanation	Recommended range or settings
Alignment	Defines whether or not you want the text, in case of astronomical revolutions, to be always aligned in parallel with the horizon.	None, Horizon Standard: None
Color	Color of the text	Color value in the RGB format, e.g., 250;0;0 for Red
Font	Text font	Any Windows font
Opacity	Opacity of the text object: 0 means the text is completely transparent, i.e. invisible; 1 means the text has no transparency, i.e. it is completely visible. Any values between 0 and 1 are possible.	[0...1] Default: 1
Text	Text to be displayed	any
Text Alignment	Defines whether the text is right- or left-justified or centered.	Centered, Left, Right Default: Centered
Text Key	Intended for the easy integration of different languages	Not yet supported for the time being.

5.8 Digital Planetarium

Powerdome offers a great number of digital planetarium functions. In this chapter you will insert stars between the full-dome video and the image of your show.

If you enter the tutorial here, open the following show: Chapter_09.show.xml.

Step 1:

To create a new layer, click on the "Add Layer" button.



You want the new layer to be presented before the full-dome video, but behind the image. For this you need the "Z Index" parameter.

"Layer_1" with image and text has a "Z Index" of 1, "Layer_2" with the full-dome video has a "Z Index" of 0. For the new layer to come in between, give it the "Z Index" 0.5.

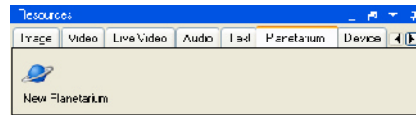
Also, for the new layer, set the value of "Blend Mode" to "Max" in the Properties Window. This ensures error-free presentation of all planetarium objects and error-free interaction with the other objects (such as videos, etc.).

Step 2:

Activate the "Planetarium" tab in the Resources window, and drag the "New planetarium" icon (keeping the left mouse button depressed) to the new layer.



The "Planetarium" tab is possibly hidden. To access it, click the "Next Tab" button (right arrow) to the right of the other tabs of the Resources window several times or keep it depressed until the desired tab appears. The same applies to the "Device" and "Lines" tabs.



Step 3:

In the dialog box that opens, select the file "default.planetarium.xml" in the directory "X:\config" (on a stand-alone PC under "C:\AllDome\config"). Then click on the "Open" button.

Step 4:

Drag the new planetarium object "Planetarium_1" to the very start of the timeline. Leave the "Duration" at one minute.

Step 5:

Create an animation of the opacity of the (fixed) stars. Select the Animation Editor. After selecting the plus sign (+), this editor offers a long list of available parameters. Scroll down until you get to the "Fixstars" element. Click on the plus sign to the left of it, and select "Opacity". The Animation Editor creates an animation bar for the parameter selected. Set the two keyframes already existing for "Opacity" to the value 1. Click on the Sync and then on the Play button to see the stars on the dome.

If you are doing this tutorial on a stand-alone PC, it may be that this PC will now be somewhat slower, as a full-dome video and stars are played simultaneously. On the dome, however, everything will run smoothly.

Step 6:

For further description of the planetarium functions, delete the layers containing the full-dome video and the still image/text. To do this, click the right mouse button on the respective layers (not on the tracks), and select Remove Layer, or click on the respective button on the Timeline palette.





Step 7:

Delete the resources (Video, Image, Text), as these are no longer required. You will save some loading time this way.

All resources required in the current chapter will be loaded at the beginning. The fewer resources have to be loaded, the quicker will the loading be completed.

Successively activate the tabs "Image", "Video", "Audio" and "Text" in the Resources Window. Click the right mouse button on the various resources below the "New ..." button, and select **Remove Resource** in the context menu.

Save the show with a click on the Sync button.

Available parameters in the Properties window for "Planetarium":

Name	Explanation	Recommended range or settings
Name	Name of the planetarium element	any
Z Index	Defines the sequence of presentation of all objects on the same layer. The greater the Z Index, the further in the foreground is the planetarium object. You can enter floating point numbers to be able to insert any number of further objects in between the objects already arranged.	≥ 0
Animations	A click on the "..." button in the parameter field opens the Animation Editor.	
Number of Repetitions	Planetarium element (with or without animations) can be repeated any number of times.	not repeated, repeated n times with n being an integer > 0 , repeated infinitely
Start Time	Start time of the planetarium element in the current chapter	$\geq 00:00:00.000$
End Time	End time of the planetarium element in the current chapter, computed automatically from "Start time" + "Duration"	$> 00:00:00.000$
Duration	Length in time of the planetarium element on the timeline	$> 00:00:00.000$

5.9 Show Compilation with "Planetarium"

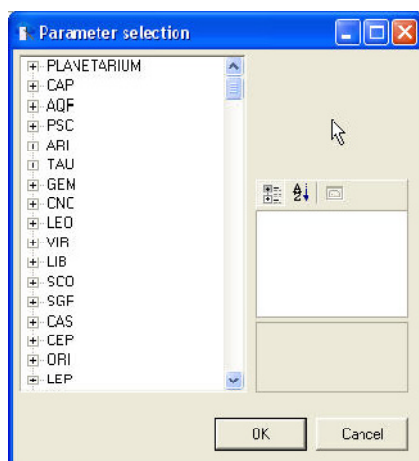
As the digital planetarium in powerdome is rather complex, there are further tutorials, which are based on chapter 5.8. The present chapter tells you how to compile a complete planetarium show. Chapters 5.10 and 5.11 instruct you how to control the planetarium live with a PDA or with a control panel, respectively. See chapters 5.14 through 5.17 to know how to use further elements such as circles, scales and grids by means of the digital planetarium.

If you enter the tutorial here, open the following show: Chapter_10.show.xml.

Step 1:

Click the right mouse button on the planetarium object "Planetarium_1" on the timeline, and select **Edit Animations**. Click on the plus sign (+) in the Animation Editor to add a new animation.

The planetarium contains a lot of objects that can be animated. All objects available are listed in the "Parameter selection" dialog box. "PLANETARIUM" is used to execute astronomical motions (AZI = azimuth rotation, POL = polar altitude motion, DIUR = diurnal motion, PREC = precessional motion). The dialog box further lists all constellations, astronomical scales, some predefined line figures (summer triangle, winter hexagon, etc.), followed by stars, the Milky Way, constellation groups, and other objects (in that order).



Step 2:

As the first application, let us fade in the equator: In the "Parameter selection" dialog box go down the list to "Equator". Click on the plus sign to the left of it, and select the property "Opacity". Confirm with "OK".

Step 3:

You see a new animation bar in the Animation Editor, with two keyframes as usual. To fade the equator in slowly, insert a new keyframe at second 5, and set its "Opacity" to 1. In the same way, set the value of the last keyframe (at second 60) to 1.

Step 4:

Close the Animation Editor with "OK"; then click on the Sync and Play buttons in succession to see the equator being faded in.

Animating the other objects contained in the digital planetarium is done in the same way, as a rule. For many objects, though, you can animate the opacity as well as the color. A special case is demonstrated in Step 5.

Step 5:

To simulate an astronomical diurnal motion, use the parameter "DIUR" in the element "PLANETARIUM". Again change to the Animation Editor of the planetarium object ("Planetarium_1"). Click on the plus sign to create a new animation. Then select "DIUR" in the element "PLANETARIUM". (To make "DIUR" visible, first click on the plus sign in front of "PLANETARIUM".) Confirm with "OK".

Step 6:

Insert a new keyframe at second 5 in the animation bar. To start the diurnal motion after the equator has been faded in, you can leave the value "DIUR" of the first two keyframes at 0. Click on the last keyframe, and set its value for "DIUR" to 90.*

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** In powerdome, all rotational motions of the digital planetarium are in terms of degrees. Motions are always carried out with relative positioning. If you usually calculate diurnal motions in terms of hours, simply convert them into degrees (1h = 15°).*



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Step 7:

Confirm with "OK", click on the Sync and Play buttons, and see the new animation: At first, the equator appears, after which you see a diurnal motion through 6 hours from 0° to 90°.

Step 8:

Next, let us fade in the zodiacal constellation figures. In powerdome, you can project individual constellation figures, or several predefined groups of them: Zodiacal constellations ("Zodiac"), northern hemisphere ("NorthernHemisphere"), southern hemisphere ("SouthernHemisphere") or all ("Constellations"). Change to the Animation Editor, add a new animation (+), select the parameter "Zodiac", and then "Opacity". To make the zodiac appear as soon as the diurnal motion has started, set the value for "Opacity" of the first keyframe of the new animation to 0, create a new keyframe at second 5 (value is 0 already), and another one at second 15. Set the value for "Opacity" of the last keyframe to 1.

Step 9:

Confirm with "OK", and click on the Sync and Play buttons to see the show you have compiled.

Step 10:

To delete the animations you have created, proceed as follows: Change to the Animation Editor of the planetarium object ("Planetarium_1"). Click the right mouse button on the front part of the animation bar containing the title of the animation (e.g., "Opacity" or "DIUR"). In the context menu, select the command "Remove Animation", and confirm with "Yes". Close the Animation Editor.

For practicing, remove all animations created for the planetarium object as described above.



5.10 Live operation with a PDA

With the procedure described in chapter 5.9 you can compile complex astronomical shows. Below, it is explained how you can use the planetarium in a live presentation. There are two possibilities: One is with the PDA (Personal Digital Assistant, pocket PC) supplied with powerdome as an option. This way of planetarium operation has some restrictions. Unrestricted operation is possible with the control panel of an optical-mechanical ZEISS planetarium (e.g., SKYMASTER ZKP 4). The present chapter explains the operation of the planetarium with a PDA, while chapter 5.11 instructs you how to operate it with the optional control panel.

Step 1:

First start the program "powerdome PDA Control" on the PDA. To do this, touch the menu item **CONNECT MOBILITY** in the Start menu of the PDA. The window that opens contains two icons – one for ActiveSync (see section "How to make shows accessible with the PDA" and one for the powerdome PDA Control.



Active Sync



powerdome PDA Control

Select the icon "powerdome PDA Control" to load the powerdome menu.



The main menu comprises four major menu items: "SHOWS", "DEVICES", "SKY TOOLS" and "PLANETARIUM". If you click on the "SHOWS" item, a submenu opens, in which you can start filed shows. The "DEVICES" item contains commands for the dome light (and perhaps further hardware functions). With "SKY TOOLS" you can turn on auxiliary functions for astronomical instruction (scales, grids etc.), and the "PLANETARIUM" item makes selected planetarium objects available.

Step 2:

In the main menu, select the: "PLANETARIUM" command (at the bottom of the list).

In the following submenu, load a show that contains the digital planetarium as an element. This show has already been filed on the PDA. Touch the P button, and wait a moment until the planetarium has been loaded.* Then touch the adjacent Pause/Play button to start the digital planetarium.



By default, all planetarium objects are off at first.

Step 3:

Touch "FIX On" to switch the stars on. Now the stars are visible on the dome and on the Master PC (in the Player of the ShowManager). The other buttons in this enable you to switch the stars off again ("FIX Off"), and to switch the Milky Way on and off ("MW On", "MW Off").

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**Loading takes a few seconds, depending on the system configurations. No acknowledgment will appear on the PDA. But you can easily ascertain the loading time by looking at the monitor and taking the time until the Play button is enabled with a stop watch. This time is constant for your system.*



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DIUR	Diurnal motion axis
POL	Polar altitude motion axis
AZI	Azimuth motion axis
PREC	Precessional motion axis

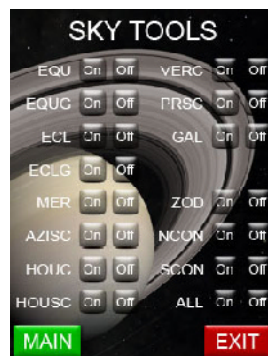
**The start positions have been set in the default.planetarium.xml file. If required, you can have the positions in this file changed by Carl Zeiss or change them yourselves, some programming skills provided.*

Also, you can activate fixed revolutions about the astronomical axes DIUR, POL, AZI and PREC (see explanations on the margin). To do this, touch the respective button (">>" or "<<") to start a forward or reverse motion. To reset the motion to the start position (zero position or local polar altitude)*, touch the round button in the center (which is labeled DIUR, for example). Stopping the motion in a desired position is not possible. Experiment with these buttons for a while to get familiarized with their functions.

Leave the stars on, and click the MAIN button to return to the main menu.

Step 4:

Open the "SKY TOOLS" menu. This contains auxiliary functions (elements) for astronomical instruction, which you can switch on and off by touching "On" and "Off", respectively.



Make a trial with "EQU On". This will make the equator appear on the dome. Try out all the elements in succession. The abbreviations stand for:

EQU	Equator
EQUQ	Equatorial grid
ECL	Ecliptic
ECLG	Ecliptic grid
MER	Meridian
AZISC	Azimuth scale
HOUC	Hour circle
HOUSC	hour angle scale
VERC	Vertical circle
PRSC	Precession scale
GAL	Galactic Equator
ZOD	Zodiacal constellation outlines

NCON	All constellation outlines of the northern hemisphere
SCON	All constellation outlines of the southern hemisphere
ALL	All constellation outlines

After you have switched on and off all elements, click on MAIN to return to the main menu. Leave the stars on.

