FastReport Online Designer User Manual

Version 2025.1

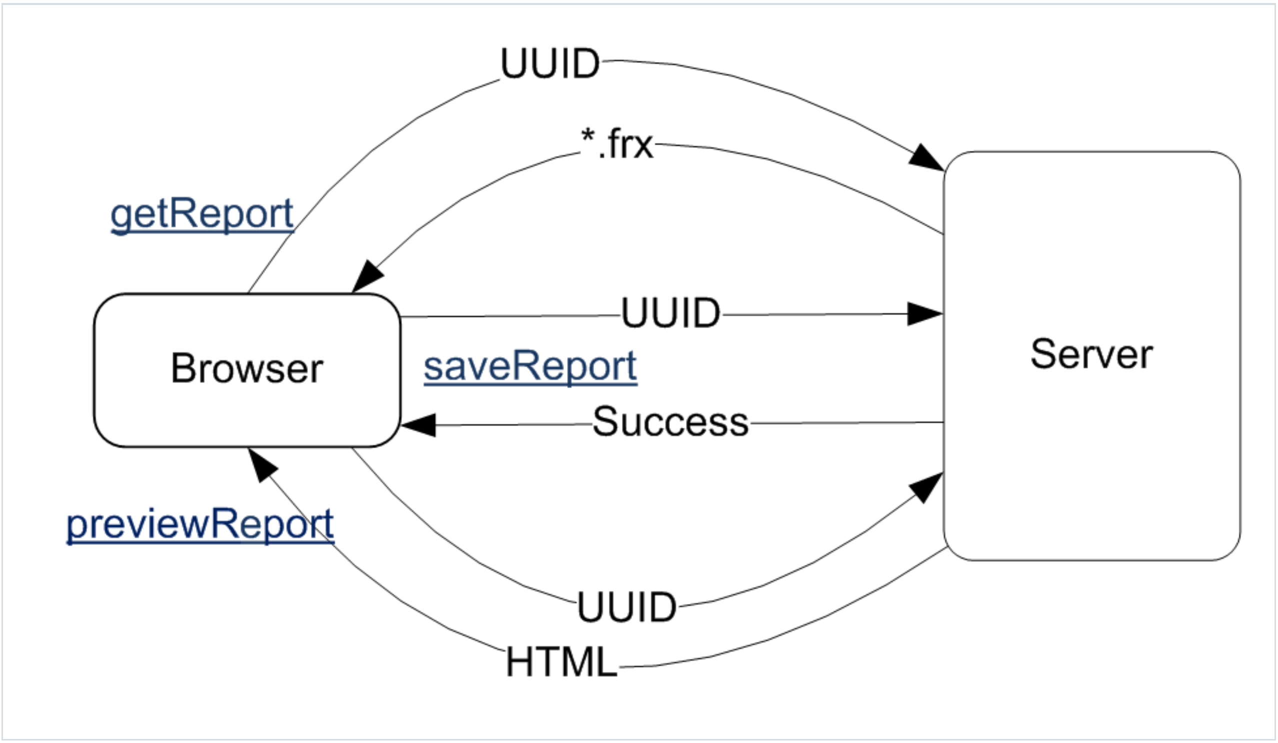
Introduction

FastReport Online Designer is a web version of the desktop FastReport.Net designer. Online report designer is a RIA (Rich Internet application) application that allows you to run it on any device that has a modern Internet browser. Online designer will work in recent versions of popular browsers (Chrome, Firefox, Opera, Safari, IE). But, despite all these cross-platform advantages, the online version is inferior to desktop version in terms of convenience and functionality.

Thus, FastReport Online Designer positioned as an editor of .Net reports that have already been created and placed on any UUID on the server. Online designer communicates with the server through a specified pre-API, which includes 3 requests:

- getReport - is used for initialization. Gets the report template and sends it to the online designer that prepares a report for editing in the browser.
- previewReport (preview mode) - edited report template is sent to the server, which builds the report and returns it in html format. The report runs on the server via FastReport.Net.
- saveReport - saves the report template to the server.

For each query you should pass the UUID of the report to the server using a parameter to identify the report on the server.



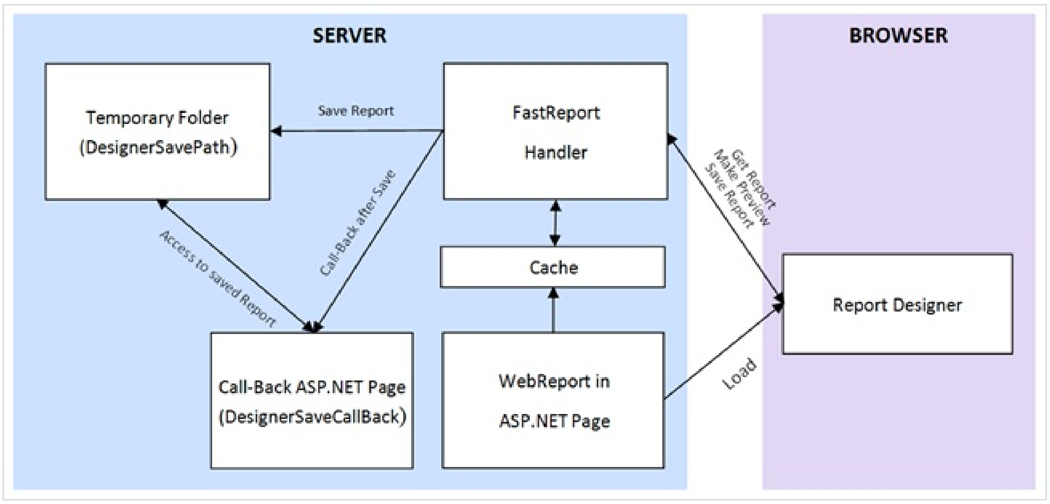
The product is developed with the latest capabilities of modern browsers. For example, thanks to HTML5, once downloading the online designer, you can use it when not connected to the network.

FastReport Designer Online has a monolithic kernel, enabling the connection of modules, which are components of/bands/dialog components and some other parts of the system. To identify these modules and their dependencies the technology RequireJS is used. Such modularity allows you to build a product for the needs of the client with the necessary components, which reduces the size of the project (since this is a web app, the size is very important and the smaller, the better). For individual assemblies the online designer provides the designer constructor.

It is worth mentioning other technologies used in FastReport Online Designer. Traditionally used jQuery, and the client's template engine uses jsrender and RequireJS. Script code editor uses CodeMirror, that can be embedded in the report.

The current version of FastReport Online Designer is missing a RFID Label component. Also not all components are available in dialogue forms. Only present: Button, CheckBox, CheckedListBox, ComboBox, DateTimePicker, Label, ListBox, MonthCalendar, RadioButton, TextObject.

Working principle



The Online Designer can be used together FastReport.Net WebReport objects in editions FastReport .Net Win+Web, Professional, Enterprise.

On-line Designer can change the script of the report and event handlers of the report, but by default for security reasons this option is disabled. This feature can be enabled in the properties of the object WebReport. When this option is disabled the script contents after design will be ignored and replaced with the original text. Also, for security purposes we do not send in Designer built-in connection strings.

- WebReport object loads in ASP.NET page.
- WebReport sends an AJAX request to the handler of FastReport to get of on-line Designers container in iframe context (The code of the Report Designer is placed in a separate folder on the application site).
- When On-line Designer is loaded in browser it sends AJAX query to the handler to get a report template (getReportByUUIDFrom).
- The server application prepares and sends a report template to the On-line Designer.
- The Designer can request a preview of the current report. It sends request to the handler in server (makePreviewByUUID). The server application runs a received report and sends back result in html. The Designer shows it in preview window. This preview can be printed or exported in several formats.
- The Designer can save a report in server through AJAX query (saveReportByUUIDTo) with report contents. The server application prepares received data and sends request to call-back page in application.

Object WebReport exists in the server cache for a limited time, and then deleted from memory. Time of keeping an object in memory is determined in minutes in property WebReport.CacheDelay (by default: 60).

Setting up the designer

Step-by-step manual for set-up the Online Designer:

1. First let's copy a folder with Online Designer (by default: WebReportDesigner) from installation path to the web applications root.

2. Then check the file web.config for handler settings that needed for WebReport functionality:

For IIS6:

```
    <system.web>
        …
        <httpHandlers>

        <addpath="FastReport.Export.axd" verb="*" type="FastReport.Web.Handlers.WebExport"/>

        </httpHandlers>
    </system.web>
```

for IIS7:

```
    <system.webServer>
        <handlers>

        <addname="FastReportHandler" path="FastReport.Export.axd" verb="*"
type="FastReport.Web.Handlers.WebExport"/>

        </handlers>
    </system.webServer>
```

3. Then check the settings of the Report Designer in the file WebReportDesigner/scripts/config-data.js:

```
'getReportByUUIDFrom': '/FastReport.Export.axd?getReport=',
'saveReportByUUIDTo': '/FastReport.Export.axd?putReport=',
'makePreviewByUUID': '/FastReport.Export.axd?makePreview=',
```

These parameters should contain the path to the handler FastReport relative to the root of web site. If your path is different from what is written, it must be corrected, for example:

```
'getReportByUUIDFrom': '/oursite/FastReport.Export.axd?getReport=',
```

4. When WebReport is used in ASPX markup, you need drag-n-drop the object on a page and set the properties. For MVC you need write the code in the controller:

4.1. Enable editing of reports:

`webReport.DesignReport = true;`

4.2. Set the unique object name for WebReport, necessary for further identification in the call-back page while maintaining the edited report:

`webReport.ID = "MyDesignReport1";`

4.3. Prohibit report's script editing in the On-line Designer (if you want to allow editing - set to true):

`webReport.DesignScriptCode = false;`

4.4. Specify the path to the main file of the report designer, the folder with the designer should be copied to the appropriate place of web-application:

`webReport.DesignerPath = "~/WebReportDesigner/index.html";`

4.5. Set the path to the call-back page on the site, the call to be executed after the report is saved to a temporary folder. Example for MVC path to View (you have to create new blank View specially for call-back in controller with same name):

`webReport.DesignerSaveCallBack = "~/Home/SaveDesignedReport";`

or, for ASPX:

`webReport.DesignerSaveCallBack = "~/DesignerCallBack.aspx";`

The following parameters sent in the GET request:

```
reportID="here is webReport.ID"&reportUUID="here is saved report file name"
```

In this context reportID corresponds to the object WebReport.ID, and reportUUID is the file name that is stored in a temporary folder. The developer shall perform further actions to save the report to the source file on the disk, database or cloud storage. Temporary file named reportUUID must be removed from the temporary folder after saving. You can use POST query for call-back transfer of report file, read more below in section 4.6. Sample code call-back pages will be shown below.

4.6. Set the path to the temporary folder in which to save the edited reports before calling the call-back. You have to set write permissions to this folder:

`webReport.DesignerSavePath = "~/App_Data/DesignedReports";`

You can set the property webReport.DesignerSavePath to blank string to activate POST mode.

4.7. Set the lifetime of WebReport object in servers cache in minutes, the default is 60:

`webReport.CacheDelay = 120;`

5. Create a call-back page to save the edited reports.

5.1. If you are using ASPX layout, you need to add the following code in the Page_Load event handler:

```
protected void Page_Load(object sender, EventArgs e)

{

string reportID = Request.QueryString["reportID"];

string reportUUID = Request.QueryString["reportUUID"];

// 1. ReportID value identifies the object that caused the designer. The value corresponds to the
property webReport.ID, which was filled by a call of the designer.

// 2. Combining the path that we have filled in the property webReport.DesignerSavePath, and the
resulting reportUUID, we get the path to the temporary file with edited report.

// 3. This file can be opened and resaved in the appropriate place (another file, cloud, a database,
etc).

// 4. The temporary file must be deleted after saving.

}
```

5.2. In MVC markup you need to create a method in the controller and an empty View. The code in the controller:

```
public ActionResult SaveDesignedReport(string reportID, string reportUUID)

{

// 1. ReportID value identifies the object that caused the designer. The value corresponds to the
property webReport.ID, which was filled by a call of the designer.

// 2. Combining the path that we have filled in the property webReport.DesignerSavePath, and the
resulting reportUUID, we get the path to the temporary file with edited report.

// 3. This file can be opened and resaved in the appropriate place (another file, cloud, a database,
etc).

// 4. The temporary file must be deleted after saving.

return View();

}
```

To work with POST transfer you need to add the following line before controller:

[HttpPost]

```
public ActionResult SaveDesignedReport(string reportID, string reportUUID)
```

5.3. You can use any localizations for Online Designer:

```
webReport.DesignerLocale = "en";
```

("en" can be changed to any other supported language, full list of supported languages is similar to files in folder "locales" in the Designer distribution package).

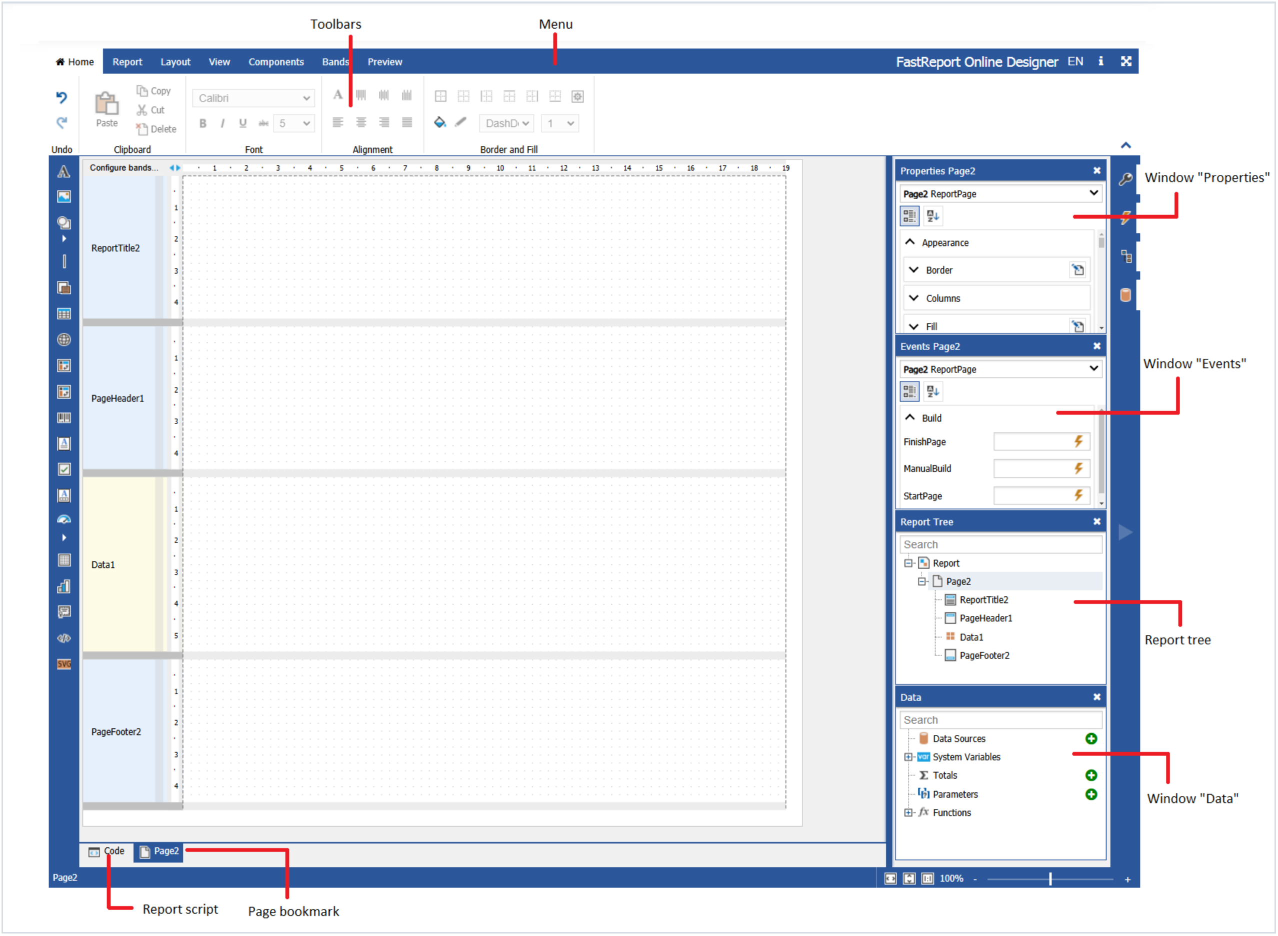
When creating handlers in the Call-back page, pay an attention to filtering and checking of parameters in the Get/POST requests. Be sure to check them for null values.

The best place for object with On-line Designer is at the bottom of the page. The recommended width is 100% or at least 930px. Recommended height of the object is at least 600px.

Designer

Let’s consider the structure of the interface of FastReport Online Designer. There are the following areas:

- menu;
- report page;
- "Properties" window;
- "Events" window;
- report tree;
- "Data" window;
- toolbar;
- pages tabs;
- report script.



Let us examine each item.

Main menu is placed at the top of the report designer: Main, Report, View, Components, Bands. When we select the menu item, we open the tab with toolbars, similar to Microsoft Office 2007.

The toolbar of the Main tab is used to change the appearance of the report components.

On the "Report" tab you can save the report, add/delete page, add dialog, and run the report in preview mode.

On the tab “View”, you can specify settings for the grid of a report page. The grid helps to position components in accordance with each other.

The “Components” tab contains the FastReport component palette. Components allow you to display different data in the bands. They are an integral part of the report template along with the bands.

The tab "Bands" contains a palette of bands that can be added to the report. The bands represent a container for placing components. The type of band determines its location in the report.

Report page contains the bands and components that make up a report template.

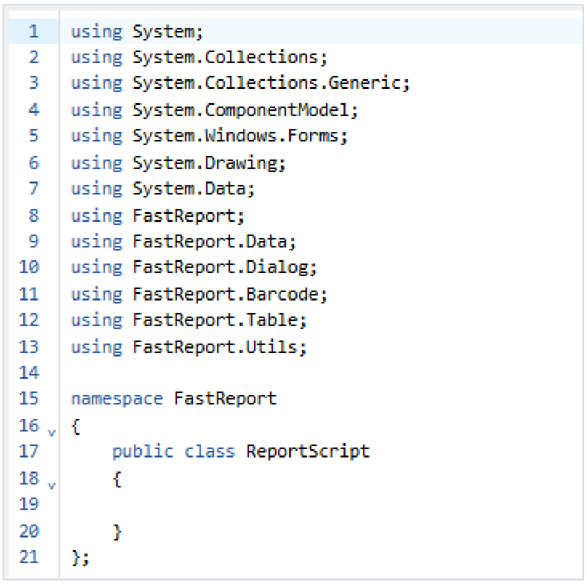
The Properties window is hidden by default, like the other windows. It can be enabled by using the icon on the sidebar. So you can include the "opening Event", the tree report and the "Data" window. For convenience the open windows can be moved anywhere on the screen. To return the window to its original position click on the pin icon in the header.