Step 5:

Change to the DEVICES submenu. Touching "Light On" switches on powerdome lighting. With the color buttons on the left you can vary the color of the light. Try some of these buttons.



Step 6:

Click on "Light Off" to switch the dome lighting off again. Then activate "Fade On". Note the difference: "Light On" switches the dome lighting on, while the current scene (here: the stars) remains visible. With "Fade On" you fade in the dome lighting and simultaneously fade out the current scene.

Step 7:

Leave the dome lighting on, and touch "Blending Off". This deactivates edge blending between the image channels. Reactivate edge blending with "Blending On".

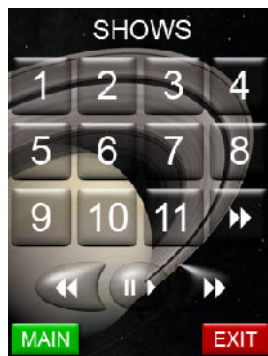
Step 8:

"Shutter On" / "Off" opens/closes the shutters of the projectors. Touch Fade Off again, and then touch "Grid On" to activate the calibration grid. This grid can be used for the manual calibration of the individual channels; it shows whether the

edge blending zones between the projectors are still in register. For further information, see the separate description of the powerdome Configurator.*

Step 9:

Via the menu item SHOWS you can call up filed shows.



For this, the buttons in the SHOWS submenu must be occupied by shows. If they are, you can start them from the PDA via the Play/Pause button. Use the "<<" and ">>" buttons to browse between the chapters of the activated show. With the square ">>>" button on the right of the "11" button you reach a second page with the buttons "12" through "22". This means that you can have up to 22 shows to be available via the PDA. (If required, you can ask Carl Zeiss to expand the number of pages and, thus, the number of shows you can open.) To get back to page 1, touch the square "<<<" button on page 2.

Read below how to make shows accessible with the PDA.

Step 10:

Experiment with the PDA capabilities to familiarize yourself with them. Then touch the EXIT button to leave the PDA menu.

How to make shows accessible with the PDA:

You can assign each existing show to one of the buttons in the PDAs SHOWS menu item and then start these shows from the PDA.

Step 11:

Plug the PDA to the base station. This will automatically start the ActiveSync program on the Master PC. This program handles data exchange with the PDA. In the message window that opens, click on "OK", and in the Setup Wizard click on "Cancel". Now a synchronization partnership is established between the Master PC and the PDA, which enables you to move and copy files.

Step 12:

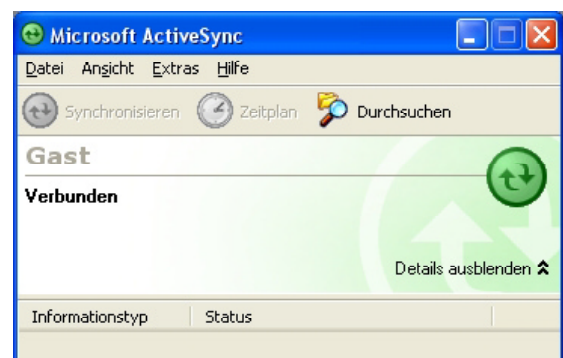
In the ActiveSync window, click on the "Browse" button. This opens an Explorer window, in which all directories of the PDA are listed. Change to the directory "powerdomeControl", select the file "menu.xml", and copy it to the desktop (menu **Edit > Copy**, click on the desktop, menu **Edit > Paste**). Change to the desktop and open the file.



Step 13:

The file contains two segments (<!-- SUBMENU SHOWS 1 --> and <!-- SUBMENU SHOWS 2 -->). These segments represent the two pages in the submenu of **SHOWS** (see Step 9). In these two segments you can assign your shows to the 22 buttons available.

In the illustration below, the lines with



* Note:

The Shutter function is not yet implemented in powerdome Version 1.00.



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the shows to be assigned to the eleven buttons of the first submenu page of **SHOWS** are highlighted. Each line assigns a show with all its parameters such as width and height etc. to a button. One of these lines looks like this, for example:

```
<MENUITEM x="0" y="40" width="60" height="60" image="01.jpg"
imagepressed="01_d.jpg" command="LOAD T:\Shows\PowerDome_Logo.show.xml"/>
```

The only thing you have to do here is to enter your show file (show.xml file) behind "command". E.g, replace T:\Shows\PowerDome_Logo.show.xml with T:\Shows\myShow.show.xml.

Step 14:

Save the file and copy it back to the PDA, by entering it in the Explorer window in the directory "powerdomeControl" of the PDA. This completes the procedure. Now you can take the PDA out of the base station and test the button you created. For this purpose, both the cluster in the powerdome ShowManager, and the powerdome Control program on the PDA must be started. Once the program has been loaded, change to **SHOWS**, and click on the button you have created. This will load the show assigned to it. Then click on the Play/Pause button below to start the show.

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5.11 Live operation with the control panel

In combination with certain optical-mechanical planetarium machines of Carl Zeiss, e.g., SKYMASTER ZKP 4, powerdome permits joint control; i.e. the optical-mechanical and the digital planetarium work as one system. The control panel of the optical-mechanical projection machine can also be used for digital functions, primarily for live operation, provided, of course, that both projection systems are installed and integrated. As an option, powerdome may be equipped with a control panel (and control PC) even where there is no optical-mechanical projector. This allows the digital planetarium to be controlled live with the control panel without the restrictions involved in control with the PDA. With the control panel it is easy to change between playback of an full-dome show and live operation. Simply load the digital planetarium with the show, and pause (not cancel) the show in the desired position, or have it stopped by a »Trigger«. You can then run the desired planetarium functions by means of the control panel, and then continue playback of the automatic show (Play button)

To practically exercise the following chapter you need a control panel and a separate PC with the SKYPOST software. Both are options available from Carl Zeiss.

Consult the „Hardware“ part of this documentation on how to connect the control panel. This tutorial assumes that all connections have been properly made.

Step 1:

Make sure that the powerdome ShowManager and the Player are on. Should the start screen of the Player should be missing (normally it is displayed as long as no show has been loaded yet), restart the Player (menu **Cluster > Stop Cluster**, then **Cluster > Start Cluster**). The Player shows the process of synchronization of the Client PCs.

Step 2:

Now start SKYPOST. This program is on a separate PC. Press the "Scroll" key of the keyboard twice*. In the menu that opens, select the SKYPOST PC.

You see that there is a link between SKYPOST and powerdome as soon as the start screen of the powerdome Player window has supplemented the number of existing computers by 1. The link is necessary for SKYPOST and powerdome to be able to exchange data.

Step 3:

Open the following show in the ShowManager: "chapter_12.show.xml". Then load the show to the Player with the Sync and Play buttons. Stop the show with the Pause button.

The show contains a planetarium element, though without animations (virtually, without presentations), as all functions are controlled via the control panel.

Live operation of powerdome with the control panel is very simple. On the control panel you will find the [X] pushbutton (see the illustration on the following page). Pushing this button, and then a button of a planetarium function, calls up the digital function via powerdome.

Step 4:

Switch on the digital equator by pushing button [X] and then button [EQU].

Step 5:

Switch the digital equator off again by pushing buttons [BWD], [X] and [EQU] in succession.

Step 6:

Experiment by switching on and off other objects of your choice. Also try out the astronomical revolutions (AZI, POL, DIUR, PREC), using the rotary knobs of the control panel.

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* This function depends on the operating system. On your system, it may require a different succession of keys. Consult the manual of your operating system.

For detailed information on the control panel and the planetarium functions, see the description of the planetarium projector and the associated control software. See also chapter 7 "Communication and Synchronization".



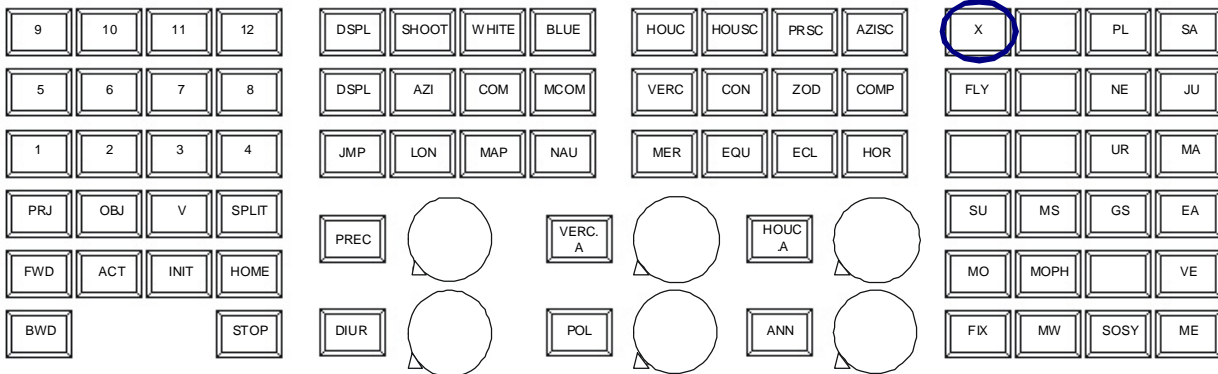
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Carl Zeiss

SKYMASTER ZKP 4



5.12 Control of external equipment

You can only exercise this tutorial if a connection between powerdome and the projector-independent dome lighting or other external devices is installed in your planetarium.

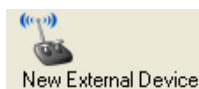
The Device object permits you to control external devices linked to powerdome. Dome illumination is a typical example. You can turn it up and dim it down to any level between zero and maximum via powerdome. The dome light control as well as the control of other equipment can be directly integrated in a show.

If you enter the tutorial here, open the following show: Chapter_13.show.xml.

So far, this show only contains stars. Now, as an example, you will dim down the dome light during the first 10 seconds, and turn it on again at the end of the show. For this to work, the dome illumination system must be linked to powerdome through a DMX control. Consult the "Hardware" part of this documentation on how to install this link. This tutorial assumes that all connections have been properly made.

Step 1:

Add a new track to the layer containing the planetarium element. In the Resources window, activate the "Device" tab, and drag the "New External Device" button onto the new track.



Step 2:

When inserting it, you are asked to select a file with a file name ending "external.xml", in which all external devices to be controlled via powerdome must be defined. If external devices are connected to your powerdome, the respective file already exists on your computer. Open the file "X:\config\default.external.xml", and in the next dialog box

("ExternalDeviceSelectionDialog") select the light you want to control. The dome illumination may be named, e.g., "Light1".

Step 3:

Move the element ("ExternalConfig_1") to the very start of the timeline, and open the Animation Editor for this object.

Step 4:

Create an animation with the "Intensity" parameter. This is the only parameter that can be animated for a light source. Set the values of the first and last keyframes to 1. Insert a new keyframe each at second 10 and 50, and set the value to 0 for both.

Thus you have created an animation that dims the dome light down to zero during the first 10 seconds ("Intensity" from 1 to 0), and turns it up again during the last 10 seconds.

Step 5:

Close the Animation Editor and see the result on the dome.



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Available parameters in the Properties window for "Device":

Name	Explanation	Recommended range or settings
Name	Name of the external device	any
Further parameters	See comment below	
Animations	A click on the "..." button in the parameter field opens the Animation Editor.	
Number of Repetitions	Control process (with or without animations) can be repeated any number of times.	not repeated, repeated n times with n being an integer > 0, repeated infinitely
Start Time	Start time of the device in the current chapter	>= 00:00:00.000
End Time	End time of the device in the current chapter, computed automatically from "Start time" + "Duration"	> 00:00:00.000
Duration	Length in time of the object on the timeline	> 00:00:00.000

Every "External Device" contains further parameters in addition to those listed above, depending on the nature of the device. A lighting device, for example, has only one parameter: brightness ("Intensity").

5.13 Reading in a time code and setting a bookmark

A time code interface and time code trigger on the timeline permit powerdome to be synchronized with other devices (e.g., an audio system).

With bookmarks you can define selected positions in the show and jump to them during playback.

If you enter the tutorial here, open the following show: Chapter_14.show.xml.

This show already contains a plane image, which is faded in during the first 10 seconds and faded out starting at second 50.

If powerdome cannot read in a time code (time code not available), continue the tutorial with Step 5.

Step 1:

Set a trigger on the timeline. To do this, click the right mouse button on the timeline in the Editor mode, and select "Add Trigger". Select the trigger, and set its time to 00:00:00.000 in the Properties window. This places the trigger to the very start of the timeline.