The “Properties” window displays the properties of the selected report object (such as band, component, or a report page).

The "Events" shows the events available for the selected report object.

The report tree contains all report objects in a hierarchical list. By the right-click on items in the list you can call the context menu for the selected object.

At the bottom of the report designer you can see the tabs that represents report pages, as well as the icon of the report script. If you use the script, the code editor opens instead of the report page:

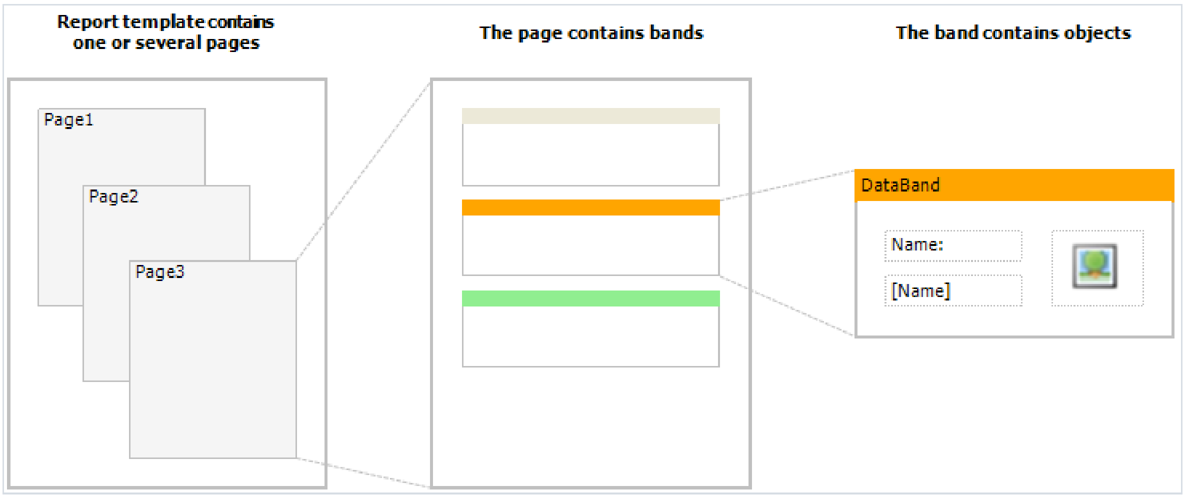


```
using System;
using System.Collections;
using System.Collections.Generic;
using System.ComponentModel;
using System.Windows.Forms;
using System.Drawing;
using System.Data;
using FastReport;
using FastReport.Data;
using FastReport.Dialog;
using FastReport.Barcode;
using FastReport.Table;
using FastReport.Utils;

namespace FastReport
{
    public class ReportScript
    {

    }
};
```

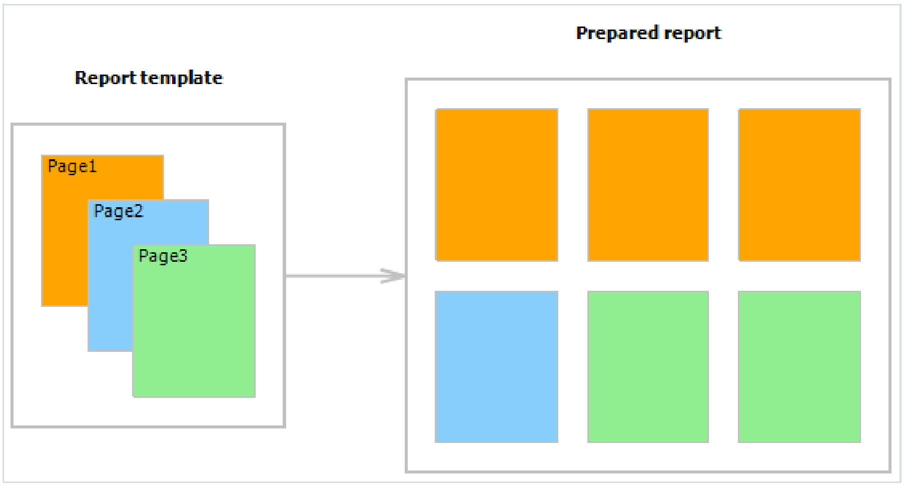
The report script allows the user to define the logic of the report.

Report pages

Template consists of one (mostly) or several report pages. Report page, in turn, contains bands. Report objects like Text, Picture and others are placed on the band:

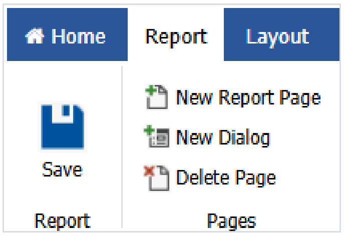

Report template contains one or several pages
The page contains bands
The band contains objects
Page1
Page2
Page3
DataBand
Name:
[Name]

Report template can consist of several pages. For example, you can create a template containing title-page and a page with data. When creating such a report, the first page will be printed first, then the second page and so on. Every page of template can generate one or several pages of a prepared report – this depends on the data it contains:



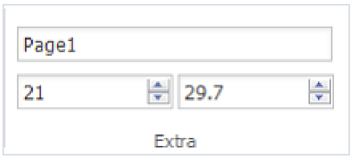
Report pages are also used when working with subreports. Contrary to other report generators, subreports in FastReport are saved in a separate template page, and not in a separate file.

A new report already contains one page, but if you want to add another one, go to the "Report" tab and click on "New Report Page" button.

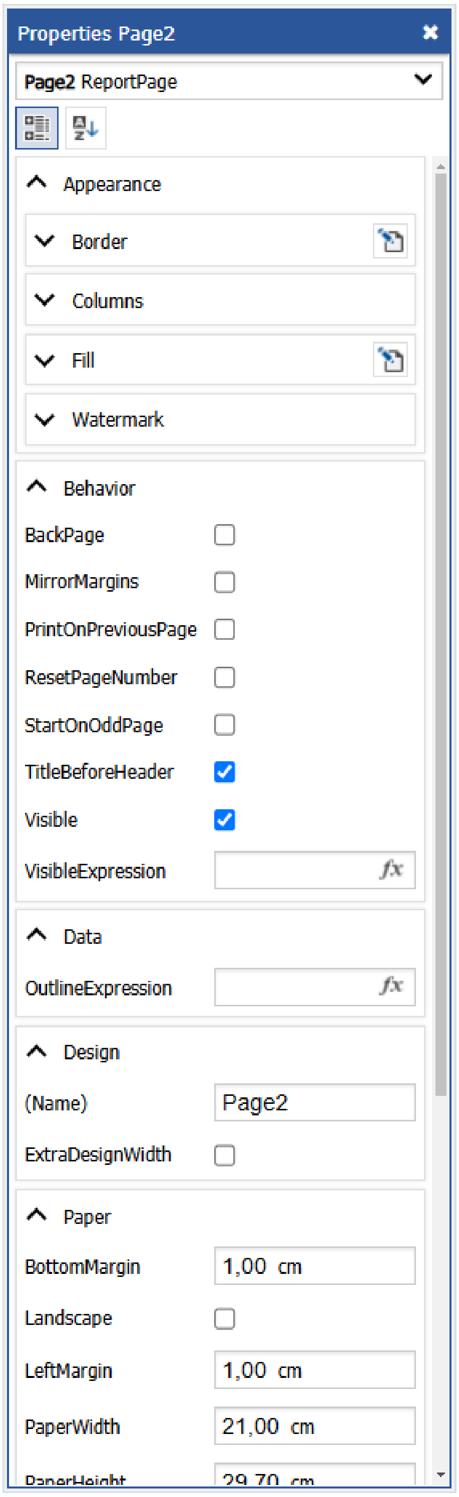


Also, here you can add a dialog form (New Dialog).

To delete a report page, you need to select the desired page and click on the "Delete page" button. If the report consists of one page the delete button will be inactive.
You can set the page size on the Home tab, in the section "Extra".



Other properties of the page can be seen in the window "Properties". You need to select the page using the tabs at the bottom of the designer window.


Properties Page2

Page2 ReportPage

Appearance
- Border
- Columns
- Fill
- Watermark

Behavior

BackPage	☐
MirrorMargins	☐
PrintOnPreviousPage	☐
ResetPageNumber	☐
StartOnOddPage	☐
TitleBeforeHeader	✓
Visible	✓
VisibleExpression	

Data

OutlineExpression	

Design

(Name)	Page2
ExtraDesignWidth	☐

Paper

BottomMargin	1,00 cm
Landscape	☐
LeftMargin	1,00 cm
PaperWidth	21,00 cm
PaperHeight	29,70 cm

You can set the page size and margins in the "Paper" section. Section "Print" allows you to determine two-sided printing, the source of the first page and the source of other pages. In addition, you have access to the page appearance properties such as border, fill, etc.

Bands

The band is an object which is located directly on the report page and is a container for other objects like "Text", "Picture" and others.

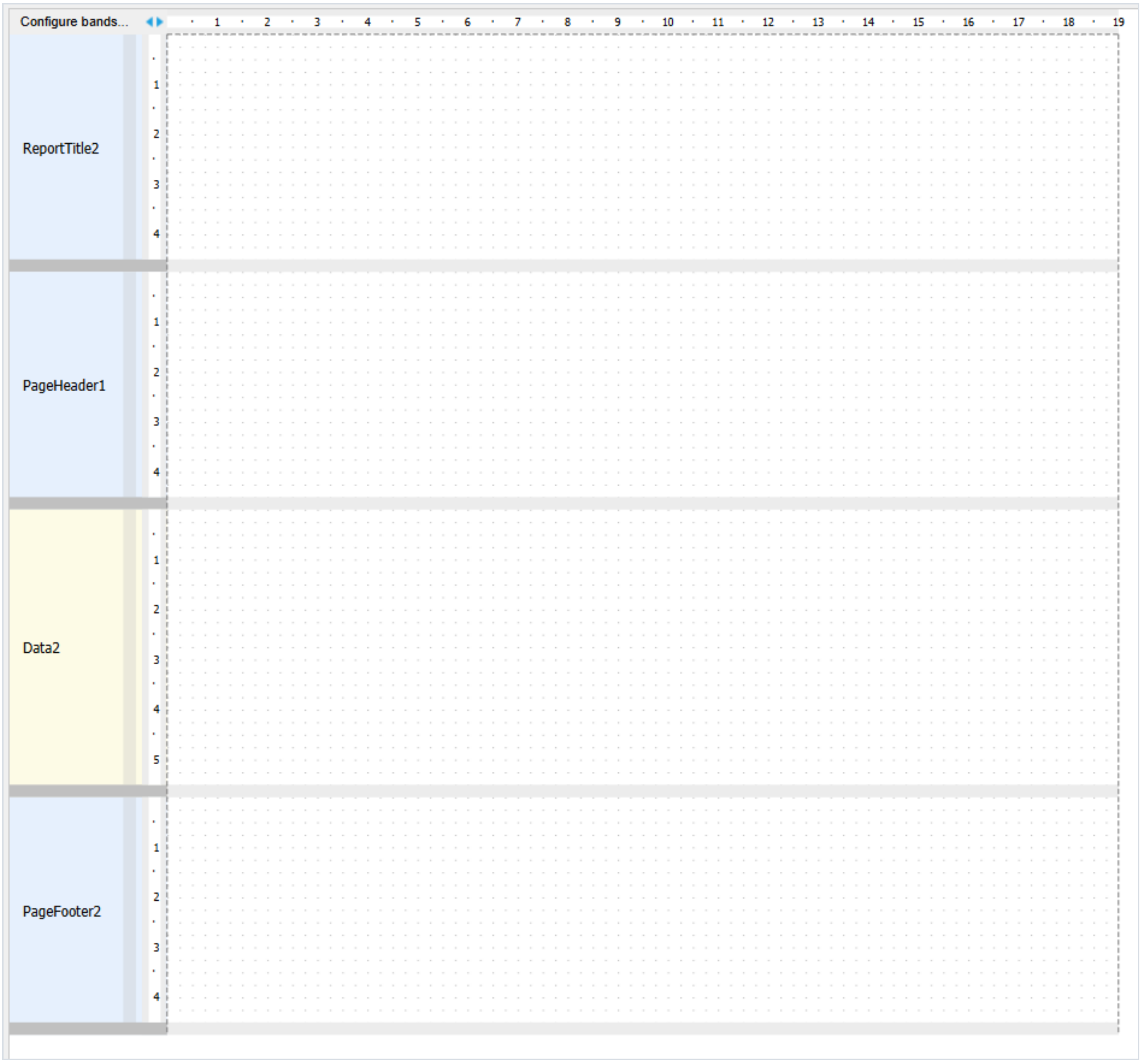
In all, in FastReport there are 13 types of bands. Depending on its type, the band is printed in a certain place in the report.

Band	How it's printed
Report Title	It is printed once at the very beginning of the report. You can choose the order of printing - before the "Page Header" band or after it - with the help of the "TitleBeforeHeader" page property. Changing this property can be done with the help of "Properties" window. By default, property is equal to true, that is, report title is printed before page header.
Report Summary	It is printed once at the end of the report, after the last data row, but before the "Page Footer" band.
Page Header	It is printed on top of every page of the report.
Page Footer	It is printed at the bottom of every page of the report.
Column Header	This band is used when printing a multi-columned report (when the number of columns indicated in the page setup > 1). It is printed on top of every column after the Page Header band.
Column Footer	Printed at the bottom of every column, before the Page Footer band.
Data	This band is connected to the data source and is printed as many times as there are rows in the source.
Data Header	This band is connected to the "Data" band and is printed before the first data row.
Data Footer	This band is connected to the "Data" band and is printed after the last data row.
Group Header	It is printed at the beginning of every group, when the value of the group condition changes.
Group Footer	It is printed at the end of every group.
Child	This band can be connected to any band, including another child band. It is printed immediately after its parent.
Overlay	Printed as a background on every report page.

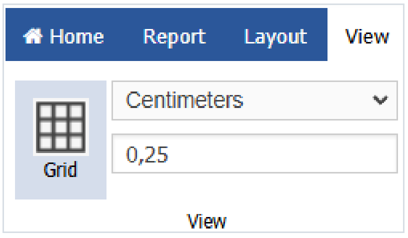
Consider the display of bands in the designer.

On the left side of the report page are the headers of the bands. By default, a new report contains 4 bands:

- ReportTitle;
- PageHeader;
- Data;
- PageFooter.



Bands can have a fill and border (disabled by default). Also, bands have a grid displayed in design-time for easy positioning of components. The grid can be set in "View" menu of the main menu.



Centimeters

0,25

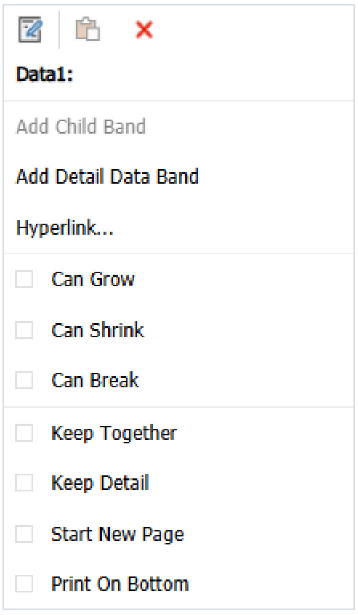
To change the size of the band you can use the mouse. Move the cursor to the bottom of the band. The cursor changes. Click the left mouse button and adjust the height of the band by moving the mouse up or down.

Band settings

To add a band to the report page, click the tab "Bands". Select the required band and click on it.

To add the "Data Header" or "Data Footer" you should pre-select the Data band on the report page.

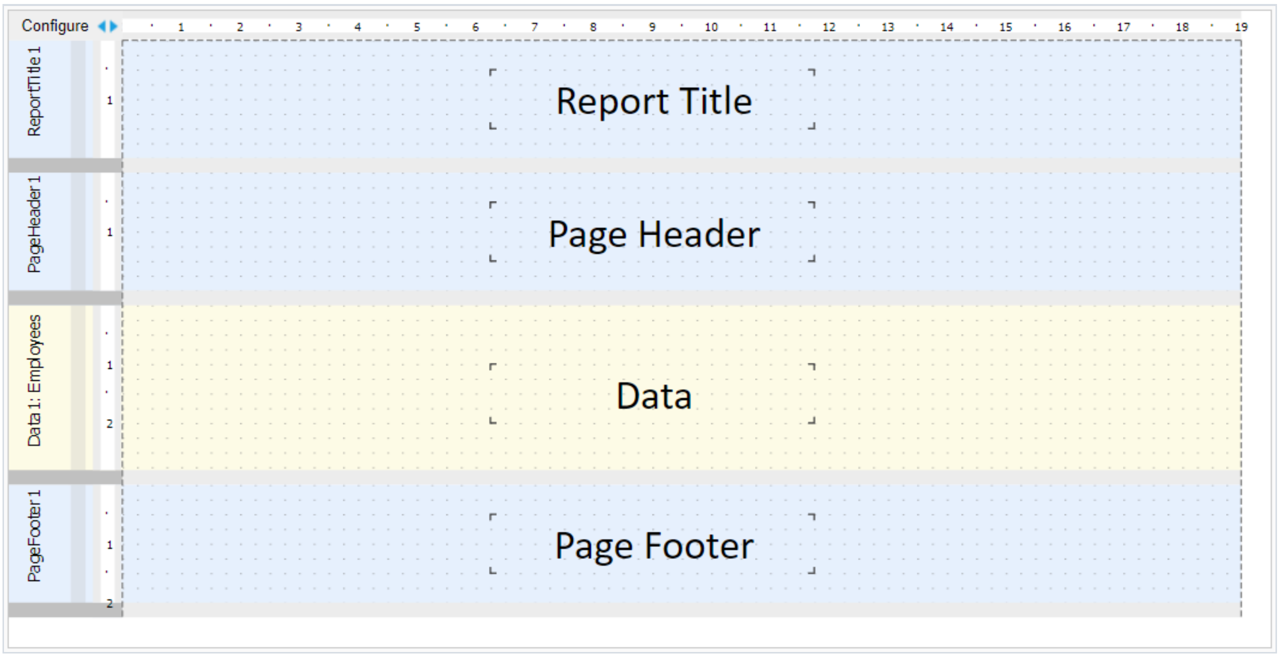
To add another band "Data" you can choose any of the bands on the report page except the already existing band "Data". Then add the band "Data" by using the icon on the toolbar. If you select Data band on the report page and add another Data band, the detailed "Data" band will be added. There is another way to add a detailed band "Data". Call the context menu for the "Data" band by the right mouse click. Then click the "Add Detail Data Band" menu item. In addition, from this menu you can add a child band.



You can delete the selected band by using a context menu or pressing the Delete key. FastReport will limit your actions which could lead to the creation of an incorrect report template. For example, if you have a band “Group Header”, you can't delete the "Data" band from this group. First you have to remove the group. Also, when you delete some of the bands, they will be deleted along with their associated bands. For example, if you delete the "Data" band its header, footer, child band and detail band will be removed too.