Step 2:

If you started the show now, nothing would happen, as the show stops at the trigger (in this case, at the very start) and will not continue until an incoming time code supplies exactly the value entered for the trigger in the "Value" parameter. Thus, if your time code generator always starts at 0 and you want to ensure that powerdome starts a show together with an external device, enter a value greater than 0 (e.g., 00:00:10.000) for the "Value" parameter of the trigger in powerdome. The show and the external device then start together as soon as the respective value (10 seconds) is received by the time code interface.

If your time code starts, e.g., at 1:00:00.000 rather than at 0, set the value to 1:00:10.000, accordingly.

Step 3:

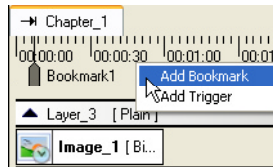
Reset your time code generator to the start value, load the show (Sync and Play buttons), and start the time code signal. Powerdome waits until the time code interface supplies the value 00:00:10.000, and then starts the show. In this way you can synchronize any number of devices with the time code.

Step 4:

To delete the trigger previously created, clicking on it with the right mouse button, select **Remove Trigger** in the context menu, and confirm with "Yes".

Step 5:

Next you will set two bookmarks within the show. Click the right mouse button on the timeline, and select **Add Bookmark** from the context menu.



Set the "Time" parameter of this bookmark to 10 seconds in the Properties window. Create another bookmark, and set its "Time" value to 50 seconds.

Step 6:

Play the show, and use the "<<" and ">>" buttons in Player Control to jump back and forth between the bookmarks you created.



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5.14 Circle

Within the planetarium functions, powerdome provides predefined astronomical great circles such as equator, ecliptic and meridian. In addition, you can define your own lines, scales and grids. The following chapters present the elements Circle, Scale and Grid with their parameters and capabilities. Chapter 5.17 deals in depth with LineSets (connecting lines). If you enter the tutorial here, open the following show: Chapter_15.show.xml.

This show contains the stars, the equator and the ecliptic for orientation. The sky has been revolved that Rigel (in Orion) is visible. The task is to mark Rigel by a little circle.

Step 1:

Add a new track to the layer containing the planetarium element.

Step 2:

Activate the "Lines" tab in the Resources window. With the left mouse button kept depressed, drag the button "New Circle" to the track, and move the new show element to the very start of the track.



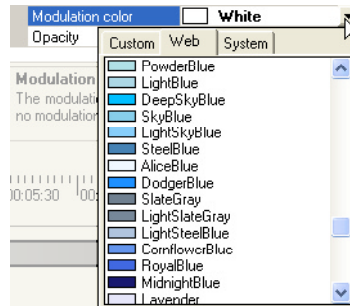
Step 3:

Change the parameter "Color" of the Circles in the Properties window to 0, 162, 255, to obtain a light blue hue. The default setting is "White". To enter the new color, overwrite the entry "White" with the above RGB value.

Color 0; 162; 255

On an English operating system, separate the RGB values by commas; on a German one, by semicolons.

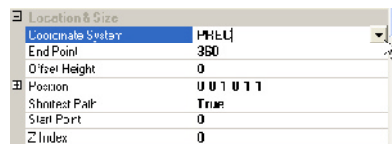
Instead of defining the RGB values, you may select a light blue from the pull-down menu.



Step 4:

Now if you look at the show with the settings made so far, you will hardly discern the circle, as by default it is presented as a great circle on the dome horizon. To change this, proceed with Step 5.

To couple the circle to the planetarium sky, change the "Coordinate system" parameter to "PREC".



This changes the coordinate system for the circle. Now the circle is located right on the equator and participates in the sky motions.

The setting "PREC" causes the circle to take part in the precessional motion and in all those motions standing above PREC in the "Coordinate system" list box (diurnal, polar altitude and azimuth motions). If you want to create an element taking part, e.g., in all motions except precession, select "DIUR". In this case, the element will follow the diurnal motion and all motions listed above it.

Step 5:

To assign the circle a radius of 1°, change the value of the "Offset latitude" parameter from 0 to 89.



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The parameter "Offset latitude" shifts the circle up or down from its great circle position (dome horizon, if "Coordinate system" equals "None"; equator, if "Coordinate system" is unequal to "None"). Meaningful values range from 90° to -90°. If you enter a value of, say, 20°, the great circle is converted into a height circle running in parallel to the dome horizon at a height of exactly 20° ("Coordinate system" = "None"). If you set the value to 89° now, the circle will be drawn around the dome at a height of 89° and thus has a radius of 1°.

Step 6:

If you carry out this tutorial on a stand-alone computer (e.g., desktop PC or laptop), set the "Line thickness" parameter of the circle to 0.5 to make the circle well visible in the Player.

Step 7:

Click on the Sync button and then on Play to see the circle in its current position. It exactly encircles the North celestial pole with a radius of 1°.

Step 8:

Rigel is situated at the coordinates 78.63° right ascension (RA) and 8.20° declination (DE). The coordinates for individual stars can be taken from an atlas or an astronomy software program. Convert right ascension into degrees. For correct positioning of the circle, the astronomical coordinates have to be converted into the parameters required by powerdome. Use the equations:

$$\begin{aligned} \text{Longitude}_{\text{powerdome}} &= 360^\circ - \text{RA}_{\text{astronomical}} \\ \text{Latitude}_{\text{powerdome}} &= \text{DE}_{\text{astronomical}} - 90^\circ \end{aligned}$$

For the position of the circle around Rigel, we get:

$$\begin{aligned} \text{Longitude}_{\text{Rigel}} &= 360^\circ - 78.63^\circ \\ &= 281.36^\circ \\ \text{Latitude}_{\text{Rigel}} &= -8.20^\circ - 90^\circ \\ &= -98.20^\circ \end{aligned}$$

Enter the values for the "Longitude" and "Latitude" parameters of the circle (under "Position").

Step 10:

Click on the Sync button, and then on Play. In the East part of the dome, you see Rigel marked by a light blue circle.

If you care for some exercise here, you may turn on the circle at the beginning of the show, turn it off at the end, and then mark some more stars by circles.

Available parameters in the Properties window for "Circle":

Name	Explanation	Recommended range or settings
Coordinate System	For planetarium objects you can define the astronomical motion you want the circle to take part in. Select PREC to include all revolutions.	None, AZI, DIUR, POL, PREC
End Point	If this value is < 360, you obtain a segment of the circular line (an arc) only.	[0...360]
Offset Latitude	Shifts the circle up or down from its default position and changes its radius in terms of degrees.	[-90...90]
Position	Defines the position of the circle on the dome in terms of longitude and latitude, rotation about its own axis ("Roll"), the distance from the observer ("Radius"), and a scaling factor each for the width and height of the image ("ScaleWidth", "ScaleHeight").	Longitude: [0...360] Latitude: [-90...90] Roll: [0...360] Values for Longitude, Latitude and Roll may be > 360 and < 0 Radius: > 0 ScaleWidth: > 0 ScaleHeight: > 0
Shortest Path	Defines whether the arc between Start Point and End Point is to be shortest.	True, False
Start Point	If this value is >0, you obtain a segment of the circular line (an arc) only.	[0...360]
Z Index	Defines the sequence of presentation of all objects on the same layer. The greater the Z Index, the further in the foreground is the circle. You can enter floating point numbers to be able to insert any number of further objects in between the objects already arranged.	>= 0
Animations	A click on the "..." button in the parameter field opens the Animation Editor.	
Number of Repetitions	The circle (with or without animations) can be repeated any number of times.	not repeated, repeated n times with n being an integer > 0, repeated infinitely
Start Time	Start time of the circle in the current chapter	>= 00:00:00.000
End Time	End time of the circle in the current chapter, computed automatically from "Start time" + "Duration"	> 00:00:00.000
Duration	Length in time of the circle on the timeline	> 00:00:00.000

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Available parameters in the Properties window for “Circle”:

Name	Explanation	Recommended range or settings
Color	Color of the circle	RGB color value, e.g., 255, 0, 0 for Red
Dot Distance	If Dotted=True, dotted line with dot spacing in degrees	> Line Thickness + Dot length
Dot Length	Line of elliptical instead of circular dots	>= 0
Dotted	Dotted line (True) or solid line (False)	True, False
Line Thickness	Thickness of the circle line	> 0,1
Opacity	Opacity of the circle: 0 means the circle is completely transparent, i.e. invisible; 1 means it is completely opaque, i.e. it is completely visible. Any values between 0 and 1 are possible.	[0...1]

5.15 Scale

A scale is largely identical to a circle, save that it has graduation lines across it. Graduation lines are available in three lengths: short, medium and long. You can set different properties for each of these lengths. Just as circles, scales can be created with solid or dotted lines. The graduation lines, too, can be solid or dotted.

In this chapter you will create an azimuth scale.

Open the show: "chapter_16.show.xml".

This file also contains the light blue circle around Rigel, that you created in Chapter 5.15.

Step 1:

Add a new track to the layer containing the planetarium element.

Activate the "Lines" tab in the Resources window. Drag the "New Scale" icon onto the track, and move the element to the start of the timeline.



Step 2:

In the default setting, the scale is placed exactly on the dome horizon. For a better view of the cardinal points, set the value of "Offset Latitude" to 4. This raises the scale to a level of 4° above the dome horizon.

Leave the value of "Coordinate system" at "None", as the cardinal points are to remain in fixed positions relative to the dome and not to take part in any sky revolutions.

Step 3:

For the scale's graduation lines you can define three different lengths and thicknesses. The parameters are named: "Graduation lines..." (short graduations), "Medium Graduations..." and "Long Graduations..." . You can set the parameters (length, thickness, color, etc.) of each of these kinds separately. A scale may have one, two or all three kinds of graduations (short, medium, long).

Create an azimuth scale with a short graduation every 5°, a medium one every 45°, and a long one every 90°. In this tutorial we will make the graduations somewhat longer than the normally optimum sizes, so that you can follow the effect of each setting. The graduations used in actual shows should be somewhat shorter.

Change the value of the "Graduation Interval" parameter for the scale to 5, and "Graduation Line Length" to 2 (degrees). Then click on Sync and Play to see the newly created scale on the dome, with graduations every 5°.

Step 4:

To create the medium and long graduations, enter the value 9 for "Medium

Graduation Alignment	Centered
Graduation Color	<input type="checkbox"/> White
Graduation Distance	5
Graduation Length	1
Graduation Thickness	0.15
Graduation Dotted	False
Out Distance	5
Out Length	0
Dotted	False
Collection	(Collection)
Large Graduation Distance	0
Long Graduation Color	<input type="checkbox"/> White

Graduation Interval", the value 18 for "Long Graduation Interval", the value 3 for "Medium Graduation Line", and the value 4 for "Long Graduation Line Length". Then click on Sync and Play to see the scale with the three kinds of graduations on the dome.

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Value 9 for "Medium Graduation Interval" says that every 9th of the short graduations will be drawn as a medium-length graduation. As the short graduations are spaced 5° from each other, there will be a medium one every 45° ($9 \times 5^\circ$). Analogously, value 18 for "Long Graduation Interval" means that every 18th of the short graduations will be drawn as a long graduation; i.e. a long graduation line will be seen every 90° ($18 \times 5^\circ$).

By their different lengths, the graduation lines are better distinguished. With the setting you made, the length of the short graduations is 1° , of the medium ones 2° , and of the long ones 4° .

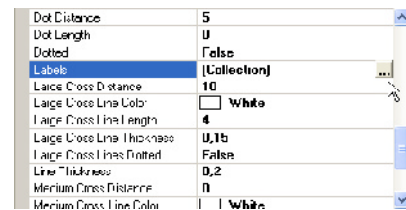
Step 5:

Set the value of "Graduation Alignment" to "Top". Now if you reload the scene (Sync and Play buttons), you can see that all graduation lines are aligned above the main scale line.

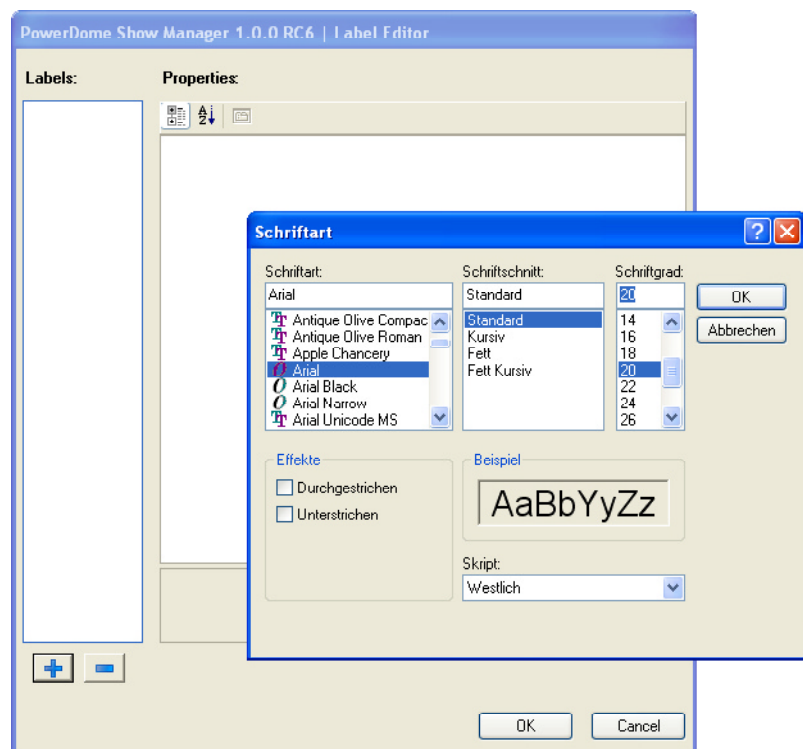
"Bottom" would align the graduations below the main line. Mind that a change of the "Graduation Alignment" parameter will not change the lengths of the graduations but merely shift them up or down with their full lengths.