Print order

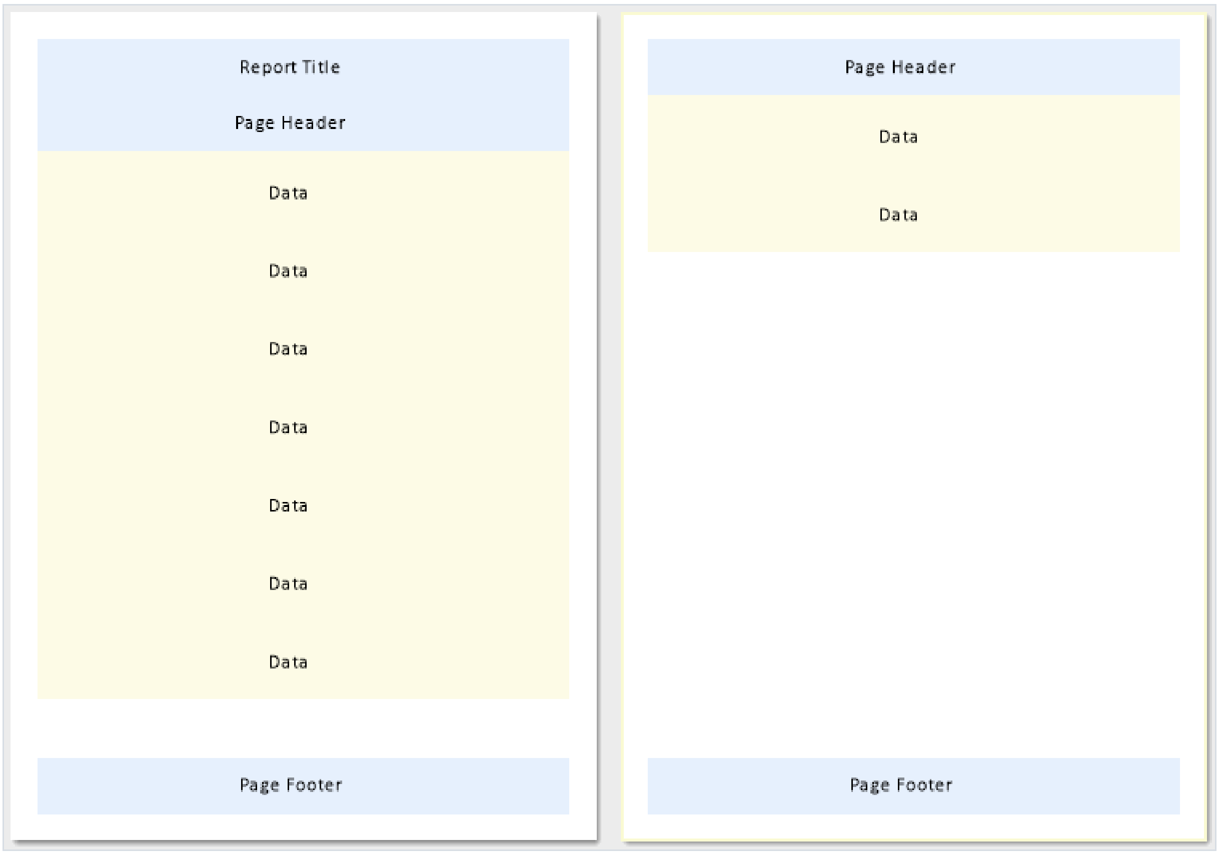
So, there are several bands on the page. Look at how FastReport will create a report:



The order of the bands is as follows:

- report title;
- page header;
- data. Will be printed as many times as there are rows in the data source that is connected to the band;
- page footer.

The finished report will look like this:



In the process of printing, FastReport checks if there is enough space on the current page of the prepared report, so that the band can be printed. If there isn't enough space, the following occurs:

- page footer is printed;
- a new page is added;
- page header is printed;
- continues to print the band which did not fit on the previous page.

Band properties

Every band has several useful properties, which affect the printing process. To view the properties of the band, you need to select it with the mouse on the report page, and open the Properties window with the icon on the side bar.

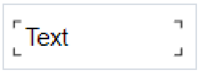
Property	Description
CanGrow, CanShrink	These properties determine whether a band can grow or shrink depending on the size of the objects contained in the band. If both properties are disabled, the band will always have the size specified in the designer.
CanBreak	If the property is enabled, FastReport tries to print a part of the band's contents on the available space, that is, "break" the band.
StartNewPage	Printing a band with such property begins on a new page. This property is usually used when printing groups; that is, every group is printed on a new page.
PrintOnBottom	A band with this property is printed at the bottom of the page, before the "Page Footer" band .This can be useful when printing certain documents, where the total sum is supposed to be printed at the bottom of the page.
RepeatOnEveryPage	The bands - "Data Header", "Data Footer", "Group Header" and "Group Footer" - have got this property. This type of band will be printed on each new page, when data printing is being done.

Components

Text

The "Text" object is the basis of a data presentation in FastReport. In the components palette, it looks like: A

And on the report page:

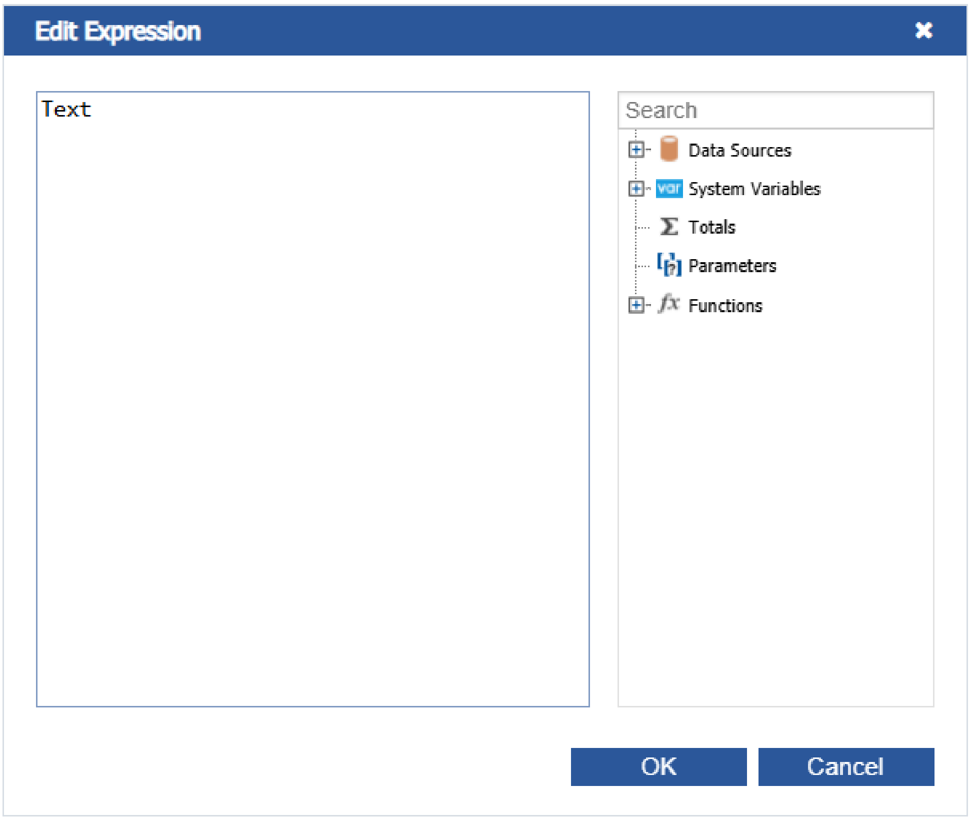


Object “Text” allows to display the following text information:

- lines of text;
- expressions;
- report parameters;
- totals;
- fields from data sources;
- system variables.

Furthermore, you can combine these data in a text object.

To open the editor of the text object, you need to double-click on the object. This opens the "Expression editor":



The "Text" object can contain a plain text mixed with expressions. For example:

```
Today is [Date]
```

When printing such an object, all expressions contained in the text will be calculated. So the result may look like this:

```
Today is 12.09.2010
```

As seen, expressions are identified by square brackets. This is set in the "Brackets" property, which by default contains the string "[,]".When needed, you can use a different set of symbols, for example "<,>", or "<!,!>". In the last case, an expression in the text will be like this:

```
Today is <!Date!>
```

Apart from this, it is possible to disable all expressions. To do this, set the AllowExpressions property to false. In this case the text will be shown "as is".

Inside the square brackets, you can use any valid expression. Read more about expressions in the "Expressions" chapter. For example, an object with the following text:

```
2 * 2 = [2 * 2]
```

will be printed like this:

```
2 * 2 = 4
```

Frequent mistake - attempt to write an expression outside the square brackets. Reminding, that it is considered an expression and gets executed only that, which is located inside square brackets. For example:

```
2 * 2 = [2] * [2]
```

This text will be printed this way:

```
2 * 2 = 2 * 2
```

There may be elements inside an expression that needs own square brackets. For example, it may be a reference to a system variable. Let's look at the following example:

```
The next page: [[Page] + 1]
```

The text contains an expression `[Page] + 1.` Page is a system variable which returns the number of the current report page. It is included in own brackets. These brackets must be square brackets, regardless of the "Text" object settings.

Strict speaking, we were supposed to use two pairs of square brackets when using the "Date" system variable in the examples above:

```
Today is [[Date]]
```

However FastReport allows to leave out unnecessary pair of brackets if there is only one member in an expression.

You can print the data column in the following way:

```
[Datasourcename.Column name]
```

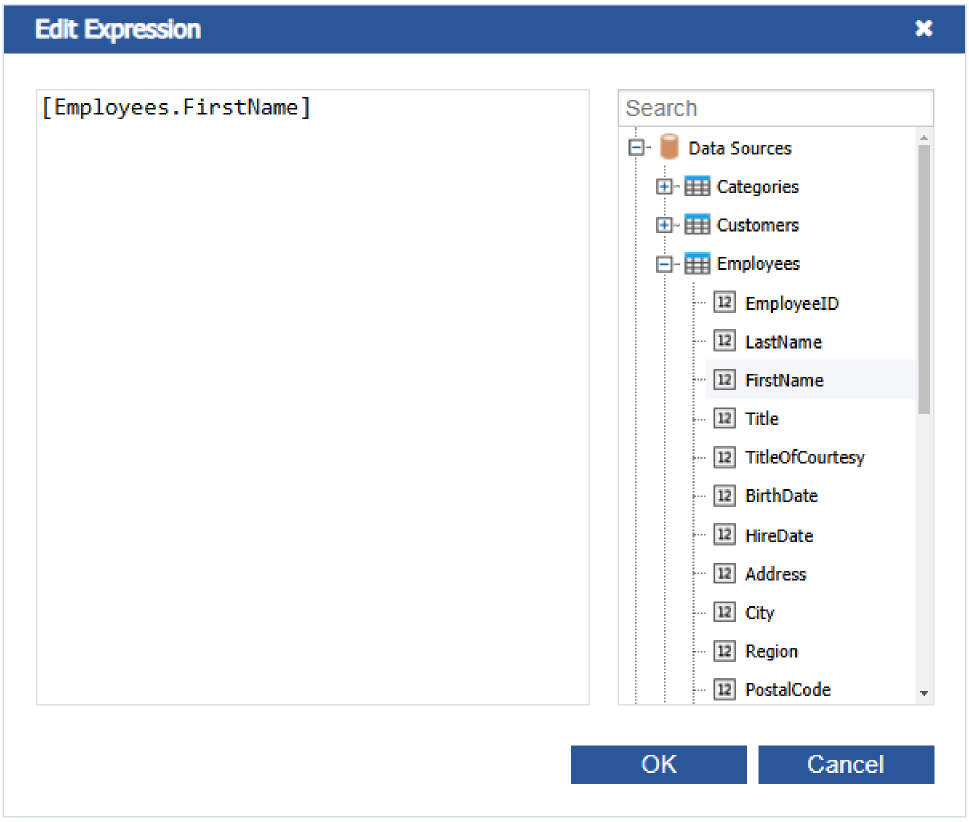
As you can see, the square brackets are used here. The data source name and data column name are separated by the period. For example:

```
[Employees.FirstName]
```

Read more about using the data columns in the "Expressions" chapter.

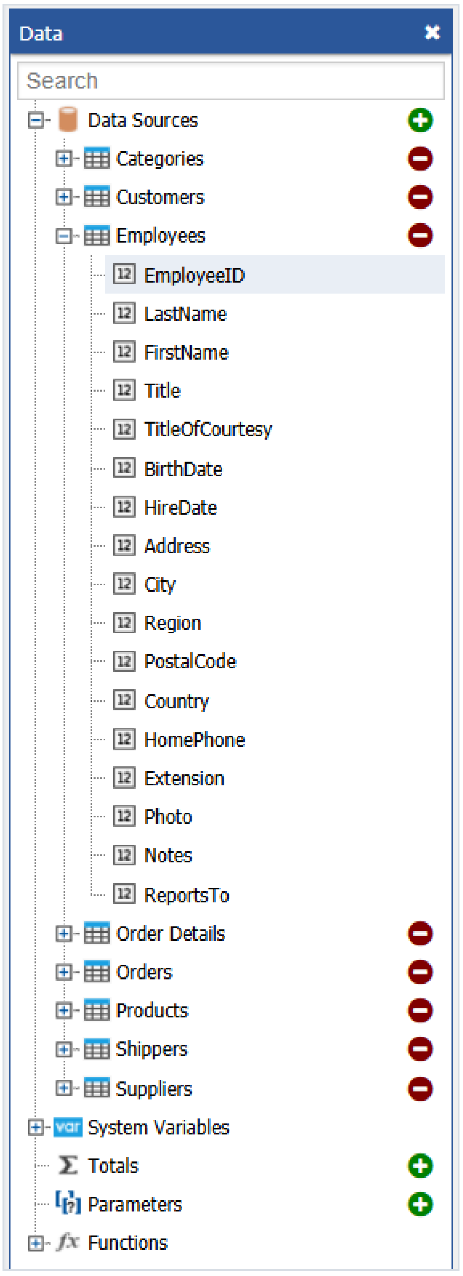
There are several ways to insert a data column into the "Text" object.

1. In the "Text" object's editor we write the name of the data column manually. This method is the most inconvenient as it is easy to make a mistake.
2. In the object's editor we choose the needed data column and drag&drop it into the text:



```
[Employees.FirstName]
```

3. Drag&drop a data column from the "Data" window into the report page. In this case the "Text" object is created which contains a link to the column.



You may use some simple HTML tags in the "Text" object. By default, tags are disabled; to enable it, go "Properties" window and set the "HtmlTags" property to true. Here is a list of supported tags:

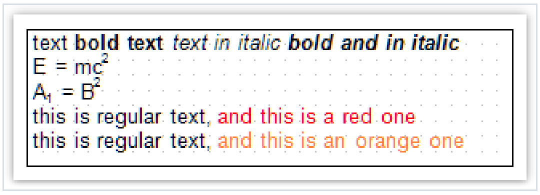
Tag	Description
<b>...</b>	Bold text.
<i>...</i>	Italic text.
<u>...</u>	Underlined text.
<strike>... </strike>	Strikeout text.
<sub>...</sub>	Subscript.
<sup>...</sup>	Superscript.

Tag	Description
<font color=...>...</font>	Font color. The color may be either the named color (such as DarkGray), or a hexadecimal code in the #RGB format, for example `#FF8030.`

The following examples demonstrate how these tags can be used.

```
text <b>bold text</b> <i>text in italic</i> <b><i>bold and in italic</b></i>
E = mc<sup>2</sup>
A<sub>1</sub> = B<sup>2</sup>
this is regular text, <font color=red>and this is a red one</font>
this is regular text, <font color=#FF8030>and this is an orange one</font>
```

This text will be displayed in the following way:


text **bold text** *text in italic* ***bold and in italic***
E = mc^2
$A_1 = B^2$
this is regular text, and this is a red one
this is regular text, and this is an orange one

The "Text" object has the following properties which can be set in the "Properties" window:

Property	Description
AllowExpressions	This property allows to turn on or off the expression handling. It is on by default.
Angle	This property indicates the text rotation, in degrees.
AutoShrink	This property allows to shrink the font size or font width automatically to fit the text.
AutoShrinkMinSize	This property determines the minimum size of a font, or the minimum font width ratio, if the AutoShrink property is used.
AutoWidth	This property allows to calculate the width of object automatically.
Brackets	This property contains a pair of symbols that designate an expression.
BreakTo	With this property you can organize the text flow from one text object to another. For example, we have "A" and "B" text objects. The "A" object contains the long text that does not fit in the object's bounds. You can set the A.BreakTo to B, so the "B" object will display the part of text that does not fit in "A".
Clip	This property determines whether it is necessary to clip a text outside of object's bounds. It is on by default.
Duplicates	This property determines how the repeated values will be printed.
FirstTabOffset	This property determines the offset of the first TAB symbol, in pixels.
FontWidthRatio	Use this property to make the font wider or narrower. By default the property is set to 1. To make the font wider, set the property to value > 1. To make the font narrower, set the property to value between 0 and 1.

Property	Description
HideValue	This property is of string type. It allows to hide values that are equal to the value of this property.
HideZeros	This property allows to hide zero values.
Highlight	This property allows to setup the conditional highlight.
HorzAlign, VertAlign	These properties determine the text alignment.
HtmlTags	Allows simple HTML tags in the object's text.
LineHeight	This property allows to explicitly set the height of a text line. By default it is set to 0, so the default line spacing is used.
NullValue	The text that will be printed instead of a null value. You also need to uncheck the "Convert null values" option in the "Report/Options..." menu.
Padding	This property allows to setup the padding, in pixels.
RightToLeft	This property indicates whether the text should be displayed in right-to-left order.
TabWidth	This property determines the width of the TAB symbol, in pixels.
Text	This property contains the text of the object.
TextFill	This property determines the text fill. Use this property editor to choose between different fill types.
Trimming	This property determines how to trim the text that does not fit inside the object's bounds. It is used only if the "WordWrap" property is set to false.
Underlines	This property allows to display a graphical line after each text line. This property can be used only if the text is top-aligned.
WordWrap	This property determines whether it is necessary to wrap a text by words.
Wysiwyg	This property changes the display mode of the "Text" object to match the screen and the final printout. This mode is also used if you use the justify-align or non-standard line height.

Rich text

The object "Rich text" allows you to display multiline text in RTF format preserving the layout and styles. On the toolbar it looks like this:

And on the report page, it looks like a simple component "Text":

> When possible, it is recommended to use regular "Text" object to display a text. When you export the report to some document formats, the "Rich Text" object will be exported as a picture.

"Formatted text" can display the data from the source as well as object "Text". To do this, either type the expression manually or connect components to the data field using the DataColumn property.

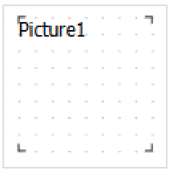
The object has the following properties:

Property	Description
AllowExpressions	This property allows to turn on or off the expression handling. It is on by default.
Brackets	This property contains a pair of symbols that designate an expression.
DataColumn	The data column that this object is bound to.
Text	This property contains the RTF text.
Padding	The padding, in pixels.

Picture

An object can display graphics in the following formats: BMP, PNG, JPG, GIF, TIFF, ICO, EMF, WMF. With the help of the "Picture" object, you can print your company logo, a photo of employee or any graphical information. On the toolbar, it looks like this:

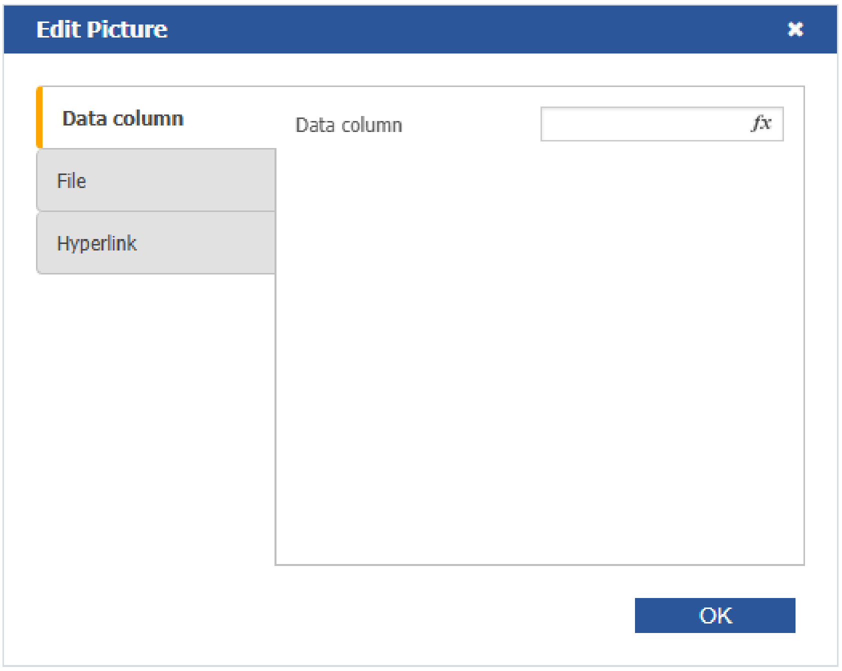
And on the report page, it looks like this:



An object can show data from the following sources:

- Data column - Picture from a data column. Name of the column is stored in the "DataColumn" property.
- File with a picture - Picture is loaded from a file and is saved inside the report. Picture is stored in the "Image" property.
- Hyperlink – Picture loaded via the link every time the report is built. Picture is not stored within the report. The address is stored in the property ImageLocation. This may be a URL or link to a local file. In the last case, you have to distribute the image file together with the report.

In order to call a picture editor, double click on the object. In the editor, you can choose the data source for the picture:



You can also set the image source in the object properties: DataColumn, Image, ImageLocation.

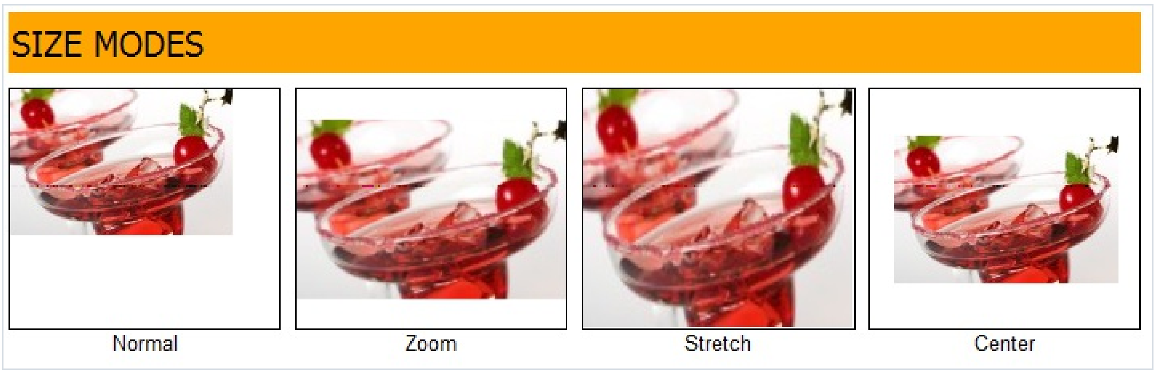
You also can drag&drop a data column from the "Data" window into the report page. In this case the "Picture" object is created which contains a link to the column. The column you drag should have the "byte[]" data type.

The "SizeMode" property determines how the picture is displayed:

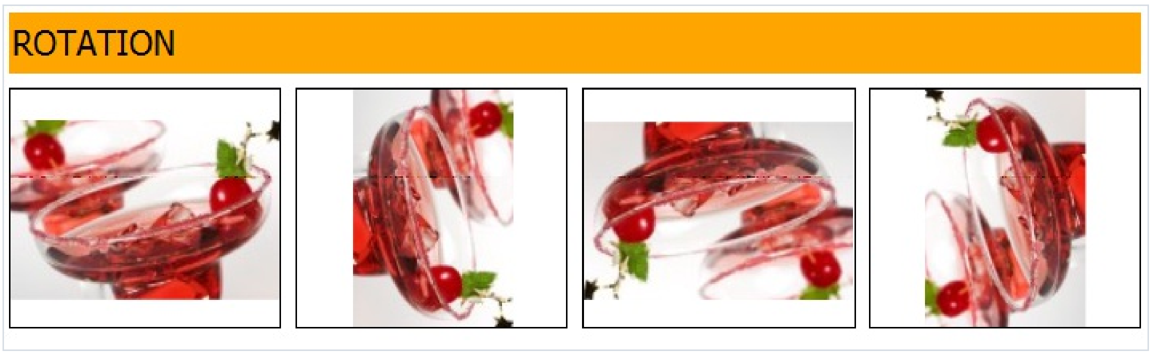
- AutoSize. The object gets the size of the picture.
- CenterImage. The picture is centered inside the object.
- Normal. The picture is displayed in the left corner of the object.

- StretchImage. The picture is stretched to the size of the object.
- Zoom. The picture is stretched to the size of the object in accordance with the aspect ratio.

The difference between modes is shown in the following picture:



It is possible to rotate the image by using the Angle property. Results of the pictures rotation by a predetermined angle shown below:



The "Picture" object has the following properties:

Property	Description
Angle	The rotation angle, in degrees. Possible values for this property are 0, 90, 180, 270.
SizeMode	The size mode.
Transparency	The degree of transparency of the pictures. The property can have values between 0 and 1. The value 0 (by default) means that the picture is opaque.
TransparentColor	The color which will be transparent when displaying the picture.
Image	The picture.
DataColumn	The data column that this object is bound to.
ImageLocation	This property can contain name of the file or URL. The picture will be loaded from this location when building the report.
Padding	The padding, in pixels.
ShowErrorImage	Shows the “No picture” picture, in case when the picture is empty. This property makes sense to use if the picture is downloaded from the Internet.

Line

The "Line" object can display horizontal, vertical or diagonal line. The object is as follows: ▯

On the page, the object is as follows:

> If possible, use the object's border instead of "Line" object. This will simplify the report and avoid possible problems with the export to different formats.

To add a line in the report, click the icon on the toolbar "Components", or drag the icon of the component to the desired location on the report page. To change the line type from horizontal to vertical or diagonal, set Diagonal property in the Properties window. An ordinary line differs from a diagonal line in that you can make it only vertical or horizontal.

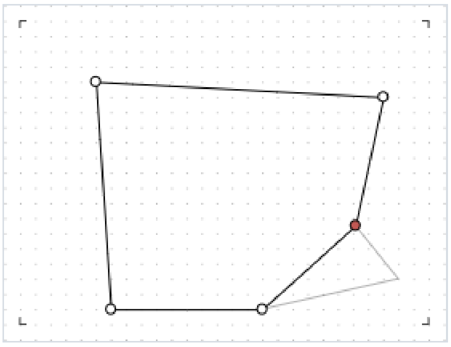
> Do not choose the "Double" line style for this object. This style applies only to the object's border.

The "Line" object has the following properties:

Property	Description
Diagonal	The property determines weather the line is diagonal. An ordinary line can be turned into a diagonal one by enabling this property.
StartCap, EndCap	These properties allow to setup the line caps. You can use one of the following cap styles: - ellipse - rectangle - diamond - arrow Size of the cap can be set in the Width, Height properties of the cap. You can configure caps for each end of the line.

Polyline and polygon objects

These objects are used to display a variety of shapes such as polygons. They are in the same category as the Shape and Line objects. To place the Polygon object, open the menu under the and select one of the polygons. You can place a pre-made five-, six-, seven- or octagon. Alternatively, you can select Polygon to draw the shape yourself. An example of what a polygon might look like:

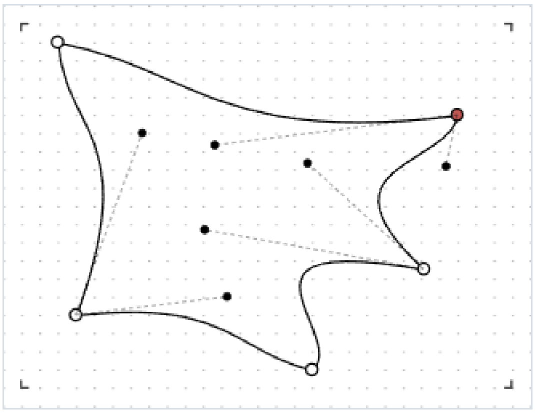


The gray lines in the image help you see how the object will look after adding a new point.

After placing the first point, you can add additional ones. After you finish drawing the polygon, press `Escape` or switch Edit mode. The editing mode panel for the Polyline and Polygon objects is located on the Home tab.

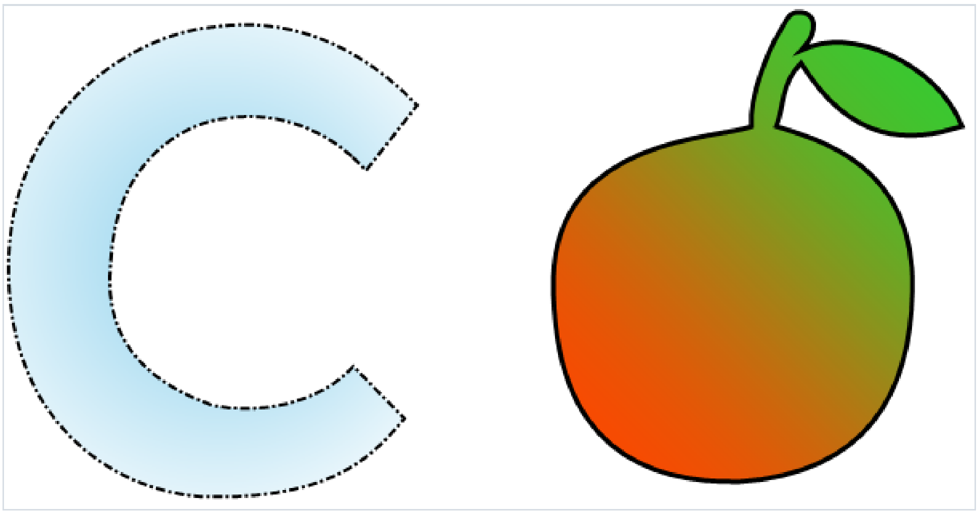
Polyline and polygon editing modes:

Button	Mode	Description
	Adding a point	This mode turns on immediately after adding a polygon. To add a point, select this mode and select one of the points of the object. After that, hover over the desired location of the point and press the left mouse button. The point will be added next to the one you selected.
	Moving and scaling	In this mode, you can move the entire object, as well as stretch it.
	Deleting a point	To remove a point from a polygon or polyline, select this mode and click on the desired point. You can also select it in another mode and press the Delete key.
	Mouse pointer	This mode allows you to view and move all points of the object that were added earlier.
	Curve anchor point	In this mode, you can add a point of a curve to the line adjacent to the selected point. This line will become a Bezier curve, and the added point will act as an anchor.



This is what a broken line with a set point of curvature (blue) looks like. The red line shows the state of the line before it was converted to a curve.

Both objects have the ability to adjust their borders, and the Polygon object supports the same fill modes as the rest of the objects.

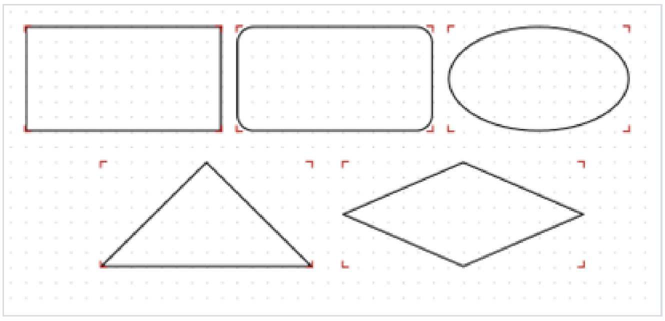


Shape

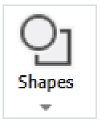
The "Shape" object displays one of the following shapes:

- rectangle;
- rounded rectangle;
- ellipse;
- triangle;
- diamond.

The object is as follows:



On the toolbar in looks like this:



In order to insert a shape into the report, click the the icon in the Components toolbar. Then, select the desired shape type from the list in the Shape property of the Shape object.

The shape, like any other report object, has a fill and border. Contrary to the "Text" object, you cannot control each border line. Also, don't use the "Double" line style.

> Instead of rectangular shape, use the object's borders if possible.

The "Shape" object has the following properties:

Property	Description
Shape	This property determines the type of shape.
Curve	This property is used with the "RoundRectangle" shape. It allows to set the curve.

CheckBox

The object displays the checkbox in the report. On the toolbar, it looks as follows: ✓

And on the report page – as follows:

The object can display two states: "Checked" and "Unchecked". Use the following ways to handle the object's state:

- set the state in the "Checked" property;
- bind the object to a data column using the "DataColumn" property;
- set the expression that returns the true or false in the "Expression" property.

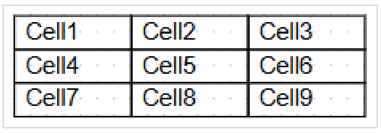
The "CheckBox" object has the following properties:

Property	Description
CheckedSymbol, UncheckedSymbol	These properties determine the symbol that is shown in the object, depending on the object's state.
CheckColor	This property determines the color of the check symbol.
CheckWidthRatio	Use this property to set the check width ratio. The width of the check symbol depends on the size of the object. You can use values in the 0.2 - 2 range.
HideIfUnchecked	This property allows to hide the object if it is unchecked.
Checked	This property controls the state of the object.
DataColumn	The data column which this object is bound to. The type of column should be either bool or int.
Expression	The expression that returns the true or false.

Table

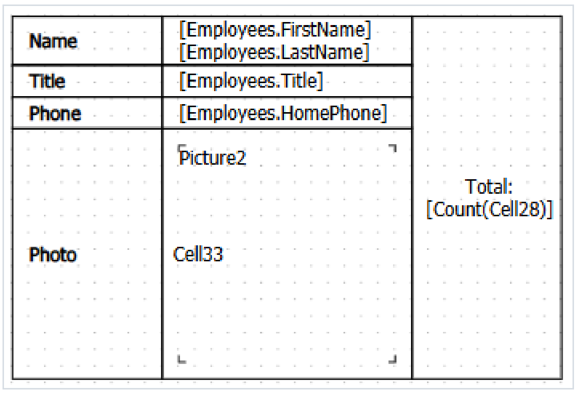
The "Table" object is made up of rows, columns and cells. It is a simplified analog of Microsoft Excel table. It looks like this:

And on the report page – as follows:



Cell1	Cell2	Cell3
Cell4	Cell5	Cell6
Cell7	Cell8	Cell9

You can create a static table, filling cells by hand. And it is possible to create a dynamic table using the fields from the data source. An example of a dynamic table is shown below:



Name	[Employees.FirstName] [Employees.LastName]	Total: [Count(Cell28)]
Title	[Employees.Title]	
Phone	[Employees.HomePhone]	
Photo	Picture2 Cell33	

The "Table" object has the following properties:

Property	Description
ColumnCount	Use this property to quickly set the number of columns. If columns in a table are few, they get added, and when they are more, they get deleted.
RowCount	Use this property to quickly set the number of rows. If rows in a table are few, they get added, and when they are more, they get deleted.
FixedColumns	The property determines how many columns in the table are fixed. Fixed columns form the table header. Printing of the header is controlled by the "RepeatHeaders" property.
FixedRows	The property determines how many rows in the table are fixed. Fixed rows form the table header. Printing of the header is controlled by the "RepeatHeaders" property.
RepeatHeaders	The property allows printing the table header on every new page. This property works only for tables which are formed dynamically.

Table layout

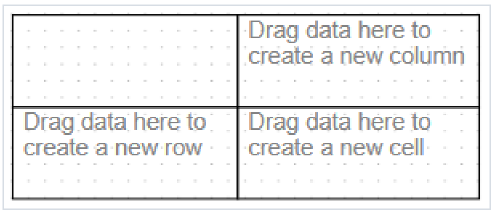
The table which is built dynamically, can be automatically splitted across pages. This behavior is controlled by the `Layout` property of the table. You can choose one of the following values:

Value	Description
AcrossThenDown	Table is rendered across then down.
DownThenAcross	Table is rendered down then across.
Wrapped	Wide table is wrapped and rendered on the same page.

Matrix

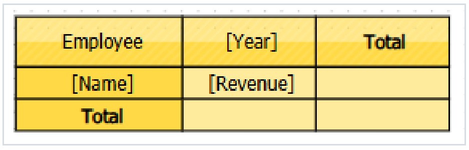
The "Matrix" object is, like the "Table" object, made up of rows, columns and cells. At the same time, it is not known beforehand how many rows and columns will be in the matrix - this depends on the data to which it is connected. On the toolbar it looks like this:

And on the page, it is as follows:



	Drag data here to create a new column
Drag data here to create a new row	Drag data here to create a new cell

Object matrix can be filled with data manually. But you also can create a dynamic matrix with fields from data source:



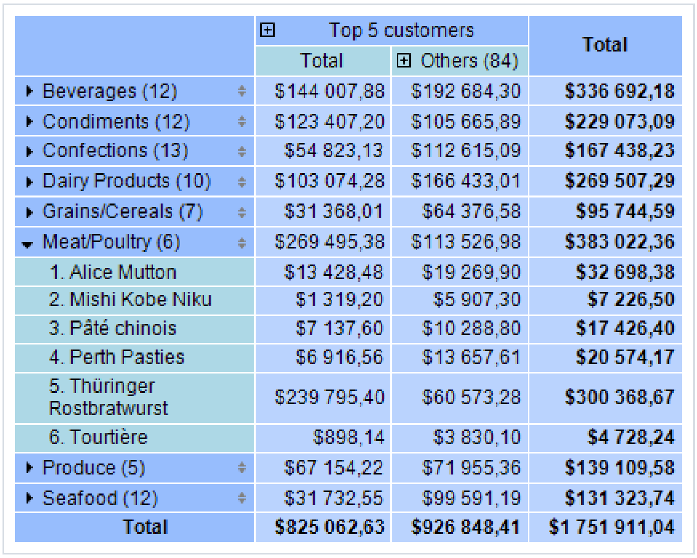
Employee	[Year]	Total
[Name]	[Revenue]	
Total		

The "Matrix" object has the following properties:

Property	Description
RepeatHeaders	If matrix is divided on several pages, this property allows printing matrix header on each new page.
CellsSideBySide	This property determines how matrix cells will be located if the matrix has several data cell levels. Possible variants: - the cells are displayed side by side; - the cells are displayed under each other.
Style	Using this property you can set a style for the whole matrix. You can choose one from predefined styles.
AutoSize	This property allows to calculate the matrix size automatically. Disable it if you want to control the object size manually.
DataSource	The property allows connecting the matrix to the data source. This property is set up automatically when you drag data column to the matrix. However, if you use expressions in cells,check that this property was set up correctly.
Filter	This property contains expression for data filtering which will be applicable to data source of the matrix (see "DataSource" property).