Step 6:

Next, the scale needs labeling. This is done by means of the Label Editor. Scroll the Resources window somewhat down, and click into the field of the "Labels" parameter. On the right, a button marked by three dots ("...") appears.



Click on the "..." button to open the Label Editor.



Step 7:

In the Label Editor, click on the Plus button to open a font list box. Select "Arial" as a font, and "20" as a font size. Click on OK to open the "Edit Text" dialog box. Merely enter a capital "S" (for South), and confirm with "OK".



On the left margin of the Label Editor, Label 1 is now listed. This box shows all labels belonging to the scale selected. Close the Label Editor with a click on "OK", and inspect the labeled scale (Sync and Play buttons).

Step 8:

You can see that the label "S" exactly overlies the long graduation in the South. To prevent this, go back to the Label Editor, click on Label 1 in the "Labels" list, and change the value of the "Vertical Shift" parameter from 2 to -2. Now the labeling is 2° below the scale.

For exercise, you may create another three labels for North, East and West. To shift the Labels to 90°, 180° and 270°, use the "Horizontal Shift" parameter.

Step 9:

If you like, you may have powerdome show the lines of the scale as dotted lines in the following steps. For this purpose, change the parameters "Dotted", "Dot Spacing" and "Line Thickness" to the following values:

Dotted	True
Dot Spacing	1
Line Thickness	0.5

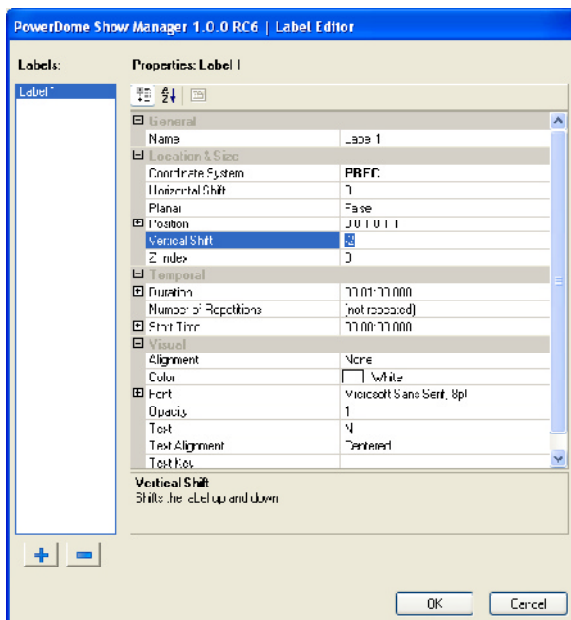
With these three parameter settings, the main line will appear dotted. Click on the Sync and Play buttons to see it.

Step 10:

Now you may also have the graduations appear as dotted lines. To do this, change the following parameters:

Graduation Lines Dotted	True
Graduation Line Thickness	0.5
Medium Graduation Lines Dotted	True
Medium Graduation Line Thickness	0.5
Long Graduation Lines Dotted	True
Long Graduation Line Thickness	0.5

Reload the show (Sync and Play) to see the entire scale as dotted lines.





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Available parameters in the Properties window for "Scale":

Name	Explanation	recommended range of settings
Coordinate System	For planetarium objects you can define the astronomical motion you want the scale to take part in.	None, AZI, DIUR, POL, PREC
End Point	If this value is < 360, you obtain a segment of the circular line (an arc) only.	[0...360]
Offset Latitude	Shifts the scale up or down from its default position and changes its radius in terms of degrees.	[-90...90]
Position	Defines the position of the scale on the dome in terms of longitude and latitude, rotation about its own axis ("Roll"), the distance from the observer ("Radius"), and a scaling factor each for the width and height ("ScaleWidth", "ScaleHeight").	Longitude: [0...360] Latitude: [-90...90] Roll: [0...360] Values for Longitude, Latitude and Roll may be > 360 and < 0 Radius: > 0 ScaleWidth: > 0 ScaleHeight: > 0
Shortest Path	Defines whether the arc between Start Point and End Point is to be shortest.	True, False
Start Point	If this value is >0, you obtain a segment of the circular line (an arc) only.	[0...360]
Z Index	Defines the sequence of presentation of all objects on the same layer. The greater the Z Index, the further in the foreground is the scale. You can enter floating point numbers to be able to insert any number of further objects in between the objects already arranged.	>= 0
Animations	A click on the "..." button in the parameter field opens the Animation Editor.	
Number of Repetitions	The scale (with or without animations) can be repeated any number of times.	not repeated, repeated n times with n being an integer > 0, repeated infinitely
Start Time	Start time of the scale in the current chapter	>= 00:00:00.000
End Time	End time of the scale in the current chapter, computed automatically from "Start time" + "Duration"	> 00:00:00.000
Duration	Length in time of the scale on the timeline	> 00:00:00.000
Graduation Alignment	Defines whether the graduation lines are aligned above (Top) or below (Bottom) the main line, or centered (Centered) on it.	Centered, Top, Bottom
Graduation Line Color	Color of the short graduations	RGB color value, e.g., 255, 0, 0 for Red

Available parameters in the Properties window for "Scale":

Name	Explanation	Recommended range of settings
Graduation Interval	Spacing of the short graduations in degrees	≥ 1
Graduation Line Length	Length of short graduations in degrees	$>$ line thickness
Graduation Line Thickness	Thickness of short graduations in degrees	≥ 0.1
Graduation Line Dotted	Defines whether short graduations are dotted or solid.	True, False
Dot Spacing	Spacing of dots of the main line in degrees (Dotted=True)	$>$ Line thickness + Dot length
Dot Length	Main line with elliptical dots instead of circular ones	≥ 0
Dotted	Dotted (True) or solid (False) main line	True, False
Labels	A click on the "... " button in the parameter field opens the Label Editor.	
Long Graduation Interval	Factor for spacing long graduations (4 = every fourth one)	≥ 1
Long Graduation Line Color	Color of the long graduations	RGB color value, e.g., 255, 0, 0 for Red
Long Graduation Line Length	Length of long graduations in degrees	$>$ Line thickness
Long Graduation Line Thickness	Thickness of long graduations in degrees	$\geq 0,1$
Long Graduation Lines Dotted	Defines whether long graduations are dotted or solid.	True, False
Line Thickness	Line thickness of the scale	> 0.1
Medium Graduation Interval	Factor for spacing medium-length graduations (2 = every second one)	≥ 1
Medium Graduation Line Color	Color of medium-length graduations	RGB color value, e.g., 255, 0, 0 for Red
Medium Graduation Line Length	Length of medium-length graduations in degrees	$>$ Line thickness
Medium Graduation Line Thickness	Thickness of medium-length graduations in degrees	≥ 0.1
Medium Graduation Line Dotted	Defines whether medium-length graduations are dotted or solid.	True, False
Color	Color of the scale	RGB color value, e.g., 255, 0, 0 for Red
Opacity	Opacity of the scale: 0 - transparent, i.e. invisible; 1 - completely opaque, i.e. completely visible. Any values between 0 and 1 are possible.	[0...1]



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5.16 Grid

In powerdome you can create grids according to your requirements, defining their horizontal and vertical line spacings, colors, etc. In this chapter you will create an ecliptical grid.

If you enter the tutorial here, open the following show: Chapter_17.show.xml.

Step 1:

For greater lucidity, first delete the scale you created in chapter 5.15. To do this, click the right mouse button on the element. In the context menu that opens, select "Remove Object(s)" and confirm with "Yes".

Step 2:

In the Resources window, activate the "Lines" tab, and drag the "New Grid" icon onto the track that contained the scale.



Move the new element to the start of the timeline.

Step 3:

Click on Sync and then on Play to see the default grid on the dome.

Step 4:

The grid is oriented relative to the dome horizon. Set the "Coordinate system" parameter from "None" to "PREC". This couples the grid to the equator and makes it take part in all astronomical motions, i.e. AZI, POL, DIUR and PREC.

The grid will follow the selected motion and all motions listed above it in the pull-down menu.

Step 5:

After click on Sync and Play you can see that the grid is now aligned with the equator. In order to align it with the ecliptic as well, set the "Roll" parameter for the grid (under "Position" in the Properties window) to -23.44. Reload the

show (Sync, Play) to see that the grid is now aligned with the ecliptic.

The "Roll" parameter effects a revolution about the Z axis. In powerdome, the Z axis is aligned to connect the two points of intersection between equator and ecliptic (vernal and autumnal equinox points).

The "Longitude" parameter (also to be found under "Position") defines a revolution about the Y axis relative to the equator. This axis runs from the North to the South pole. Accordingly, the X axis (the "Latitude" parameter under "Position") extends from East to West.

These axes refer to the celestial equator as long as an element is linked to the astronomical sky (via "Coordinate system"). However, if the element is arranged in a fixed position relative to the dome, the axes do not refer to the sky but to the dome. That is, the X axis runs from East to West, the Y axis from nadir to zenith, and the Z axis from North to South.

Step 6:

The height and latitude circles of the grid are spaced 15° by default. Adapt the grid to obtain longitude circles spaced 10°. Change the value of the "Longitudinal Distance" parameter to 10 (degrees), and that of "Latitudinal Distance" to 5 (degrees), and the color "Grid Line Color" to "Red".

Please note: The "Longitudinal Spacing" parameter defines the spacing between the longitude circles, and the "Latitudinal Spacing" parameter the spacing between the latitude circles.

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Powerdome gives you several possibilities to set colors. You may enter RGB values separated by commas (e.g., 255, 0, 0), or a color name predefined in powerdome (e.g., Red). Alternatively you can select from a great number of predefined colors. If you click into the right-hand field for a color parameter in the Properties window (e.g., "Grid Line Color"), a button carrying an arrow appears. Click on this button to open a pull-down menu. Here you can select between user-defined, Web and system colors.

The color of a grid can be set with two parameters: "Color" and "Grid Line Color". Each grid in powerdome has two great circles, which intersect at 90° at the grid's pole, and the color of which is specified by the "Color" parameter. The color of all other grid lines is defined by the "Grid Line Color" parameter.

In Step 6, you used "Grid Line Color" to set the color to red, but the two great circles remained white, the default color.

Step 7:

If you click on Sync and Play now, you can see the changed grid with a spacing of 10° between the longitude circles, and 5° between the latitude circles.

Step 8:

The lines of the ecliptical grid do not yet run through the 10°, 20°, and 30° marks of the ecliptic. This is because the ecliptic is offset by about 1°, because the intersection with the equator falls on March 21. To align the grid, set the "Longitude" parameter (below "Position") to 1.