Advanced Matrix Object

This object, like the "Matrix" object, allows you to build summary reports.



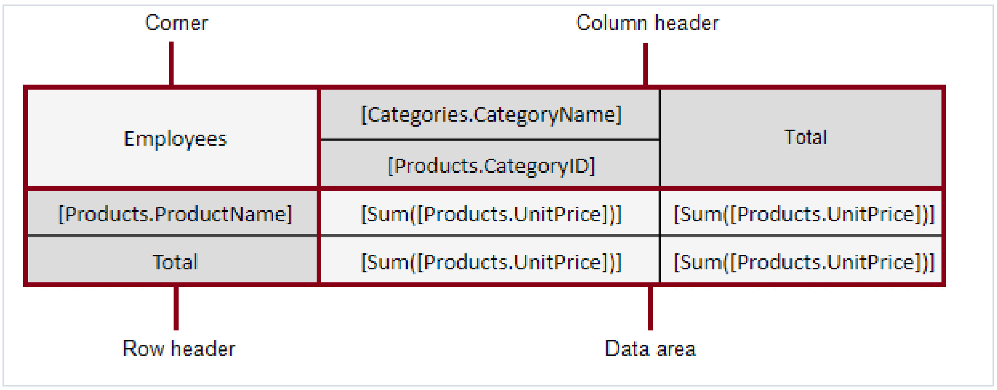
	⊞ Top 5 customers		Total
	Total	⊞ Others (84)	
▸ Beverages (12)	$144 007,88	$192 684,30	**$336 692,18**
▸ Condiments (12)	$123 407,20	$105 665,89	**$229 073,09**
▸ Confections (13)	$54 823,13	$112 615,09	**$167 438,23**
▸ Dairy Products (10)	$103 074,28	$166 433,01	**$269 507,29**
▸ Grains/Cereals (7)	$31 368,01	$64 376,58	**$95 744,59**
▾ Meat/Poultry (6)	$269 495,38	$113 526,98	**$383 022,36**
1. Alice Mutton	$13 428,48	$19 269,90	**$32 698,38**
2. Mishi Kobe Niku	$1 319,20	$5 907,30	**$7 226,50**
3. Pâté chinois	$7 137,60	$10 288,80	**$17 426,40**
4. Perth Pasties	$6 916,56	$13 657,61	**$20 574,17**
5. Thüringer Rostbratwurst	$239 795,40	$60 573,28	**$300 368,67**
6. Tourtière	$898,14	$3 830,10	**$4 728,24**
▸ Produce (5)	$67 154,22	$71 955,36	**$139 109,58**
▸ Seafood (12)	$31 732,55	$99 591,19	**$131 323,74**
Total	**$825 062,63**	**$926 848,41**	**$1 751 911,04**

Here is a list of its key features:

- row and column headers can contain groups and simple elements in any order. This allows you to build asymmetric reports;
- collapse buttons allow you to interactively manage the visibility of individual elements;
- sorting buttons allow you to interactively sort the matrix by the selected values, including the total values;
- Top N grouping allows you to display N values in the header, and group the remaining values into a separate element with the ability to expand;
- output of matrix headers in a stepped form;
- sorting headers by total values;
- a wide range of aggregate functions;
- support of custom aggregate functions;
- a wide range of special functions that allow you to get the values of totals, adjacent cells, as well as functions for calculating percentages;
- support for "Sparkline" and "Gauge" objects in data cells.

Matrix structure

The "Advanced Matrix" object consists of the following elements:



Employees	[Categories.CategoryName]	Total
	[Products.CategoryID]	
[Products.ProductName]	[Sum([Products.UnitPrice])]	[Sum([Products.UnitPrice])]
Total	[Sum([Products.UnitPrice])]	[Sum([Products.UnitPrice])]

Corner

The cells located in the corner of the matrix can contain arbitrary information. You can also split/combine them as you like.

Header

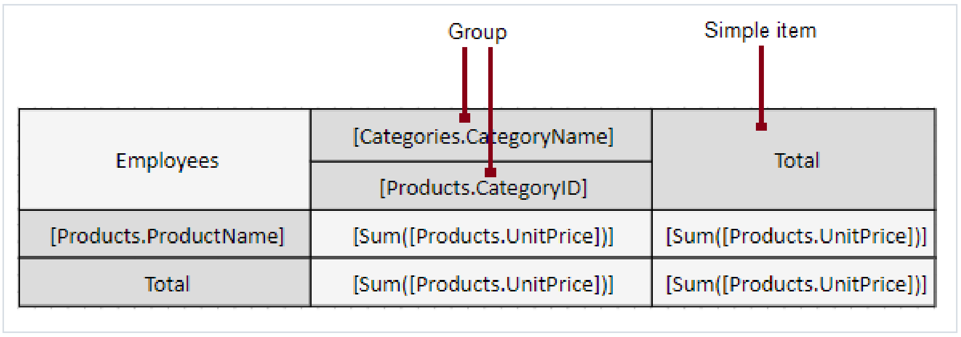
Matrix header can contain two types of elements:

- simple element: displays static information such as the text "Total".
- group: displays a list of values grouped by a specific criterion.

The header has a tree structure. The root element is invisible, it contains visible first-level elements.

Any arrangement of elements is allowed; for example, a header may not have a group, or it may have several adjacent groups. The totals can also be arranged in an arbitrary way.

In design mode, the matrix displays visual cues in the header area:



Employees	[Categories.CategoryName]	Total
	[Products.CategoryID]	
[Products.ProductName]	[Sum([Products.UnitPrice])]	[Sum([Products.UnitPrice])]
Total	[Sum([Products.UnitPrice])]	[Sum([Products.UnitPrice])]

In this case, the header structure is as follows:

```
Row header
- "Name" group
- "Total" element

Column header
- "Year" group
  - "Month" group
- "Total" element
```

See section Header Setup for more information.

Data area

Cells in a data area usually contain an aggregate function. See section Data Area Setup.

Matrix setup

Structure setup

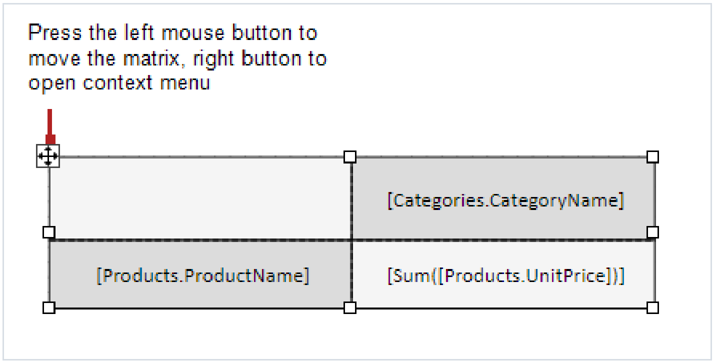
Follow these steps to set up the matrix:

1. Set up the headers (see section Header Setup).
2. Set up the data cells (see section Data area Setup).
3. Add totals (see section Header Setup). This step is best done last to save time setting up new data cells.

> The matrix must be connected to the data source — the `DataSource` property is responsible for this. Typically, this property is set up automatically during the header and cell setup.

Context menu

To open the context menu, select any element of the matrix, then right-click on the area in the upper left corner of the matrix:


Press the left mouse button to move the matrix, right button to open context menu
[Categories.CategoryName]
[Products.ProductName]
[Sum([Products.UnitPrice])]

The following commands are available in the menu:

- "Style" — select one of the available styles;
- "Swap Columns and Rows" — allows you to quickly swap columns and rows in the matrix;
- "Repeat headers" — column and row headers will be printed on each page if the matrix takes several pages.

Settings available in the "Properties" window

The following properties are available in the "Properties" window that are specific to the "Advanced Matrix" object:

Property	Value	Description
DataRowPriority	Rows	The priority of headers when accessing database fields from data cells. See section Properties available from data cells.
DataSource		Data source.
EvenStylePriority	Rows	The priority of the number of rows or columns to enable `EvenStyle` property.
Filter		Data filtering expression. See section Filtering Data.
Layout	AcrossThenDown	See section Table Layout.

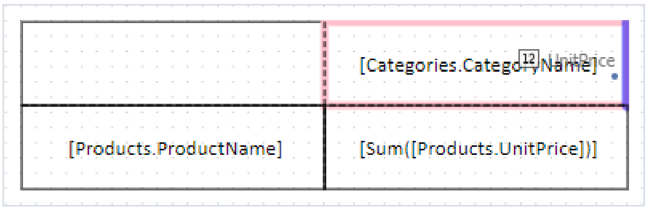
Property	Value	Description
PrintIfEmpty	True	Print matrix if empty.
RepeatHeaders	True	Repeat headers on a new page.
ResetDataOnRun	False	Reset data every time you run a report. By default, the matrix is not rebuilt during interactive operations (see section Interactive Options).
Style		Matrix style.
WrappedGap	0	The gap between the parts of the matrix in the mode `Layout = Wrapped`.

Header setup

Adding an item

There are two ways to add an element to the header:

- by dragging the field from the "Data" window. As you drag, it will show in which part of the header a new element will be added:



- you can also add a "Total" element (before or after the selected element) using the context menu. A new element will be added with the text "Total" (the text depends on the current localization).

> Adding a total is equivalent to adding an empty item and editing its text.

> When you add a database field from the "Data" window to an empty matrix, its `DataSource` property is automatically configured.

Removing an element

You can delete an element by selecting the "Delete" item in the context menu. You can delete only the selected element, or the element tree (the selected element and all its children).

You can also delete an element by pressing the `Delete` key. In this case, only the selected element is deleted.

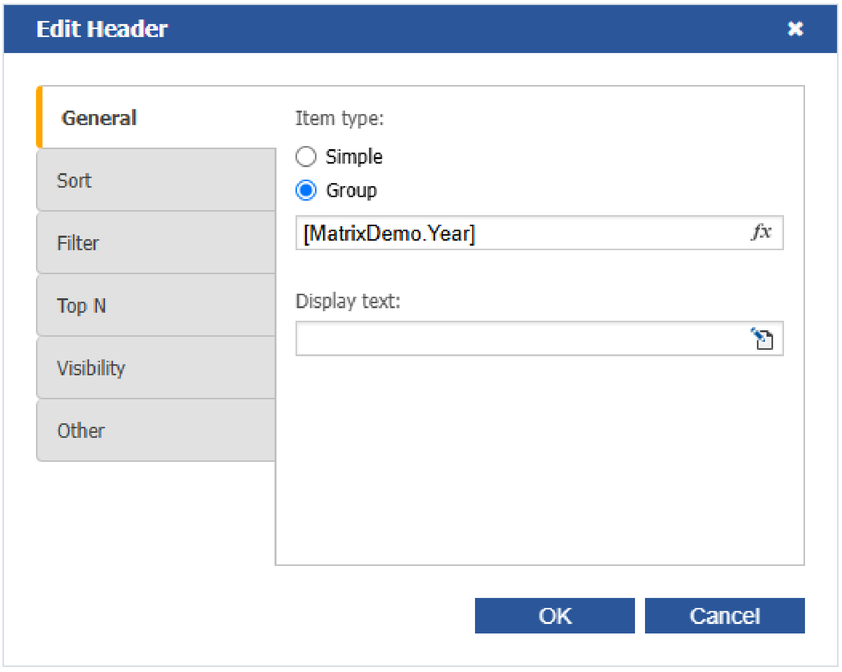
> An element with a lock icon cannot be deleted in the described way. See section TopN Grouping.

Editing elements

To call the element editor, double-click on it with the left mouse button, or select the "Edit ..." in the context menu. You can also call the editor by pressing `Enter`.

Grouping

As described above, the matrix header can contain two types of elements — a group and a simple element. The element type is set in the header editor:



Item type:
Simple [✓ Group]
[MatrixDemo.Year]
Display text:

> You can turn a simple element into a group and vice versa. Some of the settings in the editor window are not available for a simple element.

The group allows you to display a list of values grouped by condition. In the example above, the condition `[MatrixDemo.Year]` is specified — this means that the element will display a list of years. The list will contain non-duplicate values; identical values will be grouped.

By default, the group displays the values specified in the grouping condition. For example, if the condition `[MatrixDemo.Month]` is specified, the month numbers will be displayed. The "Display Text" property allows you to display a different value, for example:

```
[MonthName([MatrixDemo.Month])]
```

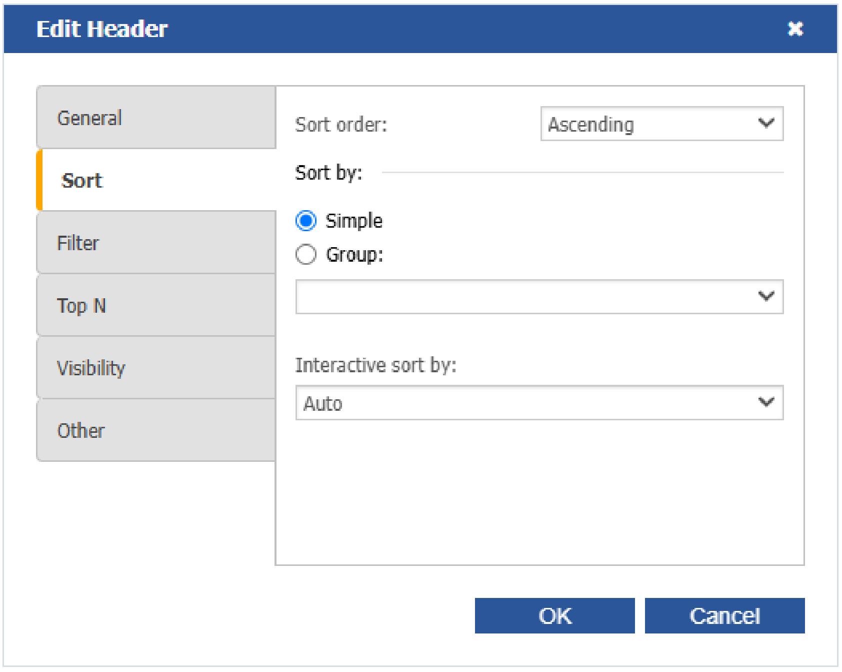
will display the name of the month instead of its number.

In this property, you can call special functions of the matrix (see the section Properties accessible from header cells), for example:

```
[Matrix1.RowNo].[MatrixDemo.Name]
```

Sort

Sort settings for output values are presented on the tab of the same name in the header editor. The settings are active if the "Group" element type is selected:



Sort order: Ascending

Sort by:

Simple [✓]

Group:

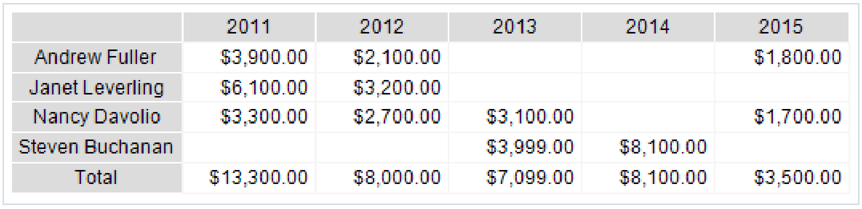
Interactive sort by: Auto

Description of settings:

"Sort order" — sets the sort order — ascending, descending or no sort.

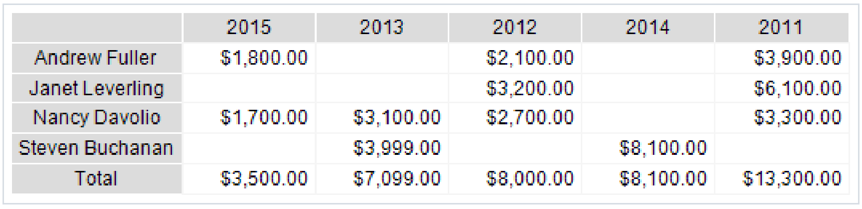
"Sort by" — select one of two sort options: by displayed values, or by total value. The pictures below show how the "Year" element is sorted:

By element value:



	2011	2012	2013	2014	2015
Andrew Fuller	$3,900.00	$2,100.00			$1,800.00
Janet Leverling	$6,100.00	$3,200.00			
Nancy Davolio	$3,300.00	$2,700.00	$3,100.00		$1,700.00
Steven Buchanan			$3,999.00	$8,100.00	
Total	$13,300.00	$8,000.00	$7,099.00	$8,100.00	$3,500.00

By total value:



	2015	2013	2012	2014	2011
Andrew Fuller	$1,800.00		$2,100.00		$3,900.00
Janet Leverling			$3,200.00		$6,100.00
Nancy Davolio	$1,700.00	$3,100.00	$2,700.00		$3,300.00
Steven Buchanan		$3,999.00		$8,100.00	
Total	$3,500.00	$7,099.00	$8,000.00	$8,100.00	$13,300.00

"Interactive sort by total" - defines how to sort the header values if interactive sort is active (see Interactive sort). The options are None, Auto, and the name of the total.

"Sort order toggled by button" — here the name of the button of type `MatrixSortButton` is specified, which is located in the corner of the matrix or outside of it. When you click the button in the report viewer, the sort order is changed and the matrix is updated.

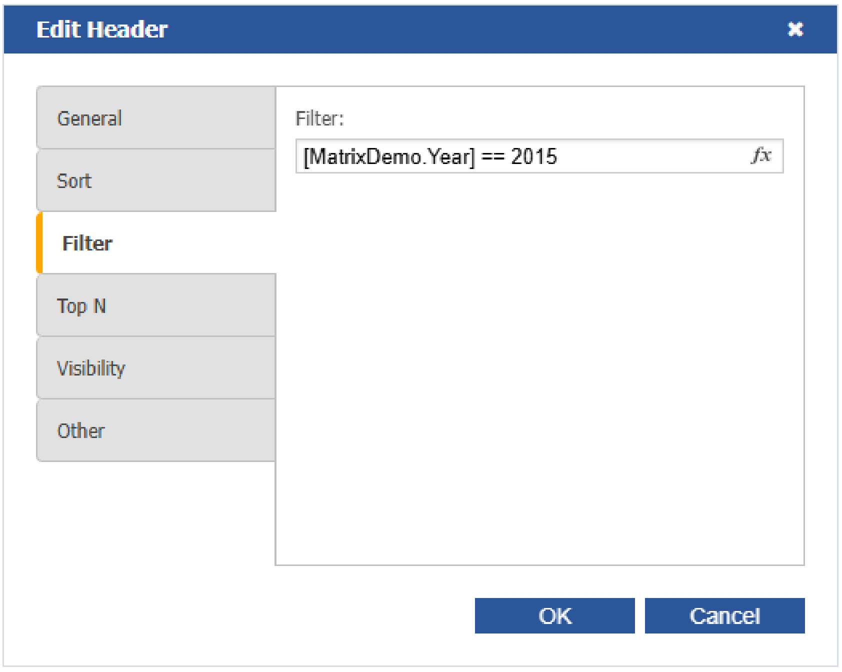
Data filtering

There are two ways to filter the data displayed in the matrix.