Available parameters in the Properties window for "Grid":

Name	Explanation	Recommended range or settings
Coordinate System	For planetarium objects you can define the astronomical motion you want the grid to take part in.	None, AZI, DIUR, POL, PREC
Position	Defines the position of the grid on the dome in terms of longitude and latitude, rotation about its own axis ("Roll"), the distance from the observer ("Radius"), and a scaling factor each for width and height ("ScaleWidth", "ScaleHeight").	Longitude: [0...360] Latitude: [-90...90] Roll: [0...360] Values for Longitude, Latitude and Roll may be > 360 and < 0 Radius: > 0 ScaleWidth: > 0 ScaleHeight: > 0
Z Index	Defines the sequence of presentation of all objects on the same layer. The greater the Z Index, the further in the foreground is the grid. You can enter floating point numbers to be able to insert any number of further objects in between the objects already arranged.	>= 0
Animations	A click on the "..." button in the parameter field opens the Animation Editor.	
Number of Repetitions	The grid (with or without animations) can be repeated any number of times.	not repeated, repeated n times with n being an integer > 0, repeated infinitely
Start Time	Start time of the grid in the current chapter	>= 00:00:00.000
End Time	End time of the grid in the current chapter, computed automatically from "Start time" + "Duration"	> 00:00:00.000
Duration	Length in time of the grid on the timeline	> 00:00:00.000
Dot Spacing	Defines the spacing of the dots of the great circle lines in degrees (Dotted=True).	> Line thickness + Dot length
Dot Length	Line of elliptical instead of circular dots	>= 0
Dotted	Great circle lines dotted (True) or solid (False)	True, False
Grid Line Color	Color of the other lines of the grid	RGB color value, e.g., 255, 0, 0 for Red
Grid Line Dot Spacing	Defines the spacing of dots of the other lines of the grid in degrees.	> Grid line thickness + Grid line dot length
Grid Line Dot Length	Other grid lines of elliptical instead of circular dots	>= 0

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Available parameters in the Properties window for "Grid":

Name	Explanation	Recommended range of settings
Grid Line Thickness	Thickness of the other grid lines	> 0.1
Grid Lines Dotted	Other grid lines dotted (True) or solid (False)	True, False
Longitudinal Spacing	Spacing between the longitudinal circles	[1...90]
Line Thickness	Spacing between the longitudinal circles	> 0.1
Color	Color of the 90° and 180° longitude circles	RGB color value, e.g., 255, 0, 0 for Red
Opacity	Opacity of the grid: 0 - transparent, i.e. invisible; 1 -completely opaque, i.e. completely visible. Any values between 0 and 1 are possible.	[0...1]
Latitudinal Spacing	Spacing between the latitudinal circles	[1...45]

Note: The 90° and 180° longitude circles can be set independently from all other lines. Therefore, the settings for these great circles are the same as for the other lines. "Dot Spacing" refers to the dot spacing of the 90° and 180° longitude circles, "Grid Line Dot Spacing" to the dot spacing of the other lines. All parameters beginning with "Grid Line..." only refer to the other lines.

5.17 Connecting lines (LineSet)

LineSets consist of arcs of great circles. You can create any number of such arcs and assemble them into a LineSet. In this way you can, e.g., connect stars by line drawings. In this chapter we will emphasize the figure of the Big Dipper (called the Plough in Britain) by a line drawing.

If you enter the tutorial here, open the following show: Chapter_18.show.xml.

Step 1:

Cancel the grid you created in chapter 5.16 (click the right mouse button on the grid element, then on "Remove Object(s)"; confirm with "Yes").

Step 2:

To have the Big Dipper right in the South, change the position of the planetarium object as follows: Delete the existing DIUR motion. Set the two keyframes of the POL motion to 90, generate a new AZI revolution, and set the values of the two keyframes to 180. (For creating animations for planetarium objects, see chapter 5.9.)

Step 3:

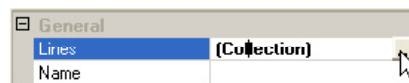
When you load the show now (Sync, Play), you can see the Big Dipper in the South, at a height of approx. 50°. Select the "Lines" tab. Drag the "New LineSet" icon onto the track that just became empty.



Move the show element to the very start of the timeline, and set the "Coordinate system" parameter for the connecting lines (LineSet) to "PREC" to couple it to the star motion.

Step 4:

To create the lines, use the Line Editor. Let the first line connect the two outer stars of the dipper handle (Benetnasch, also known as Alkaid [Eta UMa], and Mizar [Zeta UMa]). Click on the "LineSet" and then into the field for the "Lines" parameter in the Properties window. This makes the "..." button appear.



Click on this button to open the Line Editor.

Step 5:

In the Line Editor, click on the Plus button, then select the newly created line "Line 1" in the "Lines" field, and enter the following values in the properties window:

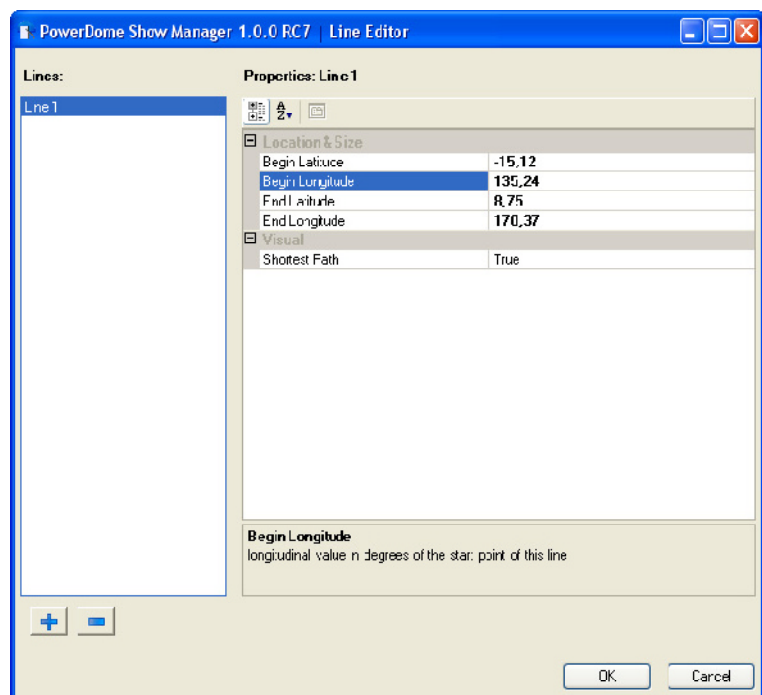
begin longitude:	153.11
begin latitude:	49.31
end longitude:	159.02
end latitude:	54.93

Close the Line Editor, and look at the connecting line (Sync, Play). It connects the outer two stars of the handle.

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As a special feature, powerdome allows you to change coordinate systems by the setting of parameters, and to couple them to, or uncouple them from, astronomical motions. Thus, astronomical coordinate names such as azimuth, height, right ascension and declination apply only to particular parameter settings. To avoid faulty and misleading terms, powerdome are generally given as "Longitude" and "Latitude".





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The start and end positions for lines connecting the stars you will find in an astronomical atlas or an astronomy software program. The coordinates for Benetnasch and Mizar are:

Benetnasch: RA 206.89°
DE 49.31°
Mizar: RA 200.98°
DE 54.93°

You can use the declination directly; determine the second coordinate from right ascension:

$$\text{pos} = 360 - \text{RA}$$

Hence, for Benetnasch:
 $360 - 206.89 = 153.11$
and for Mizar:
 $360 - 200.98 = 159.02$,
the values specified above.

Step 6:

To represent the entire figure of the Big Dipper by a line drawing, create another six lines in the Line Editor, with the following parameters:

Line 2:
begin longitude: 159.02
begin latitude: 54.93
end longitude: 166.49
end latitude: 55.96

Line 3:
begin longitude: 166.49
begin latitude: 55.96
end longitude: 176.14
end latitude: 57.03

Line 4:
begin longitude: 176.14
begin latitude: 57.03
end longitude: 194.07
end latitude: 61.75

Line 5:
begin longitude: 194.07
begin latitude: 61.75
end longitude: 194.54
end latitude: 56.38

Line 6:
begin longitude: 194.54
begin latitude: 56.38
end longitude: 181.54
end latitude: 53.69

Line 7:
begin longitude: 181.54
begin latitude: 53.69
end longitude: 176.14
end latitude: 57.03

Step 7:

Now change the color of the connecting lines. Set the parameter "Color" for "LineSet" to 0, 162, 255 (blue).

If you want the lines to end somewhat short of the stars rather than to cover them, change the value of the "Line End Distance" parameter to 0.5, and look at the result (Sync, Play).

All lines in the "LineSet" now end 0.5° off the stars.

Available parameters in the Properties window for "LineSet":

Name	Explanation	Recommended range of settings
Lines	A click on the "..." button in the parameter field opens the Line Editor.	
Name	Name of the LineSet	any
Coordinate System	For planetarium objects you can define the astronomical motion you want the LineSet to take part in.	None, AZI, DIUR, POL, PREC
Position	Defines the position of the LineSet on the dome in terms of longitude and latitude, rotation about its own axis ("Roll"), the distance from the observer ("Radius"), and a scaling factor each for the width and height ("ScaleWidth", "ScaleHeight").	Longitude: [0...360] Latitude: [-90...90] Roll: [0...360] Values for Longitude, Latitude and Roll may be > 360 and < 0 Radius: > 0 ScaleWidth: > 0 ScaleHeight: > 0
Z Index	Defines the sequence of presentation of all objects on the same layer. The greater the Z Index, the further in the foreground is the LineSet. You can enter floating point numbers to be able to insert any number of further objects in between the objects already arranged.	>= 0
Animations	A click on the "..." button in the parameter field opens the Animation Editor; see chapter 4..	
Number of Repetitions	Line Set (with or without animations) can be repeated any number of times.	not repeated, repeated n times with n being an integer > 0, repeated infinitely
Start Time	Start time of the LineSet in the current chapter	>= 00:00:00.000
End Time	End time of the LineSet in the current chapter, computed automatically from "Start time" + "Duration"	> 00:00:00.000
Duration	Length in time of the LineSet on the timeline	> 00:00:00.000
Dot Spacing	If Dotted=True, dotted line with dot spacing in degrees	> Line thickness + Dot length
Dot Length	Line of elliptical instead of circular dots	>= 0
Dotted	Dotted line (True) or solid line (False)	True, False

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Available parameters in the Properties window for "LineSet":

Name	Explanation	Recommended range or settings
Line End Distance	Permits the lines to end at a defined distance from their start and end target points and thus prevents them from hiding the stars they connect.	[0...2]
Line Thickness	Thickness of the line	> 0.1
Color	Color of the connecting lines	RGB color value, e.g., 255, 0, 0 for Red
Opacity	Opacity of the circle: 0 - transparent, i.e. invisible; 1 - completely opaque, i.e. completely visible. Any values between 0 and 1 are possible.	[0...1]

5.18 Groups, Copy/Paste and Undo/Redo

Groups facilitate the creation of animations for several like objects. If you have positioned, e.g., several plane images on the dome that you want to fade in or out together, you can group these images and create a single opacity animation for the whole group.

In addition to grouping, this chapter also familiarizes you with the Copy/Paste and Undo/Redo functions in powerdome.

If you enter the tutorial here, open the following show: Chapter_19.show.xml.

In this chapter you will create a »Show« with three plane images to be jointly faded in and faded out again.

Step 1:

Delete the elements "Circle_1" and "LineSet_1". Also delete the planetarium resource. To do this, select the "Planetarium" tab in the Resources window, and delete the "default.planetarium.xml" resource there (click the right mouse button on it, and select "Remove Resource" in the context menu). Otherwise the digital planetarium would be loaded with every Sync action even though it is not required.

Deleting the resource will also delete the "Planetarium_1" show element from the timeline.

Step 2:

Now insert the plane image named "HST.dds", (under "T:\Planar Pictures") into the topmost track on the timeline (for insertion, see chapter 5.2, steps 2 and 4), and set the "Start Time" parameter of the image to 00:00:00.000. Let us now copy and paste the new show element twice. Click on the image on the timeline, and drag it onto the track below it, keeping both the left mouse button and the <Ctrl> key of the computer keyboard depressed.

The element has thus been duplicated (copied). The copy is located in the track below the top one. The copied image element has the same properties as the original. Repeat the copy action to copy the image to the bottom track as well.

Step 3:

To distribute the three images over the dome, set the "Longitude" parameter of one of the images (under "Position") to 120, that of another to -120, and leave that of the third one at 0.

To fade the three images in simultaneously, you have two options.

Step 4:

Option 1: Copy/Paste Animations

Create a simple animation on the first track for fading the image in and out (for creating animations, see chapter 5.3, steps 1-9). To apply the same animation to the other two images, select the animated image element with the right mouse button, and select **Copy Animations** in the context menu. Click the right mouse button on the other two images, and select **Paste Animations**.

If the first element is provided with several animations, all of them will be applied to the other images. However, to enable animations to be copied from one element to another, the source and target elements must be of equal length.

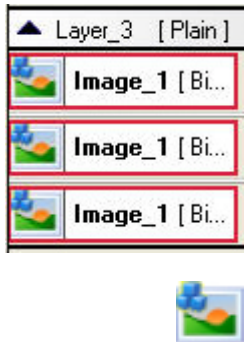
Step 5:

You can undo your last action(s), either by selecting the **Undo** command in the **Edit** menu, or using the key combination <Ctrl>+<Z>.

Have a try: Undo your last action (copying the animations). As you undo the animation, the little watches at the left end of the element disappear. Repeat the Undo action twice until the watches at all elements have disappeared. If you undo further actions, the "Longitude" parameter of the images will be reset from 120 and -120 to 0 again.

To restore an action undone, use the **Redo** command in the **Edit** menu, or the key combination <Ctrl>+<Y>. Redo the undone positioning actions until the two images are positioned on the dome as before. Do not redo the animations.

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Step 6:

Option 2: Groups

The same result (simultaneous fading in of the three images) can be obtained by grouping the three elements and creating a single animation.

To group the three image elements, click on all three elements on the timeline, while keeping the <Ctrl> key depressed. The selected elements are marked by a red frame. Now click the right mouse button on one of the elements, and select **Group selected objects**. Each of the selected elements is marked with an icon (3 blue cubes to the left of it) to indicate their group association. In the properties window you will find the properties of the group.