Method 1: filtering using the `Filter` matrix property. To do this, select the "Matrix" object and fill the Property `Filter` in the "Properties" window:

```
[MatrixDemo.Year] == 2015
```

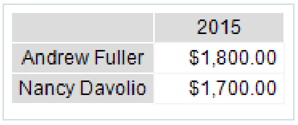
Method 2: filtering in the header editor using a similar expression:



Filter: [MatrixDemo.Year] == 2015

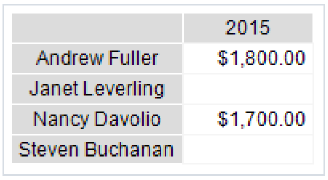
In both cases, the filter expression returns the type `bool`.

The difference between the two described methods is how much data gets into the matrix. In the first case, all values are discarded, except for those where the year is 2015. The result may look like this:



	2015
Andrew Fuller	$1,800.00
Nancy Davolio	$1,700.00

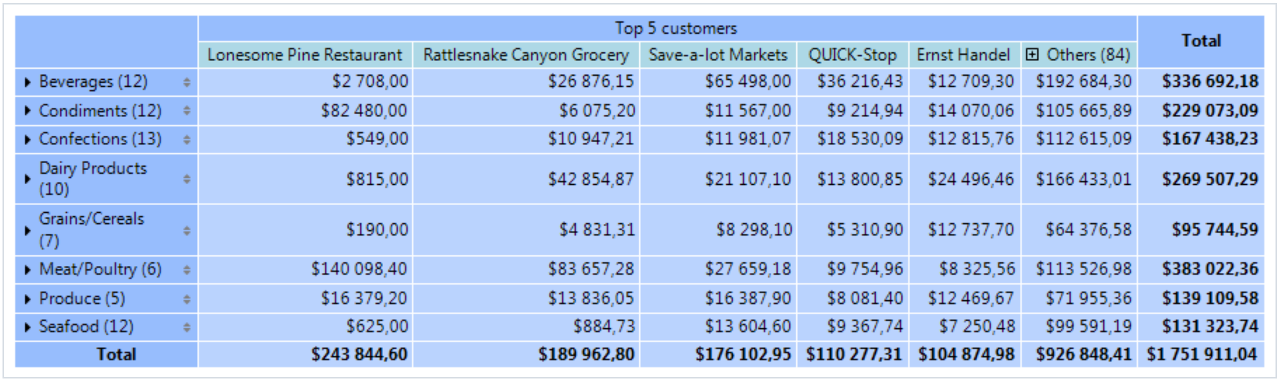
In the second case, the values of a specific element in the header are filtered. Unlike the previous option, the result can contain empty values:



	2015
Andrew Fuller	$1,800.00
Janet Leverling	
Nancy Davolio	$1,700.00
Steven Buchanan	

TopN grouping

If the number of values in the header group is large, it will generate an excessive number of report pages. TopN grouping allows you to display the first N values, and show the remaining values in a collapsed form:



	Top 5 customers						Total
	Lonesome Pine Restaurant	Rattlesnake Canyon Grocery	Save-a-lot Markets	QUICK-Stop	Ernst Handel	⊞ Others (84)	
▸ Beverages (12)	$2 708,00	$26 876,15	$65 498,00	$36 216,43	$12 709,30	$192 684,30	**$336 692,18**
▸ Condiments (12)	$82 480,00	$6 075,20	$11 567,00	$9 214,94	$14 070,06	$105 665,89	**$229 073,09**
▸ Confections (13)	$549,00	$10 947,21	$11 981,07	$18 530,09	$12 815,76	$112 615,09	**$167 438,23**
▸ Dairy Products (10)	$815,00	$42 854,87	$21 107,10	$13 800,85	$24 496,46	$166 433,01	**$269 507,29**
▸ Grains/Cereals (7)	$190,00	$4 831,31	$8 298,10	$5 310,90	$12 737,70	$64 376,58	**$95 744,59**
▸ Meat/Poultry (6)	$140 098,40	$83 657,28	$27 659,18	$9 754,96	$8 325,56	$113 526,98	**$383 022,36**
▸ Produce (5)	$16 379,20	$13 836,05	$16 387,90	$8 081,40	$12 469,67	$71 955,36	**$139 109,58**
▸ Seafood (12)	$625,00	$884,73	$13 604,60	$9 367,74	$7 250,48	$99 591,19	**$131 323,74**
Total	**$243 844,60**	**$189 962,80**	**$176 102,95**	**$110 277,31**	**$104 874,98**	**$926 848,41**	**$1 751 911,04**

How it works

TopN function uses four elements to display data:

1. TopN group is a source group containing a large number of values.

2. TopN total, which displays a total of TopN values.

3. Group "Others", which displays values that are not included in TopN.

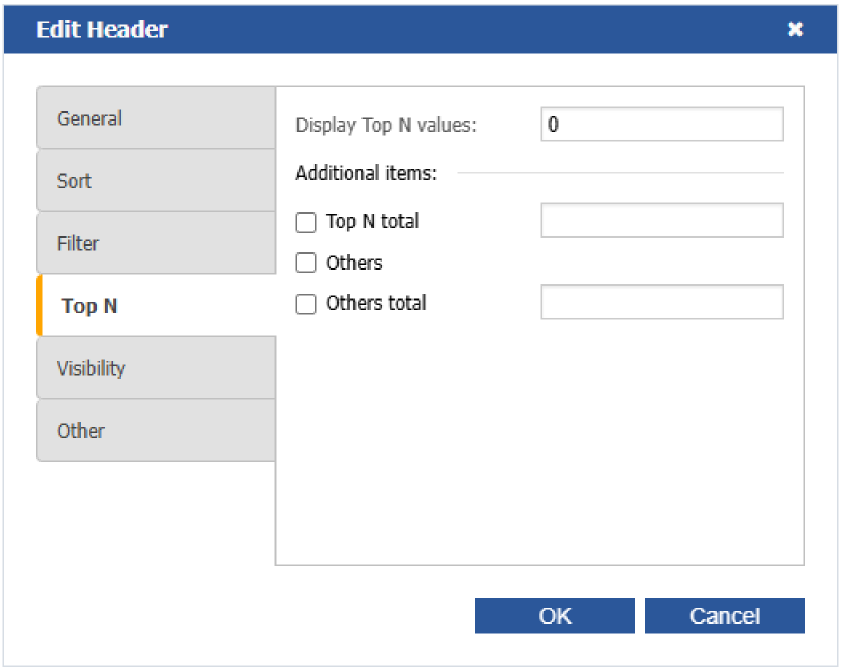
4. The result of the group "Others".

If the source group has fewer values than specified in the `TopN.Count` property, it is displayed as usual, without TopN grouping. Otherwise, the following happens:

- N values are left in the main group;
- the rest of the values are transferred to the "Others" group;
- data in the main group and in the "Others" group are aggregated;
- the obtained values are displayed as a total of TopN and as a total of the group "Others".

Setup

TopN is set up for the main group. To do this, double-click on the element or select "Edit ..." from the context menu.



Display Top N values: 0

Additional items:

- [ ] Top N total
- [ ] Others
- [ ] Others total

There are two options for working with additional elements:

- the elements "TopN total", "Others", "Others total" are created automatically when building the matrix. Their visual design is copied from the main element. You can manage the visibility of the elements, as well as specify text for the total elements. There are no other options to customize the appearance;
- the above elements are added to the matrix template. This allows you to fully customize the appearance, as well as change the order of elements. You can add collapse buttons to interactively manage the visibility of individual elements.

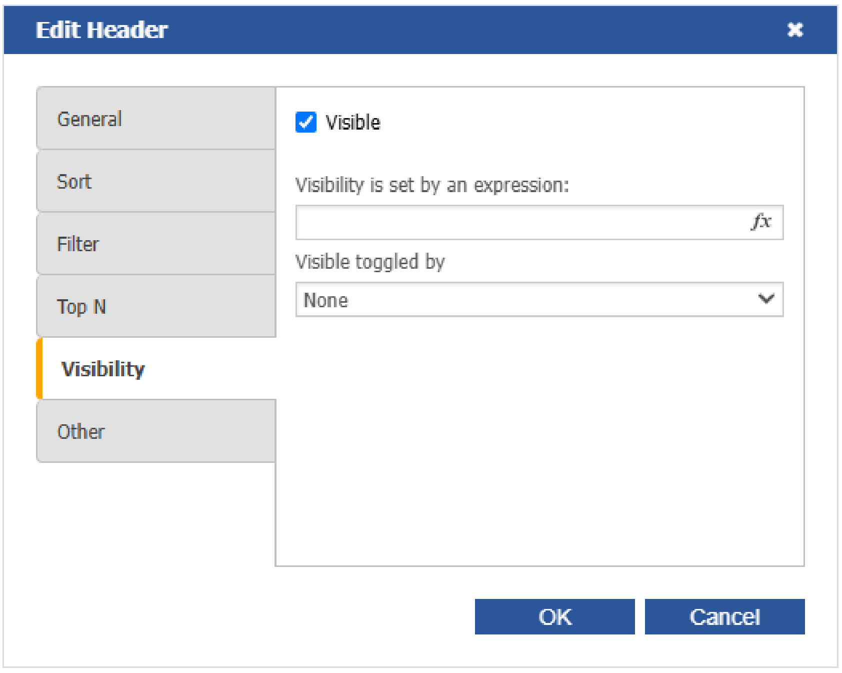
TopN, BottomN, FirstN, LastN

The TopN engine uses the first N values in the original group. The meaning of the resulting values depends on how the original group was sorted:

- the group is sorted by the value of the header: the first N (ascending sort) or the last N values (descending sort) are displayed;
- the group is sorted by total value: the largest N (descending sort) or the N smallest values (ascending sort) are displayed.

Element visibility

You can manage the visibility of an element on the "Visibility" tab:



[✓] Visible

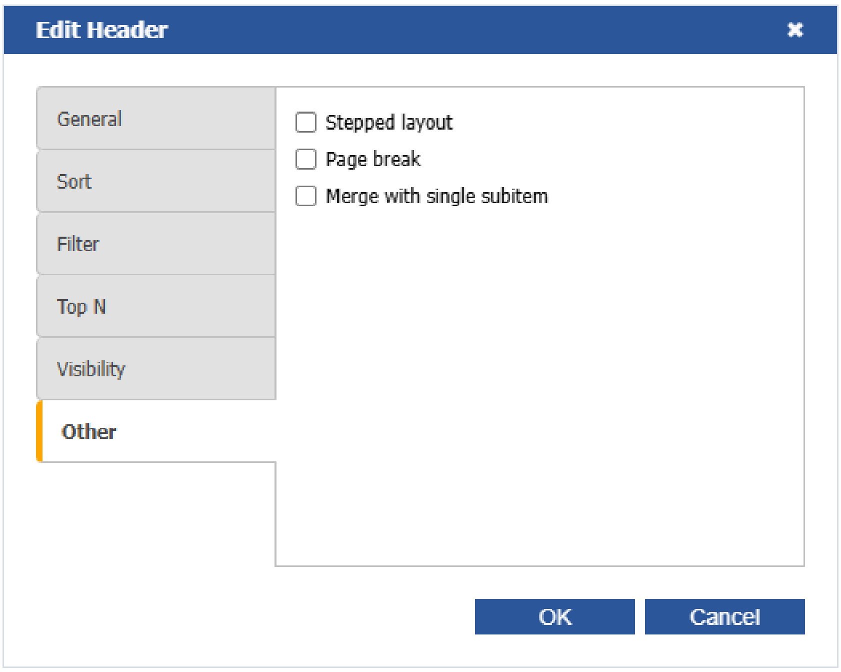
Visibility is set by an expression:

Visible toggled by: None

- "Visible" - sets the initial visibility;
- "Visibility set by an expression" is an expression that returns type `bool` that sets visibility. If the expression is not empty, its value is used instead of the "Visible" option;
- "Visible toggled by button" - the name of the button of type `MatrixCollapseButton` that manages the visibility of this element. See the section Collapsing/Expanding elements.

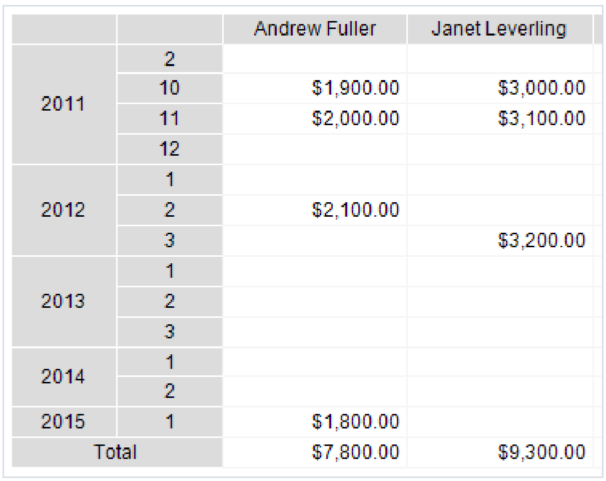
Other settings

Other settings can be found on the "Other" tab of the header editor:



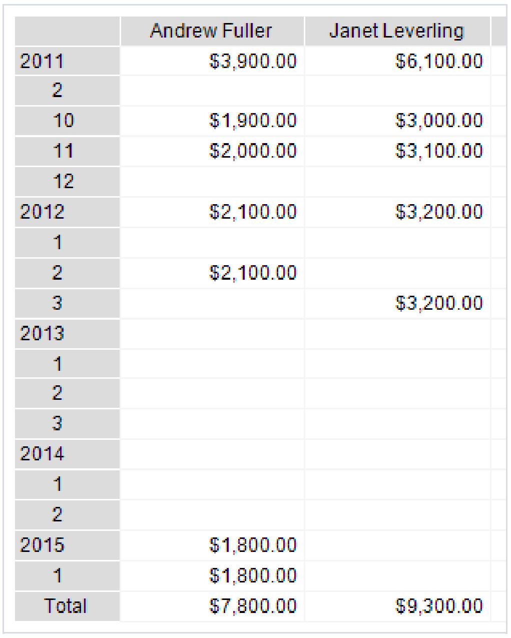
- [ ] Stepped layout
- [ ] Page break
- [ ] Merge with single subitem

The "Stepped layout" option toggles the layout of nested elements between block (default) and stepped layout. Let's look at the example of a matrix with a nested row header (Year, Month). The block layout looks like this: The finished report looks like this:



		Andrew Fuller	Janet Leverling
2011	2		
	10	$1,900.00	$3,000.00
	11	$2,000.00	$3,100.00
	12		
2012	1		
	2	$2,100.00	
	3		$3,200.00
2013	1		
	2		
	3		
2014	1		
	2		
2015	1	$1,800.00	
Total		$7,800.00	$9,300.00

If you enable the "Stepped layout" option for the "Year" element, the arrangement of the elements will change as follows:



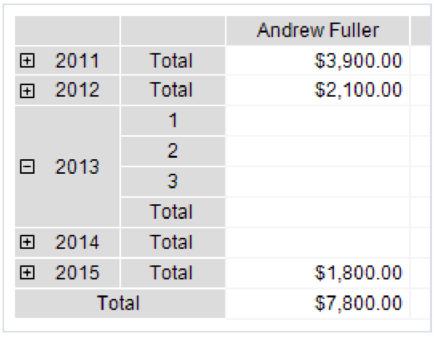
	Andrew Fuller	Janet Leverling
2011	$3,900.00	$6,100.00
2		
10	$1,900.00	$3,000.00
11	$2,000.00	$3,100.00
12		
2012	$2,100.00	$3,200.00
1		
2	$2,100.00	
3		$3,200.00
2013		
1		
2		
3		
2014		
1		
2		
2015	$1,800.00	
1	$1,800.00	
Total	$7,800.00	$9,300.00

> When you enable the "Stepped layout" option, the nested element changes the Property `Padding.Left`, which is responsible for text indentation. You can adjust this value in the Properties window.

> This option can be used for any element that has nested elements.

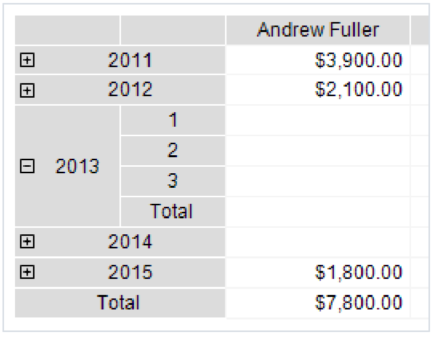
The "Page Break" option inserts a new page before printing the element. No new page is inserted before the first element.

The option "Merge with a single subitem" is used in the case of dynamically collapsed headers (see section Collapsing/expanding elements). The option allows you to hide the "Total" element. Below is the view of the finished report with the disabled option (by default).



		Andrew Fuller
⊞ 2011	Total	$3,900.00
⊞ 2012	Total	$2,100.00
⊟ 2013	1	
	2	
	3	
	Total	
⊞ 2014	Total	
⊞ 2015	Total	$1,800.00
Total		$7,800.00

and with enabled, pay attention to the output of the "Year" element:



		Andrew Fuller
⊞ 2011		$3,900.00
⊞ 2012		$2,100.00
⊟ 2013	1	
	2	
	3	
	Total	
⊞ 2014		
⊞ 2015		$1,800.00
Total		$7,800.00

"Column span" and "Row span" options allow you to merge cells in columns and rows when element is printed. By default, the element controls these parameters automatically.

Properties accessible from header cells

The matrix has a set of properties that you can use when printing header cells. The name of the matrix is used to access the property:

```
[Matrix1.RowNo]
```

Property	Return value	Description
RowNo	int	Header element ordinal.
ItemCount	int	The number of children in the current header element.

These properties can be used in the "Displayed Text" field of a header cell, for example:

```
[Matrix1.RowNo].[MatrixDemo.Name]
```

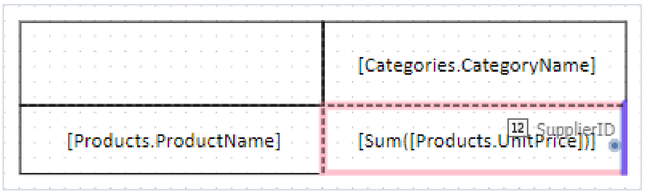
will display the text

```
1. Andrew Fuller
```

Data area setup

Adding an item

You can add an element by dragging the DB field from the "Data" window. As you drag, it will be shown in which part of the data area the new element will be added:



> When you add an element to an empty matrix, its Property `DataSource` is automatically configured.