Objects to be grouped must satisfy two conditions:

1. *Objects in a group must be of the same type, i.e. a group can contain, e.g., plane images only, or lines only, etc.*
2. *The objects to be grouped must have the same Start time and the same Duration.*

Note: It is also possible to group plane images with plane videos, or full-dome images with full-dome videos, as long as condition 2 is satisfied.

Step 7:

You can remove any of the elements from a group by clicking the right mouse button on the element, selecting **Remove object from group** in the context menu, and confirming with "Yes". Remove two images from the group. The little cubes to the left of the elements disappear. Undo the removal of the two elements from the group by hitting <Ctrl>+Z twice. The little cubes reappear, which means the elements belong to the group again.

Step 8:

Create an "Opacity" animation for one of the three show elements of the group. All three elements are faded in and out together.

If you want to animate several elements with different start times, use the functions **Copy Animations** and **Paste Animations** (see Step 4).

If the elements differ also by their duration, first create the elements so that they have the same duration (e.g., 1 minute), copy the desired animations to all elements, and then vary the durations of the elements as desired. This will automatically scale the keyframes as well. If you proceed differently, keyframes of objects of shorter duration might get curtailed when you copy the animations.

6 Encoding Videos with the powerdome® MPEG Encoder

Powerdome includes the powerdome MPEG Encoder. This encoder converts the sequential »Dome Originals« (Frames) formatted as *.tga or *.jpg into a video in the MPEG format (*.m2v) so that powerdome can play them as full-dome videos. Full-dome shows bought from Carl Zeiss are encoded already and need not be converted.

There are two ways for encoding:

1. Encoding on the MASTER PC of the powerdome cluster, or on a separate computer not connected to powerdome.
2. Encoding on several computers of the powerdome cluster.

Note:

Encoding on a single computer is time-consuming. Depending on the computer capability, the encoding of 20,000 frames may take about 24 hours. You can cut the time considerably if you have the encoding performed on all computers of your cluster simultaneously and subsequently assemble the video segments thus created into a coherent video. In case of SPACEGATE QUINTO with a cluster of 6 computers the encoding of 20,000 frames can be accomplished in about 4 hours.

The directory of the powerdome MPEG Encoder (Default: C:\AllDome\MPEG Encoding) includes, in addition to the MPEG Encoder, a batch processing file (encode.bat), which needs to be adapted to the encoding process desired. Further, the directory contains files that assemble the video segments created by encoding on several computers into a whole video.

Note:

Encode the video and the preview at the same time, if possible, as the preview is needed by the powerdome ShowManager for display.

6.1 Parameter of the MPEG Encoder

The table on the following page explains the available parameters of the MPEG Encoder.

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Mind the file syntax of the dome originals. The consecutive numbers must be separated from the file designation.
Example for the first frame:

Show1_00000.jpg (correct)
Show100000.jpg (wrong)



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powerdome MPEG Encoder

Parameters of the MPEG Encoder

Parameter	Explanation
/p	Defines that a preview video will be created simultaneously with the main video (default)
/h	[optional] horizontal flip (mirror image) in the encoded video
/v	[optional] vertical flip (mirror image) in the encoded video
/s	Start frame. This defines the frame at which encoding is to start. Usually, this value is 0 or 1, depending on the designation of the first available file of the sequence of frames. If it is, e.g., Original_00000.tga, enter 0; if it is Original_00001.tga, enter 1. You may also encode parts of a video only. If you want to encode the part starting with frame 10,000, enter 10000.
/f	Number of frames to be encoded. Note: If the number of frames to be encoded exceeds the number of existing original frames, the program will add "black" frames at the end of the video.
/b	Bit rate of the encoded videos. Recommendation: 3k-video (3072x3072) 90000000, 2k-video (2048x2048) 70000000.
/srcgamma	Gamma value of the source data (Dome Originals). If the frames are computer-generated, this value is 1.8; if they are real images, please contact the producer of the imagery.
/destgamma	Gamma value of the encoded video. This value is the gamma value to which the projectors are set. The default setting is 1.8.
/n 1 /m 0	These parameters must always be entered in exactly this way; otherwise the videos created cannot be handled as desired.
/r	Frame rate of the encoded video, usually 30 for European (EBU), 29.97 for American (SMPTE) productions.
"Source path"	Path to the first file of the source data.
"Target path"	Path to the location at which you want to file the encoded video.
width, height	Width and height of the encoded video. Only use the following values: 3072, 2048, 1536 or 1024, and create square videos only (width = height).

6.2 Encoding on a stand-alone computer

Step 1:

In the directory of the powerdome MPEG Encoder, open the "encode.bat" file by clicking the right mouse button on it, and select **Edit** in the context menu.

Use this file as a pattern for the command with which you can start the MPEG Encoder. Here you have to adapt the parameters listed below.

Parameter designation	Explanation	Acts on the MPEG Encoder parameter
startframe	Index of the first frame	/s
numberframes	Number of frames to be encoded	/f
bitrate	Bit rate of the video	/b
srcgamma	Gamma value of the source data	/srcgamma
destgamma	Gamma value of the video	/destgamma
framerate	Frame rate of the video	/r
resolution	Frame size in pixels	"width" and "height"
srcfile	File name of the first source with complete path name	"Source path"
destfile	File name of the first source with complete path name	"Target path"

A typical entry looks like this:

```
set startframe=1
set numberframes=20000
set bitrate=90000000
set srcgamma=1.8
set destgamma=1.8
set framerate=30
set resolution=3072
set srcfile=\\SGQ-NAS\\Media\\Dome_Originals\\ZeissLogo\\zeiss_00001.tga
set destfile=\\SGQ-NAS\\Media\\ZeissLogo\\Logo.m2v
```

Note:

If your originals (source material) is on an external hard disk with USB or FireWire link, you need to create a "Sharing and Security" for the directory containing the originals, and use the name of this "Sharing and Security" in the complete path name for "srcfile".

Standard resolutions:

4k = 4096 x 4096 pixels
bitrate: 100 000 000

3k = 3072 x 3072 pixels
bitrate: 90 000 000

2k = 2048 x 2048 pixels
bitrate: 70 000 000



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Step 2:

Adapt all parameters in the file "encode.bat" file. Save the file under a new file name, e.g., MyVideo.bat. Close the file and start encoding with a double click on the file name. The progress of the encoding process and the remaining time to completion are displayed in a DOS window.

Note:

Watch for error messages in the DOS window and respond accordingly see the table below.

Error message	Explanation	Necessary action
GetImageFileMask failed!	The source files have not been found.	Cancel the encoding process (<Ctrl>+<C>) and check the entry for "srcfile" in the "encode.bat" or "MyVideo.bat" file.
M2v_enc: Probably illegal profile/level (max.than high)	This message will always be shown. It has no influence on creating the video.	none

Step 3:

After completion of the encoding process, you need to create two index files. To do this, open the Windows® Explorer, click the right mouse button on each of the newly created videos (main video and preview video), and in the context menu select **Send to > SeekIndexCreator**. Now, the respective index file is created automatically.

Index files are absolutely necessary for the powerdome ShowManager to load the video, to play it, and to jump within the video during playback.

6.3 Encoding on several computers of the powerdome cluster

Encoding on several computers of the cluster requires that the video to be encoded is split up into segments, each of which to be encoded on one computer. To do this, you need to specify, for each segment, the start index of the original frames, the number of frames to be encoded, and the name of the video segment.

In addition to the "encode.bat" file mentioned before, you need further files for assembling the segments.

These are "merge_all.bat" (assembly of video segments and preview segments), "merge_video.bat" (assembly of the video segments) and "merge_preview.bat" (assembly of the preview segments).

Step 1:

Execute the "encode.bat" file. Make the necessary entries as described above in chapter 6.2, Step 1. Save the file under a new name.

Set "startframe" to 1 and "numberframes" to the number of frames to be encoded.

The batch processing program "encode.bat" or the newly created file can be called up with three parameters.

Parameter 1: Index of the start frame (overwrites the internal value "startframe")

Parameter 2: Number of frames to be encoded (overwrites the internal value "numberframes")

Parameter 3: File name extension (e.g., a number of the video segment)

Step 2:

The encoding process on a client PC of the cluster can be started via the "RemoteExec program".

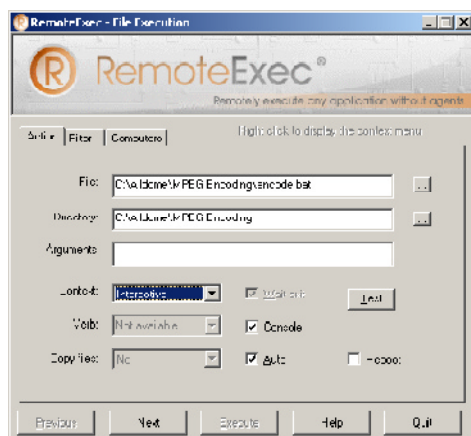
To start, select **Start > Programs > RemoteExec > RemoteExec**.

Step 3:

First, select the type of action to be taken: Click the right mouse button into the dialog box and select **Action type > File Execution**.

Select the file to be executed and the directory on the target computer, and make the entries and selections as shown in the screenshot below.

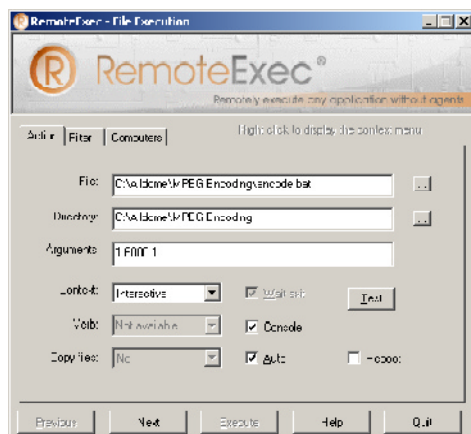
In the example, the file selected is "MyVideo.bat".



Under **Arguments**, enter the parameters for "startframe", "numberframes" and file name extension.

In the example, startframe=1, numberframes=6000 and file name extension 1.

Under Context, choose "interactive".



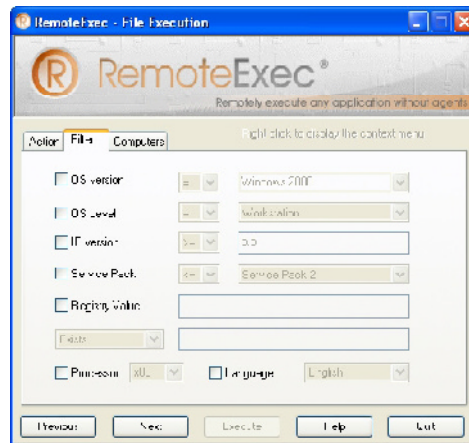
Step 4:

Click on the **Filter** tab, and check the settings according to the screenshot.



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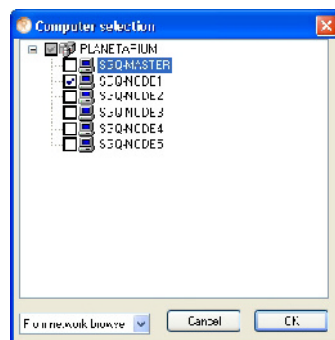
powerdome MPEG Encoder



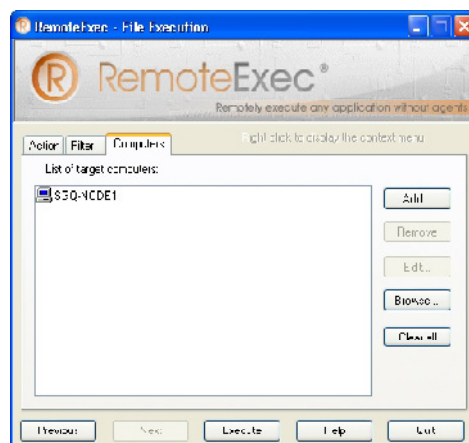
Step 5:

Click on the **Computers** tab, and select the computer on which you want the present segment to be encoded.

To do this, click on the **Browse...** button, and highlight one of the computers listed in the window.



Exit the dialog by clicking on the **OK** button.



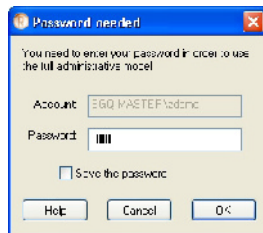
Click on the **Execute** button to start the encoding process.

Possibly, another dialog box may open that asks you to enter a password for the user "zdome".