Removing an element

You can clear the text of an element by choosing `Delete` or "Clear" from the item menu. The data element itself cannot be deleted; for this, you should delete the corresponding element in the matrix header. In the example above, you must remove the element "Revenue" from the header in order to delete `[Sum(Revenue)]`.

Editing an item

To edit the text of an element, double click to call the text editor window. You can also call the editor by pressing the `Enter` key.

You can also perform the following operations using the context menu of an element:

- call the element editor;
- customize data formatting;
- change type of aggregate function (see section Aggregate functions);
- add interest calculation;
- insert a progress indicator or sparkline into the cell.

Aggregate functions

Aggregate functions are used in data cells to aggregate cell values and to calculate totals. An aggregate function call looks like this:

```
[Function(Expression)]
```

> Square brackets are used to specify expressions in cell text. You can use multiple aggregate functions in one cell along with regular text.

Expression is usually a data source field. An example of using an aggregate function:

```
[Sum([MatrixDemo.Revenue])]
```

Below is a list of aggregate functions:

Function	Description
Sum	Returns the sum of values.
Min	Returns the minimum value.
Max	Returns the maximum value.
Avg	Returns the average value.
Count	Returns the number of values.
CountDistinct	Returns the number of different (unique) values.
StDev	Returns the standard deviation of a sample.
StDevP	Returns the standard deviation of a population.
Var	Returns the variance for a sample.
VarP	Returns the variance for a population.
First	Returns the first value.
Last	Returns the last value.
ValuesList	Returns a list of all values found in a cell. This aggregate is used to work together with the "Diagram" and "Sparkline" objects.
_name	Custom aggregate function defined in the report code.

A custom function has a name that begins with an underscore. Its code should be placed in the body of the main report class, `ReportScript`. The function is defined as follows:

```
object _FuncName(List<dynamic> l)
```

Example of a custom function `_Sum`:

```
public class ReportScript
{
    public object _Sum(List<dynamic> l)
    {
        dynamic value = 0;
        foreach (dynamic v in l)
            value += v;
        return value;
    }
}
```

Special functions

Special functions can be used in the data cell of the matrix. They allow you to get the value of another cell in the same row or column.

GrandColumnTotal

Returns the value of the grand total for the column.

Parameter	Description
`aggregate`	(optional) Aggregate function. Parameter can be omitted if the aggregate has already been accessed in the cell.

Examples:

```
GrandColumnTotal(Sum([MatrixDemo.Revenue]))
Sum([MatrixDemo.Revenue]) / GrandColumnTotal()
```

GrandRowTotal

Returns the value of the grand total for a row.

Parameter	Description
`aggregate`	(optional) Aggregate function. Parameter can be omitted if the aggregate has already been accessed in the cell.

Examples:

```
GrandRowTotal(Sum([MatrixDemo.Revenue]))
Sum([MatrixDemo.Revenue]) / GrandRowTotal()
```

GrandTotal

Returns the value of the grand total.

Parameter	Description
`aggregate`	(optional) Aggregate function. Parameter can be omitted if the aggregate has already been accessed in the cell.

Examples:

```
GrandTotal(Sum([MatrixDemo.Revenue]))
Sum([MatrixDemo.Revenue]) / GrandTotal()
```

ColumnTotal

Returns the value of the column total for the current group.

Parameter	Description
`aggregate`	(optional) Aggregate function. Parameter can be omitted if the aggregate has already been accessed in the cell.

Examples:

```
ColumnTotal(Sum([MatrixDemo.Revenue]))
Sum([MatrixDemo.Revenue]) / ColumnTotal()
```

RowTotal

Returns the value of the row total for the current group.

Parameter	Description
`aggregate`	(optional) Aggregate function. Parameter can be omitted if the aggregate has already been accessed in the cell.

Examples:

```
RowTotal(Sum([MatrixDemo.Revenue]))
Sum([MatrixDemo.Revenue]) / RowTotal()
```

ColumnMaxValue

Returns the maximum value of the column total for the current group.

Parameter	Description
`aggregate`	(optional) Aggregate function. Parameter can be omitted if the aggregate has already been accessed in the cell.

Examples:

```
ColumnMaxValue(Sum([MatrixDemo.Revenue]))
Sum([MatrixDemo.Revenue]) / ColumnMaxValue()
```

ColumnMinValue

Returns the minimum value of the column total for the current group.

Parameter	Description
`aggregate`	(optional) Aggregate function. Parameter can be omitted if the aggregate has already been accessed in the cell.

Examples:

```
ColumnMinValue(Sum([MatrixDemo.Revenue]))
Sum([MatrixDemo.Revenue]) / ColumnMinValue()
```

RowMaxValue

Returns the maximum value of the row total for the current group.

Parameter	Description
`aggregate`	(optional) Aggregate function. Parameter can be omitted if the aggregate has already been accessed in the cell.

Examples:

```
RowMaxValue(Sum([MatrixDemo.Revenue]))
Sum([MatrixDemo.Revenue]) / RowMaxValue()
```

RowMinValue

Returns the minimum value of the row total for the current group.

Parameter	Description
`aggregate`	(optional) Aggregate function. Parameter can be omitted if the aggregate has already been accessed in the cell.

Examples:

```
RowMinValue(Sum([MatrixDemo.Revenue]))
Sum([MatrixDemo.Revenue]) / RowMinValue()
```

FirstColumn

Returns the value of the first cell in the column.

Parameter	Description
`aggregate`	(optional) Aggregate function. Parameter can be omitted if the aggregate has already been accessed in the cell.

Parameter	Description
`useInteractiveSort=false`	(optional) Include the results of interactive sort, in which the order of the elements can be changed .
`useThisGroup=true`	(optional) Use a group at the same level to find a value.

The returned value depends on where the function is used:

- total cell: returns the value of the first cell in the group if parameter `useThisGroup` is `true` , otherwise it returns the value of the first total;
- group cell: returns the value of the first cell in the group.

Examples:

```
FirstColumn(Sum([MatrixDemo.Revenue]))
FirstColumn(Sum([MatrixDemo.Revenue]), true)
Sum([MatrixDemo.Revenue]) / FirstColumn()
```

FirstRow

Returns the value of the first cell in a row.

Parameter	Description
`aggregate`	(optional) Aggregate function. Parameter can be omitted if the aggregate has already been accessed in the cell.
`useInteractiveSort=false`	(optional) Include the results of interactive sort, in which the order of the elements can be changed.
`useThisGroup=true`	(optional) Use a group at the same level to find a value.

The returned value depends on where the function is used:

- total cell: returns the value of the first cell in the group if parameter `useThisGroup` is `true` , otherwise it returns the value of the first total;
- group cell: returns the value of the first cell in the group.

Examples:

```
FirstRow(Sum([MatrixDemo.Revenue]))
FirstRow(Sum([MatrixDemo.Revenue]), true)
Sum([MatrixDemo.Revenue]) / FirstRow()
```

LastColumn

Returns the value of the last cell in the column.

Parameter	Description
`aggregate`	(optional) Aggregate function. Parameter can be omitted if the aggregate has already been accessed in the cell.
`useInteractiveSort=false`	(optional) Include the results of interactive sort, in which the order of the elements can be changed.
`useThisGroup=true`	(optional) Use a group at the same level to find a value.

The returned value depends on where the function is used:

- total cell: returns the value of the last cell in the group if parameter `useThisGroup` is `true`, otherwise it returns the value of the last total;
- group cell: returns the value of the last cell in the group.

Examples:

```
LastColumn(Sum([MatrixDemo.Revenue]))
LastColumn(Sum([MatrixDemo.Revenue]), true)
Sum([MatrixDemo.Revenue]) / LastColumn()
```

LastRow

Returns the value of the last cell in a row.

Parameter	Description
`aggregate`	(optional) Aggregate function. Parameter can be omitted if the aggregate has already been accessed in the cell.
`useInteractiveSort=false`	(optional) Include the results of interactive sort, in which the order of the elements can be changed.
`useThisGroup=true`	(optional) Use a group at the same level to find a value.

The returned value depends on where the function is used:

- total cell: returns the value of the last cell in the group if parameter `useThisGroup` is `true`, otherwise it returns the value of the last total;
- group cell: returns the value of the last cell in the group.

Examples:

```
LastRow(Sum([MatrixDemo.Revenue]))
LastRow(Sum([MatrixDemo.Revenue]), true)
Sum([MatrixDemo.Revenue]) / LastRow()
```

PreviousColumn

Returns the value of the previous cell in the column.

Parameter	Description
`aggregate`	(optional) Aggregate function. Parameter can be omitted if the aggregate has already been accessed in the cell.
`useInteractiveSort=false`	(optional) Include the results of interactive sort, in which the order of the elements can be changed.
`useThisGroup=true`	(optional) Use a group at the same level to find a value.

The returned value depends on where the function is used:

- total cell: returns the value of the previous cell in the group if parameter `useThisGroup` is `true`, otherwise it returns the value of the previous total;
- group cell: returns the value of the previous cell in the group.

Examples:

```
PreviousColumn(Sum([MatrixDemo.Revenue]))
PreviousColumn(Sum([MatrixDemo.Revenue]), true)
Sum([MatrixDemo.Revenue]) / PreviousColumn()
```

PreviousRow

Returns the value of the previous cell in a row.

Parameter	Description
`aggregate`	(optional) Aggregate function. Parameter can be omitted if the aggregate has already been accessed in the cell.
`useInteractiveSort=false`	(optional) Include the results of interactive sort, in which the order of the elements can be changed.
`useThisGroup=true`	(optional) Use a group at the same level to find a value.

The returned value depends on where the function is used:

- total cell: returns the value of the previous cell in the group if parameter `useThisGroup` is `true`, otherwise it returns the value of the previous total;
- group cell: returns the value of the previous cell in the group.

Examples:

```
PreviousRow(Sum([MatrixDemo.Revenue]))
PreviousRow(Sum([MatrixDemo.Revenue]), true)
Sum([MatrixDemo.Revenue]) / PreviousRow()
```

NextColumn

Returns the value of the next cell in the column.

Parameter	Description
`aggregate`	(optional) Aggregate function. Parameter can be omitted if the aggregate has already been accessed in the cell.
`useInteractiveSort=false`	(optional) Include the results of interactive sort, in which the order of the elements can be changed.
`useThisGroup=true`	(optional) Use a group at the same level to find a value.

The returned value depends on where the function is used:

- total cell: returns the value of the next cell in the group if parameter `useThisGroup` is `true`, otherwise it returns the value of the next total;
- group cell: returns the value of the next cell in the group.

Examples:

```
NextColumn(Sum([MatrixDemo.Revenue]))
NextColumn(Sum([MatrixDemo.Revenue]), true)
Sum([MatrixDemo.Revenue]) / NextColumn()
```

NextRow

Returns the value of the next cell in a row.

Parameter	Description
`aggregate`	(optional) Aggregate function. Parameter can be omitted if the aggregate has already been accessed in the cell.
`useInteractiveSort=false`	(optional) Include the results of interactive sort, in which the order of the elements can be changed.
`useThisGroup=true`	(optional) Use a group at the same level to find a value.

The returned value depends on where the function is used:

- total cell: returns the value of the next cell in the group if parameter `useThisGroup` is `true`, otherwise it returns the value of the next total;
- group cell: returns the value of the next cell in the group.

Examples:

```
NextRow(Sum([MatrixDemo.Revenue]))
NextRow(Sum([MatrixDemo.Revenue]), true)
Sum([MatrixDemo.Revenue]) / NextRow()
```

SpecificColumn

Returns the value of the cell with the specified column index.

Parameter	Description
`index`	Index value
`aggregate`	(optional) Aggregate function. Parameter can be omitted if the aggregate has already been accessed in the cell.

The returned value depends on where the function is used:

- total cell: returns the value of the cell in the group of the total;
- otherwise, it returns the value of the cell in the column of the current group.

Examples:

```
SpecificColumn("Andrew Fuller", Sum([MatrixDemo.Revenue]))
SpecificColumn(2011, Sum([MatrixDemo.Revenue]))
Sum([MatrixDemo.Revenue]) / SpecificColumn(2011)
```

SpecificRow

Returns the value of the cell with the specified index in a row.

Parameter	Description
`index`	Index value
`aggregate`	(optional) Aggregate function. Parameter can be omitted if the aggregate has already been accessed in the cell.

The returned value depends on where the function is used:

- total cell: returns the value of the cell in the group of the total;
- otherwise, it returns the value of the cell in the row of the current group.

Examples:

```
SpecificRow("Andrew Fuller", Sum([MatrixDemo.Revenue]))
SpecificRow(2011, Sum([MatrixDemo.Revenue]))
Sum([MatrixDemo.Revenue]) / SpecificRow(2011)
```

PercentOfColumnTotal

Returns the value of the current cell divided by the value of the column total.

Parameter	Description
`aggregate`	(optional) Aggregate function. Parameter can be omitted if the aggregate has already been accessed in the cell.

Function call

```
PercentOfColumnTotal(Sum([MatrixDemo.Revenue]))
```

is equivalent to the following code:

```
Sum([MatrixDemo.Revenue]) / ColumnTotal()
```

Examples:

```
PercentOfColumnTotal(Sum([MatrixDemo.Revenue]))
[Sum([MatrixDemo.Revenue])] [PercentOfColumnTotal()]
```

PercentOfRowTotal

Returns the value of the current cell divided by the value of the row total.

Parameter	Description
`aggregate`	(optional) Aggregate function. Parameter can be omitted if the aggregate has already been accessed in the cell.

Examples:

```
PercentOfRowTotal(Sum([MatrixDemo.Revenue]))
[Sum([MatrixDemo.Revenue])]  [PercentOfRowTotal()]
```

PercentOfGrandTotal

Returns the value of the current cell divided by the value of the grand total.

Parameter	Description
`aggregate`	(optional) Aggregate function. Parameter can be omitted if the aggregate has already been accessed in the cell.

Examples:

```
PercentOfGrandTotal(Sum([MatrixDemo.Revenue]))
[Sum([MatrixDemo.Revenue])]  [PercentOfGrandTotal()]
```

PercentOfPreviousColumn

Returns the value of the current cell divided by the value of the previous cell in the column.

Parameter	Description
`aggregate`	(optional) Aggregate function. Parameter can be omitted if the aggregate has already been accessed in the cell.
`useInteractiveSort=false`	(optional) Include the results of interactive sort, in which the order of the elements can be changed .
`useThisGroup=true`	(optional) Use a group at the same level to find a value.

The returned value depends on where the function is used:

- total cell: the value of the previous cell in the group is used if parameter `useThisGroup` is `true`, otherwise the value of the previous total is used;
- group cell: the value of the previous cell in the group is used.

Examples:

```
PercentOfPreviousColumn(Sum([MatrixDemo.Revenue]))
PercentOfPreviousColumn(Sum([MatrixDemo.Revenue]), true)
[Sum([MatrixDemo.Revenue])]  [PercentOfPreviousColumn()]
```

PercentOfPreviousRow

Returns the value of the current cell divided by the value of the previous cell in a row.

Parameter	Description
`aggregate`	(optional) Aggregate function. Parameter can be omitted if the aggregate has already been accessed in the cell.
`useInteractiveSort=false`	(optional) Include the results of interactive sort, in which the order of the elements can be changed .
`useThisGroup=true`	(optional) Use a group at the same level to find a value.

The returned value depends on where the function is used:

- total cell: the value of the previous cell in the group is used if parameter `useThisGroup` is `true`, otherwise the value of the previous total is used;
- group cell: uses the value of the previous cell in the group.

Examples:

```
PercentOfPreviousRow(Sum([MatrixDemo.Revenue]))
PercentOfPreviousRow(Sum([MatrixDemo.Revenue]), true)
[Sum([MatrixDemo.Revenue])]  [PercentOfPreviousRow()]
```

Properties accessible from data cells

The matrix has a set of properties that you can use when printing data cells. The name of the matrix is used to access the property:

```
[Matrix1.RowIndex]
```

Property	Return value	Description
ColumnIndex	int	Index of the current column.
RowIndex	int	Index of the current line.
ColumnValues	object[]	Array of values from the column header.
RowValues	object[]	Array of values from the row header.

These properties can be useful for highlighting cells with color based on a condition.

You can also access data source fields from a cell. As a rule, this is required to enable conditional highlighting (see section Conditional highlighting). Thus, for a data cell, you can specify the following condition to highlight values related to 2012:

```
[MatrixDemo.Year] == 2012
```

The value of the DB field that was used to print the cell is taken from the matrix header. Since there are two headings (row and column), you must specify which heading values will have priority. Matrix property `DataRowPriority` is responsible for this. The property is set to `Rows` by default.

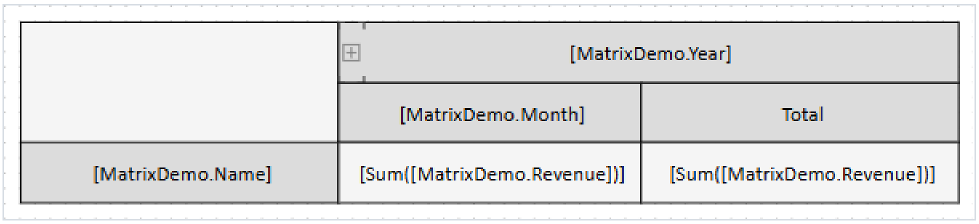
Interactive options

This section discusses interactive options of the "Advanced Matrix" object:

- collapsing/expanding header elements;
- interactive sort.

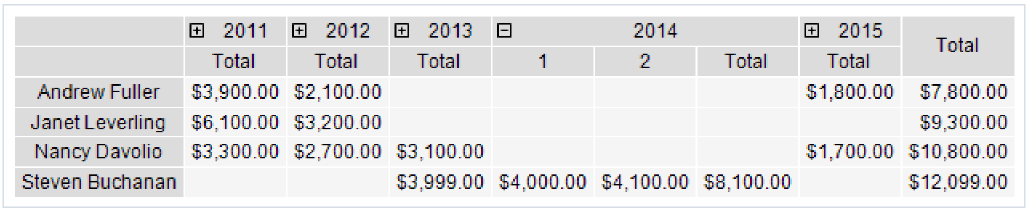
Collapsing/Expanding elements

You can interactively manage the visibility of individual header elements using a special button of type `MatrixCollapseButton`. The button is inserted into the header element and manages the visibility of other elements. The picture below shows the button:



	⊞ [MatrixDemo.Year]	
	[MatrixDemo.Month]	Total
[MatrixDemo.Name]	[Sum([MatrixDemo.Revenue])]	[Sum([MatrixDemo.Revenue])]

When you click on a button in the preview window, related elements are hidden or shown. In this case, the report is rebuilt:



	⊞ 2011	⊞ 2012	⊞ 2013	⊟ 2014			⊞ 2015	Total
	Total	Total	Total	1	2	Total	Total	
Andrew Fuller	$3,900.00	$2,100.00					$1,800.00	$7,800.00
Janet Leverling	$6,100.00	$3,200.00						$9,300.00
Nancy Davolio	$3,300.00	$2,700.00	$3,100.00				$1,700.00	$10,800.00
Steven Buchanan			$3,999.00	$4,000.00	$4,100.00	$8,100.00		$12,099.00

Adding a button

You can add a button to a header element using the context menu. Select the item, right-click and select Collapse button. The button is added to the left side of the element.