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Enter the password "zdome", and click on OK.
A separate window displays the progress of the encoding process.

```
Command Line Console on SGQ-NODE1

C:\WINDOWS\Temp\d5ab9f08-dd4a-4bdc-93d0-62cca6365598>mpegencoder.exe /p /s 1 /f
300 /b 900000000 /srcgamma 1.8 /destgamma 1.8 /n 1 /m 0 /r 30 "\\SGQ-NAS\Medien\Do
me_Originals\ZeissLogo\zeiss_00001.tga" "\\SGQ-NAS\Medien\ZeissLogo\Logo1.m2v"
3072 3072
options
startFrame:      1
frameCount:      300
bitrate:         900000000
loop:            false
gamma:           1
y-offset:        16
MpegM:           0
MpegN:           1

m2v_enc: nanoPEG MPEG-2 Video Encoder Core Version 5010 - compiled Jun 21 2006
m2v_enc: Version Resource Info: 50000.30000
m2v_enc: Copyright (c) 1999-2004 nanocosmos informationstechnologien
m2v_enc: http://www.nanocosmos.de/

m2v_enc: System: Windows 5.1 2600, 2 CPU(s) at 3412 MHz, SSE2 mode
m2vLicense: DEMO / nanoPEG_XHD

m2v_enc: nanoPEG MPEG-2 Video Encoder Core Version 5010 - compiled Jun 21 2006
m2v_enc: Version Resource Info: 50000.30000
m2v_enc: Copyright (c) 1999-2004 nanocosmos informationstechnologien
m2v_enc: http://www.nanocosmos.de/

m2v_enc: System: Windows 5.1 2600, 2 CPU(s) at 3412 MHz, SSE2 mode
m2vLicense: DEMO / nanoPEG_XHD

m2v_enc: Probably illegal profile/level (max.than high)
Progress: 0.332225913621265 % RemainingTime: 25 minutes 0 seconds.
Progress: 0.996677740863783 % RemainingTime: 16 minutes 33 seconds.
Progress: 1.32890365448505 % RemainingTime: 18 minutes 34 seconds.
Progress: 1.99335548172758 % RemainingTime: 16 minutes 23 seconds.
Progress: 2.32558139534884 % RemainingTime: 17 minutes 30 seconds.
Progress: 2.65780730897009 % RemainingTime: 18 minutes 19 seconds.
```

Step 6:

Repeat steps 3 through 5 for the other computers, i.e. for the other segments of the video. Mind that you select only one computer at a time, and that you reset the arguments for "startframe", "numberframes" and file name extension accordingly.

If you want to encode a video with 35,000 frames and have a cluster of 6 computers, each computer would have to encode 5,834 frames ($35,000 / 6 = 5,834$ frames per computer). As you need to enter the numbers of the start frames of the segment to be encoded by each computer, it is advisable to round the number of frames for each computer to whole thousands: E.g., let each client PC of the cluster render 6,000 frames, and the master PC the remaining 5,000. Accordingly, the arguments for this example are:

Client PC 1: 1 6000 1
Client PC 2: 6001 6000 2
Client PC 3: 12001 6000 3
Client PC 4: 18001 6000 4
Client PC 5: 24001 6000 5
Master PC: 30001 5000 6



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Step 7:

When all computers have completed encoding, the segments have to be assembled into a whole video.

To do this, first process the "merge_all.bat" file: Enter the file names of the segments ("srcfile") and the file name of the whole videos ("destfile"). Make both entries with the complete path description, but without the file name extension. This is added automatically (".m2v").

A possible entry looks like this:

```
set srcfile=\\SGQ-NAS\Media\ZeissLogo\Logo
```

```
set destfile=\\SGQ-NAS\Media\ZeissLogo\LogoFinal
```

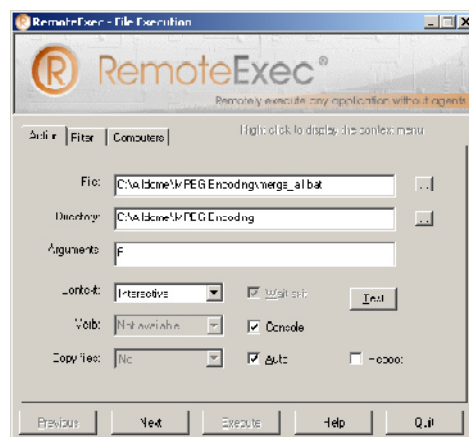
Save the file under a new file name, e.g., "merge_MyVideo.bat"

Step 8:

To start the file, continue using the "RemoteExec" program.

As argument for the program, enter a parameter stating the number of segments. With 5 client PCs and a master PC as in the above example, the argument is 6.

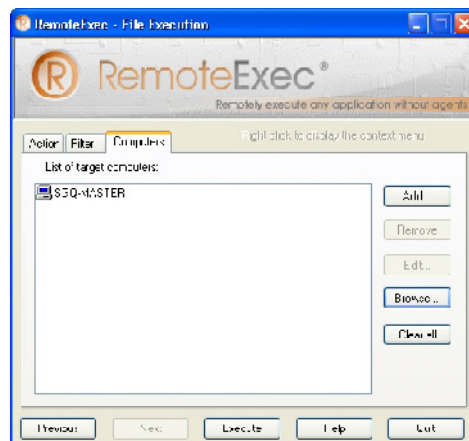
Under Context, choose "interactive".



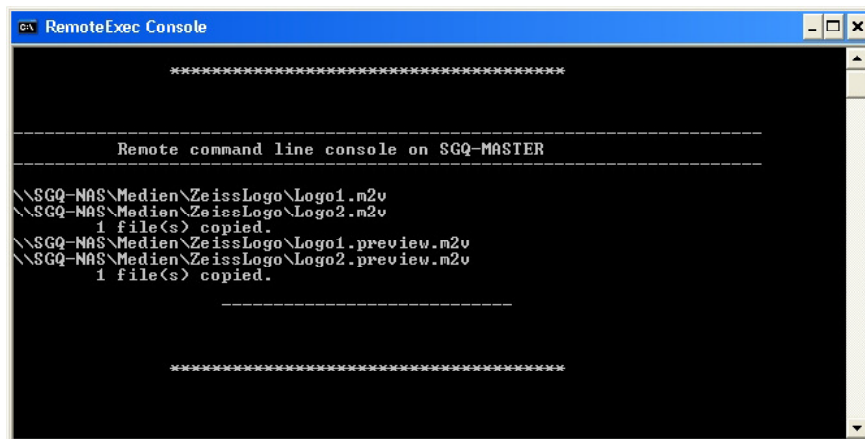
Step 9:

Check the setting on the **Filter** tab as in Step 4.

In the **Computers** tab, click on **Browse...** and select the master PC.



Click on the **Execute** button to start assembly of the segments into a whole video. The process of assembling can be watched in a DOS window. The screenshot below shows the assembling of two segments both for the video as well as of the preview.



```
RemoteExec Console

*****

-----
Remote command line console on SGQ-MASTER
-----

\\SGQ-NAS\Medien\ZeissLogo\Logo1.m2v
\\SGQ-NAS\Medien\ZeissLogo\Logo2.m2v
1 file(s) copied.
\\SGQ-NAS\Medien\ZeissLogo\Logo1.preview.m2v
\\SGQ-NAS\Medien\ZeissLogo\Logo2.preview.m2v
1 file(s) copied.

-----

*****
```

This completes the creation of the video and the preview.
Quit the "RemoteExec" program.

The segments of the video and of the preview can now be deleted by means of the Windows Explorer.

Note:

If you want to assemble the segments of the main video, use the "merge_video.bat" file as a pattern. If you want to assemble the segments of the preview only, use the "merge_Preview.bat" file as a pattern.

6.4 Handling several full-dome videos in a show

If you are compiling a show containing several full-dome videos, take note of the following:

1. In the ShowManager, leave a gap of at least two seconds on the timeline between two full-dome videos existing as two separate files. Thus, if the first video ends, e.g., at 20:47.500, the start time of the next videos must not be earlier than 20:49.500. Powerdome needs the two seconds to initialize the next video. If the time gap is shorter, the second video will not run.
2. If the show design does not allow for the gap in time, combine the two videos into a single one.

To do this, proceed as follows:

- Call up the Command Prompt on the Master PC (**Start > All Programs > Accessories > Command Prompt**).
- Change to the directory containing the videos to be combined.

In the Command Prompt window you can navigate through the directories by entering the following commands:



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<code>dir</code>	Displays the content of the current directory. Subdirectories are marked <DIR>; files are identified by their file name extensions (e.g., .txt, .htm, .exe...).
<code>dir /p</code>	Displays the content screen by screen. Press the Enter key to see the next screen.
<code>t:</code>	Changes to drive T:
<code>cd..</code>	Changes to the higher-order directory.
<code>cd Verzeichnisname</code>	e.g., <code>cd Media</code> changes to the Media directory. This must be contained as a subdirectory in the directory you are just in. Upon the entry of "dir", you can change to any directory marked <DIR>.
<code>exit</code>	Exits the prompt.

- Combine two videos using the following command:

```
copy /b video1.m2v + video2.m2v videoOutput.m2v
```

The command copies "Video2.m2v" to the end of "Video1.m2v" and saves the new, combined video under the name "VideoOutput.m2v". In the above command you need to replace "Video1.m2v" and "Video2.m2v" with the names of the videos to be combined. With large files, the process will take some time. After its completion, re-name the video in the Explorer (Rename, key <F2>).

You can also combine more than two (any number of) videos if you expand the command as follows:

```
copy /b video1.m2v + video2.m2v + video3.m2v + ... videoOutput.m2v
```

7 Communication and Synchronization

Powerdome can be integrated in the joint, time-controlled performance of several systems such as planetarium projector, sound system and light control under a »General control system«. This can be accomplished in several versions, which are briefly described below.

1st version: External control of powerdome with time code synchronization.

2nd version: Powerdome master PC as general control system (without time code synchronization)

3rd version: External control with the planetarium control computer as a general control system (without time code synchronization).

7.1 External control by a general control system with time code synchronization

This is the most comprehensive version. It consists of a separate general control system (computer with control program and communication software), the time code generator (electronic circuitry, magnetic tape), with connections to the powerdome Master PC and a time code reader.

This combination permits

- a) the sending of commands from the general control system to powerdome to control the running of shows, and
- b) synchronization of the time schedule of a powerdome show with, e.g., a sound system or an analog (optical-mechanical) planetarium projector.

This is provided that the following conditions are satisfied:

- a) Connection of the general control system to the powerdome cluster via Ethernet cable
- b) Setting on the general control system of an Ethernet address lying in the segment of the powerdome cluster
- c) Installation of the communication module on the master PC of the powerdome cluster
- d) Registration of the communication module on the general control system

- e) The application on the general control system must be capable to operate the interface with the communication module

(Relevant information for the supplier of the general control system is available from Carl Zeiss.)

- f) Control of a time code generator by the general control system
- g) Connection of a time code reader to the powerdome master PC, and appropriate entries in the configuration file – see chapter 7.4, Time code reader.

Possible commands of the general control system for controlling the automatic running of powerdome shows:

- a) Start the time-controlled running of a show
- b) Stop the time-controlled running of a show
- c) Continue a stopped show
- d) Terminate the time-controlled running of a show and jump to the start of the show
- e) Start the time-controlled running of a show from a specified start time

Optional linking to a Carl Zeiss planetarium system (SKYMASTER ZKP4, STARMASER or UNIVERSARIUM) is via a serial interface port.

For this purpose, a connection to the planetarium control computer must be made by a null modem cable, and the RS232 interface parameters must be set as follows:

Baud rate:	9600 Baud
Data bits:	8
Stop bits:	1
Parity:	none

For possible commands and for the mode of operation of the various planetarium models, see the manuals on SKYMASTER ZKP 4, STARMASER and UNIVERSARIUM.

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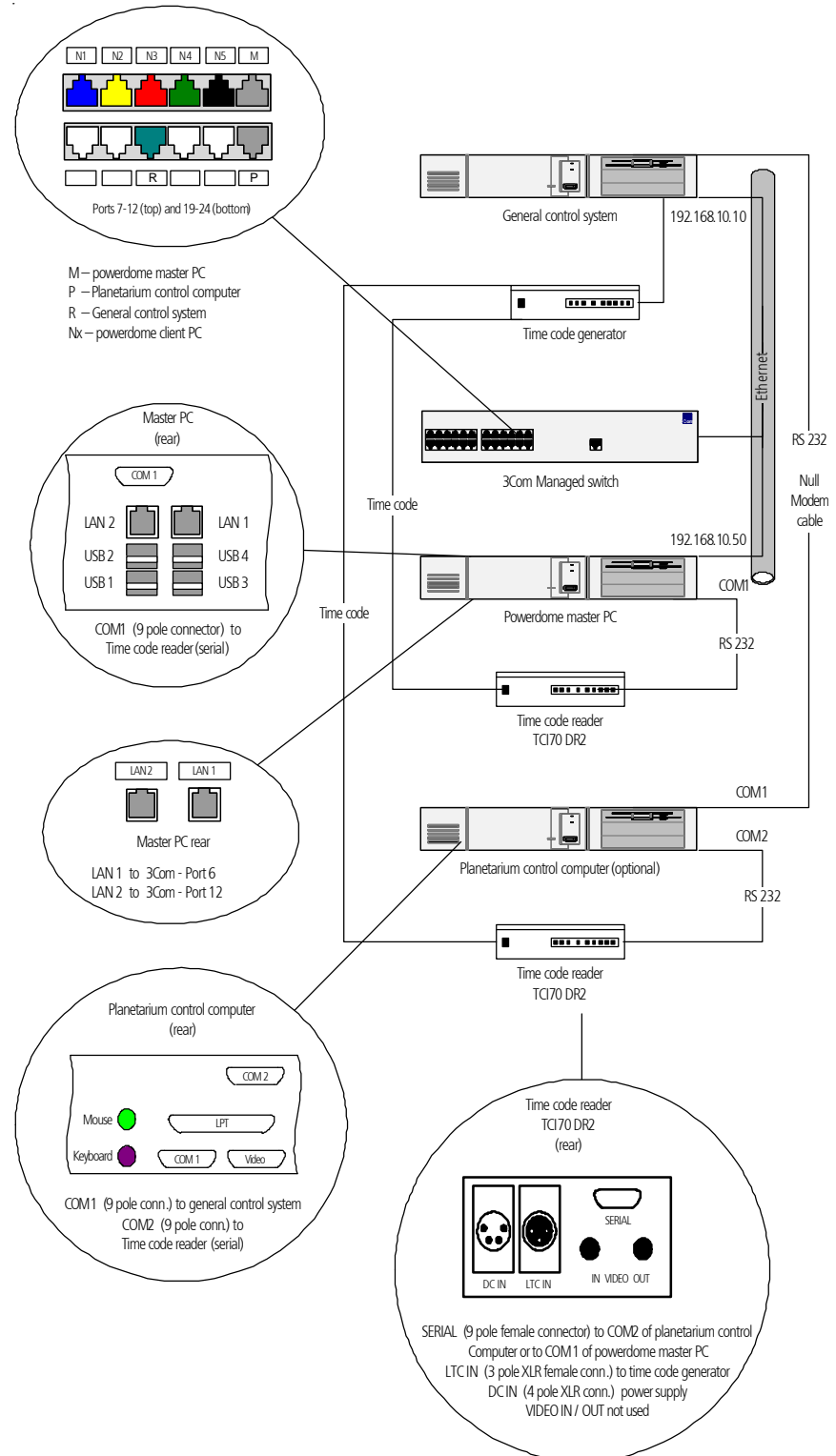


Important!

The necessary settings in the configuration file are made by Carl Zeiss during the start-up test procedures. Changes made by the user may cause malfunction of the system!

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External control by a general control system with time code synchronization – Overview of components and connections



7.2 Powerdome® Master-PC as general control system

Powerdome can send commands to other control units via a serial port, provided the following conditions are satisfied:

- Connection between the two computers via null modem cable
- The configuration file for powerdome contains an appropriate entry for communication.

The serial interface must be configured as follows:

Baud rate: 9600 Baud
Data bits: 8
Stop bits: 1
Parity: none

The default port on the master PC is COM1. If you select a different port, you need to change the entry in the configuration file accordingly (port="COMx" – see below).

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See also the overview diagram on the following page.

The entry for the control of the SKYMASTER ZKP4 planetarium has the following content:

```
<Cluster id="....." defaultMasterAddress= .....
  <Node id="MASTER" ..... role="MASTER" ..... >
    .....
    <Devices>
      <AnalogDevice id="ZKP" device="ZKP"
        description="external commands for the ZKP"
        port="COM1" settings="9600,n,8,1" enabled="true">
        <Command id="ZKP_LoadFile" name="LoadFile"
          command="F_L" parameter="true" />
        <Command id="ZKP_Jump" name="Jump to Label"
          command="S_G" parameter="true" />
        <Command id="ZKP_Run" name="Play"
          command="S_R" parameter="false" />
        <Command id="ZKP_Pause" name="Pause"
          command="S_B" parameter="false" />
        <Command id="ZKP_Rewind" name="Rewind"
          command="S_S" parameter="false" />
        <Command id="ZKP_SynchroOn" name="Synchronization on"
          command="S_N" parameter="false" />
        <Command id="ZKP_SynchroOff" name="Synchronization off"
          command="S_F" parameter="false" />
      </AnalogDevice >
    </Node>
  </Cluster>
```

These entries correspond to the external control commands possible with SKYMASTER ZKP 4.

These are:

- Load a show
- Start the time-controlled running of a show
- Stop the time-controlled running of a show
- Continue a stopped show

- Terminate the time-controlled running of a show and jump to the start of the show
- Jump to marks in the show
- Activate and deactivate time code synchronization

The control of UNIVERSARIUM or STARMASER is also possible, but requires different entries in the configuration file.



Note!

In powerdome, return values of the planetarium control computer will neither be displayed nor analyzed!

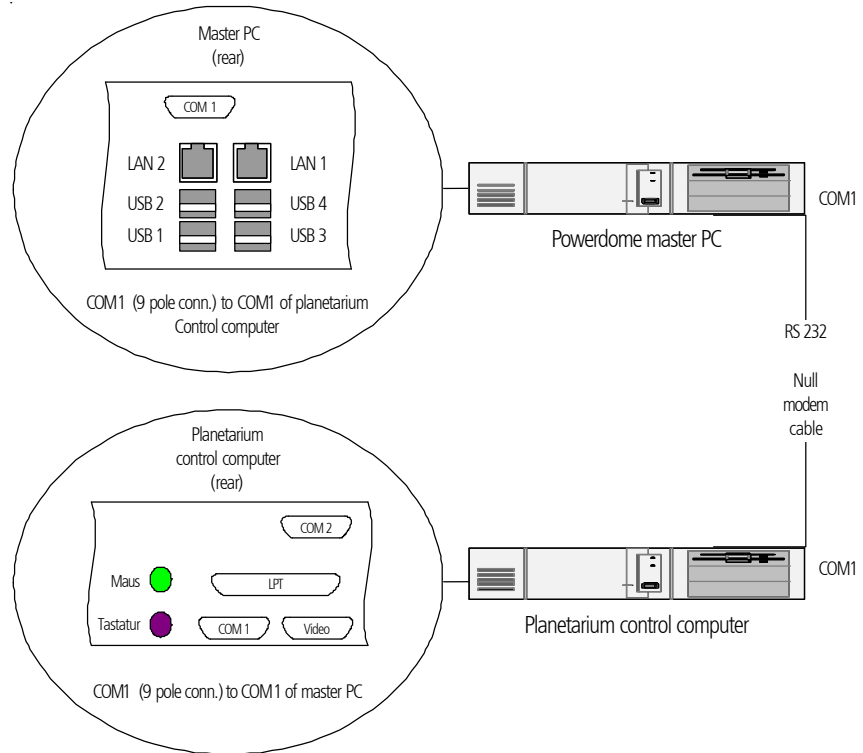


Important!

The necessary settings in the configuration file are made by Carl Zeiss during the start-up test procedures. Changes made by the user may cause malfunction of the system!

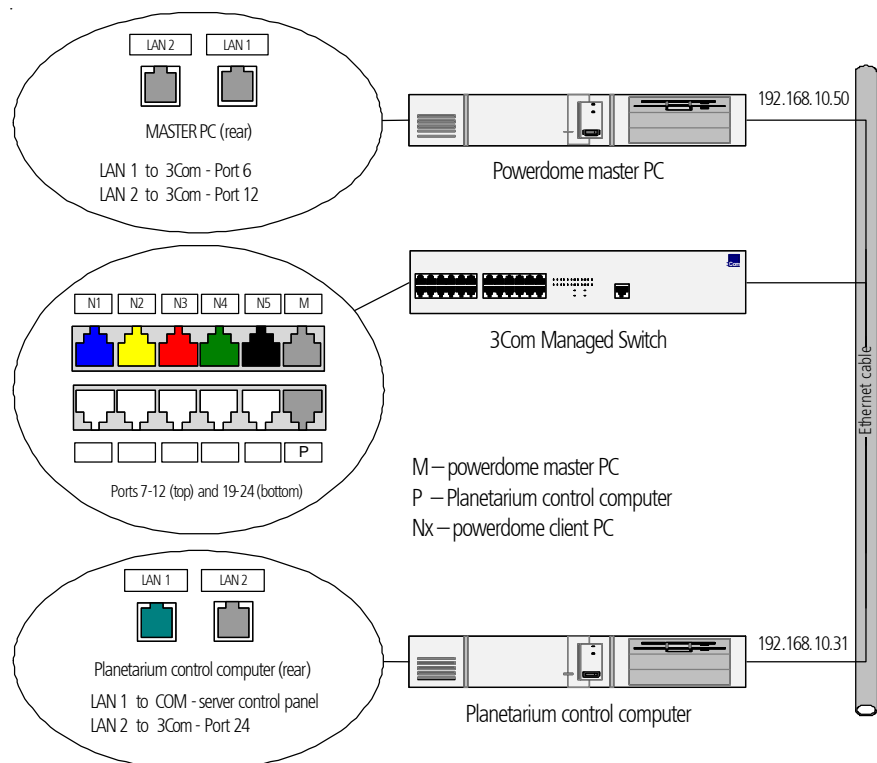
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Powerdome Master PC as general control system – Overview of components and connections



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External control with the planetarium control computer as general control system – Overview of components and connections



7.3 External control with the planetarium control computer as general control system

This control version permits commands to be sent from the planetarium control computer to powerdome for controlling the running of shows.

These commands are:

- a) Start the time-controlled running of a show
- b) Stop the time-controlled running of a show
- c) Continue a stopped show
- d) Terminate the time-controlled running of a show and jump to the start of the show

This is provided that the following conditions are satisfied:

- a) Connection of the planetarium control computer to the powerdome cluster via Ethernet cable
- b) Setting on the planetarium control computer of an Ethernet address lying in the segment of the powerdome cluster
- c) Installation of the communication module on the master PC of the powerdome cluster
- d) Registration of the communication module on the planetarium control computer

Note:

For the time being, this version is implemented only by the SKYPOST control software for the SKYMASTER ZKP 4.

For the mode of operation, see the SKYMASTER ZKP 4 manual.

7.4 Time code reader

The time code reader is designed to receive analog time code signals (SMPTE/EBU), and to forward this information to the powerdome master PC via a serial interface port.

The data interface is configured as follows:

Baud rate:	38400 Baud
Data bits:	8
Stop bits:	1
Parity:	none

The time code protocol at the serial port is "TC60 Req".

Further parameters in the time code reader can be set by means of the TCI70.exe configuration program supplied by Alpermann+Velte. (see manual of "Time Code Interface TCI70" of Alpermann+Velte).

For the terminals and port assignments of the time code reader and the powerdome master PC, see the diagram on page 94.

The default port on the master PC is COM1. If you select a different port, you need to change the entry in the configuration file accordingly (port="COMx" see below).

Powerdome will read and analyze the time code only if the following entry is made in the powerdome configuration file:

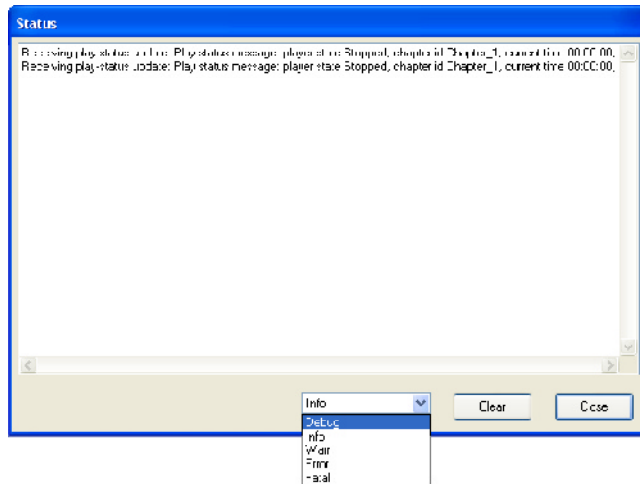
```
<Cluster id="...."
defaultMasterAddress= .....
  <Node id="MASTER" .....
role="MASTER" ..... >
  ....
  <Devices>
    <TimeCodeReader description="Alpermann+Velte SMPTE Code Reader"
port="COM1" control="38400,n,8,1" enabled="true" id="TCI70">
    </TimeCodeReader>
  </Devices>
</Node>
</Cluster>
```



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Status Window



The status window informs you about the current status of the system and displays errors and warnings, if any. Click into the list box at the bottom of the window and select the display you need:

Debug	Information about the cluster status
Info	General status information
Warn	Warnings
Error	Errors
Fatal	Serious errors

Once you have gained some experience in handling powerdome, you will be able on your own to analyze the information displayed. Contact Carl Zeiss if the system does not work properly, or if the status messages give no hint for problem elimination.

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