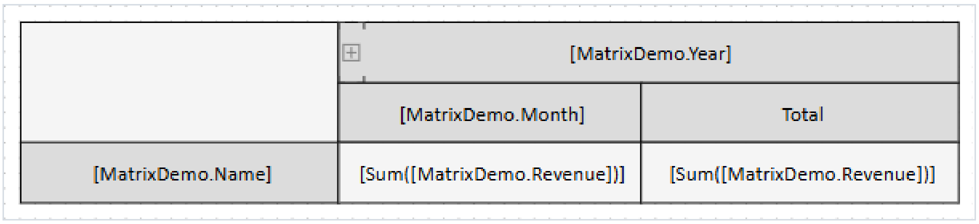
> When a button is added, the element's Property `Padding.Left` changes so that the button does not overlap the text.

Button customization

When a button is added, FastReport automatically configures the link between the button and its managed element. In some cases, you may need to configure the link manually. To do this, open the editor of the element that should be dependent on the button, and specify the name of the button on the "Visibility/Visibility is toggled by" tab.

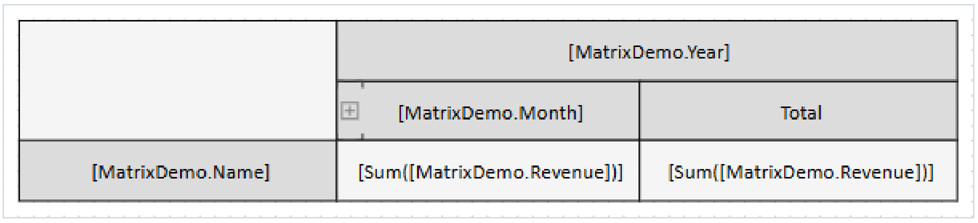
> The button can manage several elements at the same time.

The button can be placed above the managed element:



	⊞ [MatrixDemo.Year]	
	[MatrixDemo.Month]	Total
[MatrixDemo.Name]	[Sum([MatrixDemo.Revenue])]	[Sum([MatrixDemo.Revenue])]

or at the same level with it:



	[MatrixDemo.Year]	
	[MatrixDemo.Month]	Total
[MatrixDemo.Name]	[Sum([MatrixDemo.Revenue])]	[Sum([MatrixDemo.Revenue])]

The initial state of the controlled element — its visibility — is set in the element editor on the "Visibility/Visible" tab.

Deleting a button

You can delete a button in two ways:

- select the button and press the `Delete` key;
- uncheck the "Collapse button" in the context menu of the element.

Moving a button

By default, the button has Property `Dock = Left`. This means that it is docked to the left edge of the element. Set Property `Dock = None` in the "Properties" window to move the button to a new place.

> You can also use the Property `Anchor` of a button to anchor it to a specific location of an element.

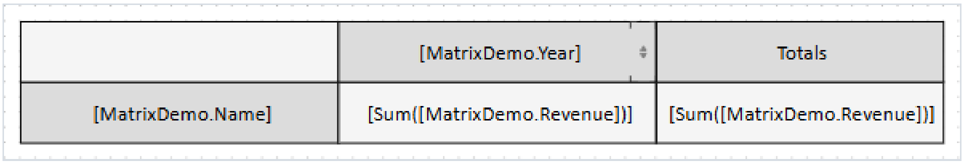
Customizing the appearance of the button

Using the "Border" toolbar, you can customize the button icon: frame color and style, background color. In addition, you can set the following properties of the button in the Properties window:

Property	Default value	Description
Cursor	Hand	Mouse cursor shape.
Exclusive	False	If `true`, then only one element can be expanded.
Exportable	False	If `true`, the button will be displayed when exporting the report.
Printable	False	If `true`, the button will be displayed when printing a report.
ShowCollapseExpandMenu	False	Determines whether a menu with "Collapse/Expand All" items should be shown when the right mouse button is pressed on this button.
Symbol	PlusMinus	The symbol displayed inside the button.
SymbolSize	5	Button Symbol Size.

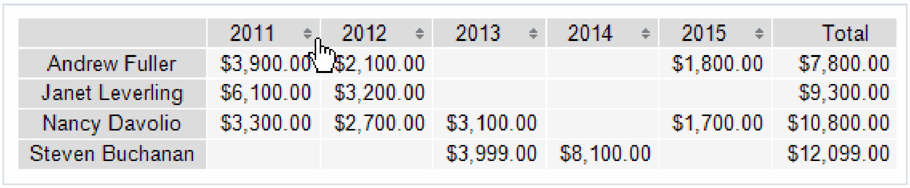
Interactive sort

The sort button `MatrixSortButton` allows you to interactively sort the rows or columns of the matrix. The button should be inserted into a lower-level header element:



	[MatrixDemo.Year]	Totals
[MatrixDemo.Name]	[Sum([MatrixDemo.Revenue])]	[Sum([MatrixDemo.Revenue])]

When you click on the button in the preview window, the opposite header is sorted. The example below sorts rows by value in the selected column:



	2011	2012	2013	2014	2015	Total
Andrew Fuller	$3,900.00	$2,100.00			$1,800.00	$7,800.00
Janet Leverling	$6,100.00	$3,200.00				$9,300.00
Nancy Davolio	$3,300.00	$2,700.00	$3,100.00		$1,700.00	$10,800.00
Steven Buchanan			$3,999.00	$8,100.00		$12,099.00

Each press of the button switches the sort mode: ascending/descending/no sort.

Adding a button

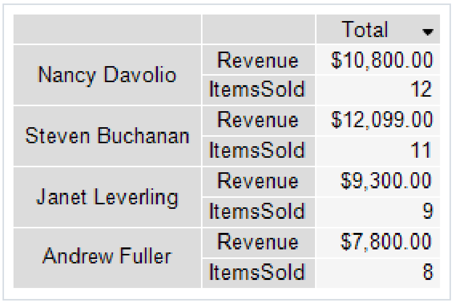
You can add a button to a header element using the context menu. Select the element, right-click and select "Sort Button". The button will be added to the right part of the element.

> When you add a button, the element's Property `Padding.Right` changes so that the button does not overlap the text.

Button customization

The header sort mode is set in its editor on the "Sort/Interactive Sort" by Total tab. The following values are possible:

- "No" - this header is not sorted.
- "Auto" is the default mode. Sort is performed by the value of the first total (aggregate).
- Total (aggregate) name: if the header has several output values, you can select one of them to sort. In the example below, to sort the row header by the `ItemsSold` value, select the `Sum ([MatrixDemo.ItemsSold])` aggregate:



		Total
Nancy Davolio	Revenue	$10,800.00
	ItemsSold	12
Steven Buchanan	Revenue	$12,099.00
	ItemsSold	11
Janet Leverling	Revenue	$9,300.00
	ItemsSold	9
Andrew Fuller	Revenue	$7,800.00
	ItemsSold	8

Removing a button

There are two ways to remove a button:

- select the button and press the `Delete` key;
- uncheck the "Sort button" item in the context menu of the element.

Moving a button

By default, the button has Property `Dock = Right` . This means that it is docked to the right edge of the element. To move the button to a new location, set Property `Dock = None` in the Properties window.

> You can also use the Property `Anchor` of a button to anchor it to a specific location on an element.

Customizing button appearance

Using the "Border" toolbar, you can customize the button icon: frame color and style, background color. You can also set the following properties of the button in the Properties window:

Property	Default value	Description
AllowInactiveSort	True	Determines whether the button can be in an inactive state ("no sort" mode).
Cursor	Hand	Mouse cursor shape.
Exportable	False	If `true` , the button will be displayed when exporting the report.
InactiveSortColor	Gray	Button color in inactive state.
Printable	False	If `true` , the button will be displayed when printing a report.
Symbol	Arrow	Button symbol.
SymbolSize	7	Button symbol size.

Barcode

The object displays barcodes in the report. It looks like this:

And on the report page, it is as follows:

The object supports the following types of barcodes:

Code	Length	Allowed symbols
2 of 5 Interleaved		0-9
2 of 5 Industrial		0-9
2 of 5 Matrix		0-9
Codabar		0-9, -$:/.+
Code128		128 ASCII chars
Code39		0-9,A-Z, -. *$/+%
Code39 Extended		128 ASCII chars
Code93		0-9,A-Z, -. *$/+%
Code93 Extended		128 ASCII chars
EAN8	8	0-9
EAN13	13	0-9
MSI		0-9
PostNet		0-9
UPC A	12	0-9
UPC E0	6	0-9
UPC E1	6	0-9
2-Digit Supplement	2	0-9
5-Digit Supplement	5	0-9

Code	Length	Allowed symbols
PDF417		any
Datamatrix		any
QR code		any
Aztec		any

Barcode data in an object is of a string type. The string can contain any symbol, allowed for the chosen type of barcode. You can choose the type of barcode in the context menu of the "Barcode" object.

You can connect an object to data by using one of the following methods:

- set the barcode data in the "Text" property;
- bind the object to a data column using the "DataColumn" property;
- set the expression that returns the barcode data in the "Expression" property.

The "Barcode" object has the following properties:

Property	Description
Barcode	This property contains barcode-specific settings. Expand this property to set these settings.
Angle	This property determines the rotation of a barcode, in degrees. You can use one of the following values: 0, 90, 180, 270.
Zoom	This property allows to zoom a barcode. It is used along with the "AutoSize" property.
AutoSize	If this property is on, the object will stretch in order to display a whole barcode. If this property is off, the barcode will stretch to to object's bounds.
ShowText	This property determines whether it is necessary to show the human-readable text.
DataColumn	The data column which this object is bound to.
Expression	The expression that returns the barcode data.
Text	The barcode data.
Padding	The padding, in pixels.

The following properties are specific to the barcode type. To change them, select the barcode, go "Properties" window and expand the "Barcode" property.

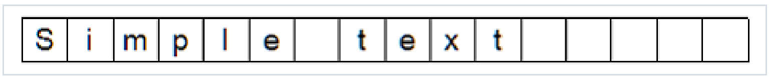
Property	Description
WideBarRatio	This property is specific to all linear barcodes. It determines the wide-to-narrow bar ratio. For most of barcode types, the value for this property should be between 2 and 3.

Property	Description
CalcCheckSum	This property is specific to all linear barcodes. It determines whether is necessary to calculate the check sum automatically. If this property is off, you should provide the check digit in the barcode data.
AutoEncode	This property is specific to the Code128 barcode. This code has three different encodings - A, B, C. You should either set the encoding explicitly in the barcode data, or set this property to true. In this case the encoding will be chosen automatically. Use the following control codes in the barcode data: &A; START A / CODE A &B; START B / CODE B &C; START C / CODE C &S; SHIFT &1; FNC1 &2; FNC2 &3; FNC3 &4; FNC4 If you set the "AutoEncode" property to true, all control codes will be ignored. Example of use the control codes: `&C;1234&B;ABC`
AspectRatio	This property is specific to the PDF417 barcode. It determines the height-to-width aspect ratio and is used to calculate the barcode size automatically (in case the "Columns" and "Rows" properties are not set).
CodePage	This property is specific to the PDF417 and Datamatrix barcode. It determines the code page which is used to convert non-ASCII chars. For example, the default windows codepage is 1251.
Columns, Rows	These properties are specific to the PDF417 barcode. They determine the number of columns and rows in a barcode. If both properties are set to 0, the size of the barcode will be calculated automatically. In this case the "AspectRatio" property is used as well.
CompactionMode	This property is specific to the PDF417 barcode. It determines the PDF417 data compaction mode.
ErrorCorrection	This property is specific to the PDF417 barcode. It determines the error correction level.
PixelSize	This property is specific to the PDF417 barcode. It determines the size of barcode element, in screen pixels. As a rule, the element's height should be greater than the element width by 3 times or more.
Encoding	This property is specific to the Datamatrix barcode. It determines the Datamatrix data encoding.
PixelSize	This property is specific to the Datamatrix barcode. It determines the size of barcode element, in pixels.
SymbolSize	This property is specific to the Datamatrix barcode. It determines the size of barcode symbol.

Cellular text

This object can display each character of a text in its individual cell. It is often used to print some forms in financial applications. On the toolbar it looks like this:

On the report page, the object is as follows:



In fact, this object is directly inherited from the "Text" object. You may connect it to data in the same manner. For example, you may invoke the object's editor and type the following text:

```
[Employees.FirstName]
```

The "Cellular Text" object has the following properties:

Property	Description
CellWidth, CellHeight	These properties determine the size of a single cell. If both properties are 0 (by default), the cell size will be calculated automatically, depending on the font used.
HorzSpacing, VertSpacing	These properties determine the horizontal and vertical gap between adjacent cells.

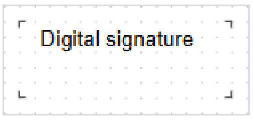
The "Digital Signature" object

The digital signature - cipher that guarantee uniqueness and originality, allowing to unequivocally establish authorship and protect against document changes. Thanks to reliable encryption algorithms, such signatures are no worse than handwritten, and even better, more reliable.

Signing field (signature field) - implies the presence of a special field in the document, by clicking on which, the user will be able to attach his certificate.

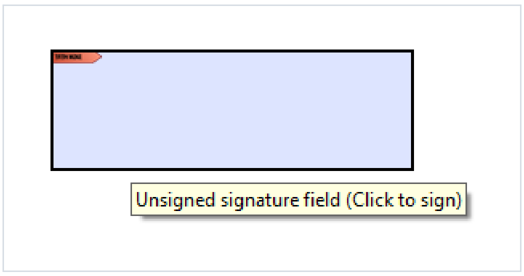
An object that implements this feature is added by pressing this key:

It is called Digital Signature. When placing this control on the report page, it looks like this:

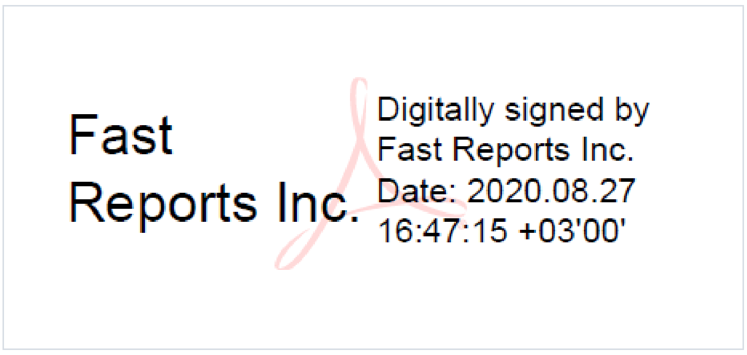


In the report view it is invisible. Its functionality is limited solely to PDF export. That is, you will see this field when viewing a PDF file in Acrobat Reader.

After export, the field will look like this:



Click on the signature field and see the window for choosing a certificate to sign the document:



Map

The MapObject component is intended for displaying 2D maps in "ESRI shapefile" format. You can find information on this file format at:

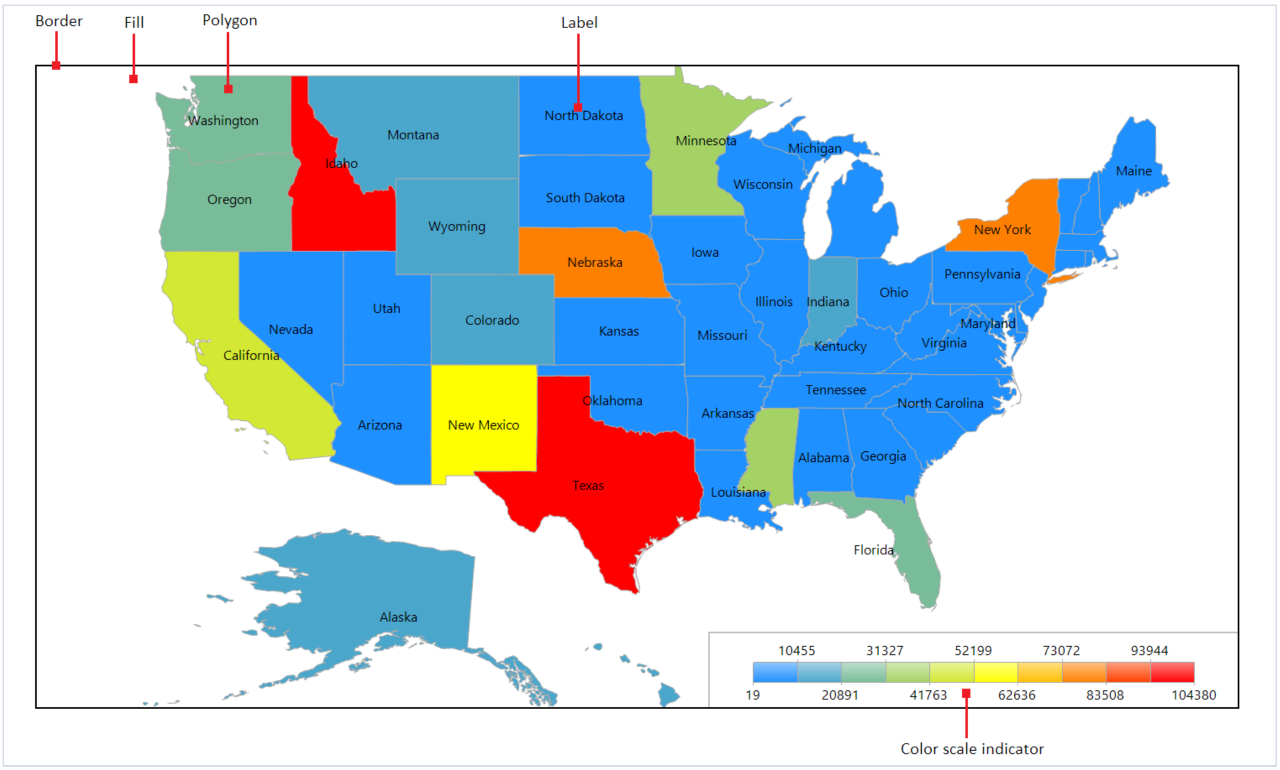
http://en.wikipedia.org/wiki/Shapefile

Two files are required:

- .shp (shape format - the feature geometry itself);
- .dbf (attribute format - columnar attributes for each shape).

Map elements

The "Map" object consists of the following elements:



One "Map" object can display one or more layers. Each layer contains its own map.

Controlling the map with the mouse

In the report designer and in the preview window the map can be controlled by the mouse:

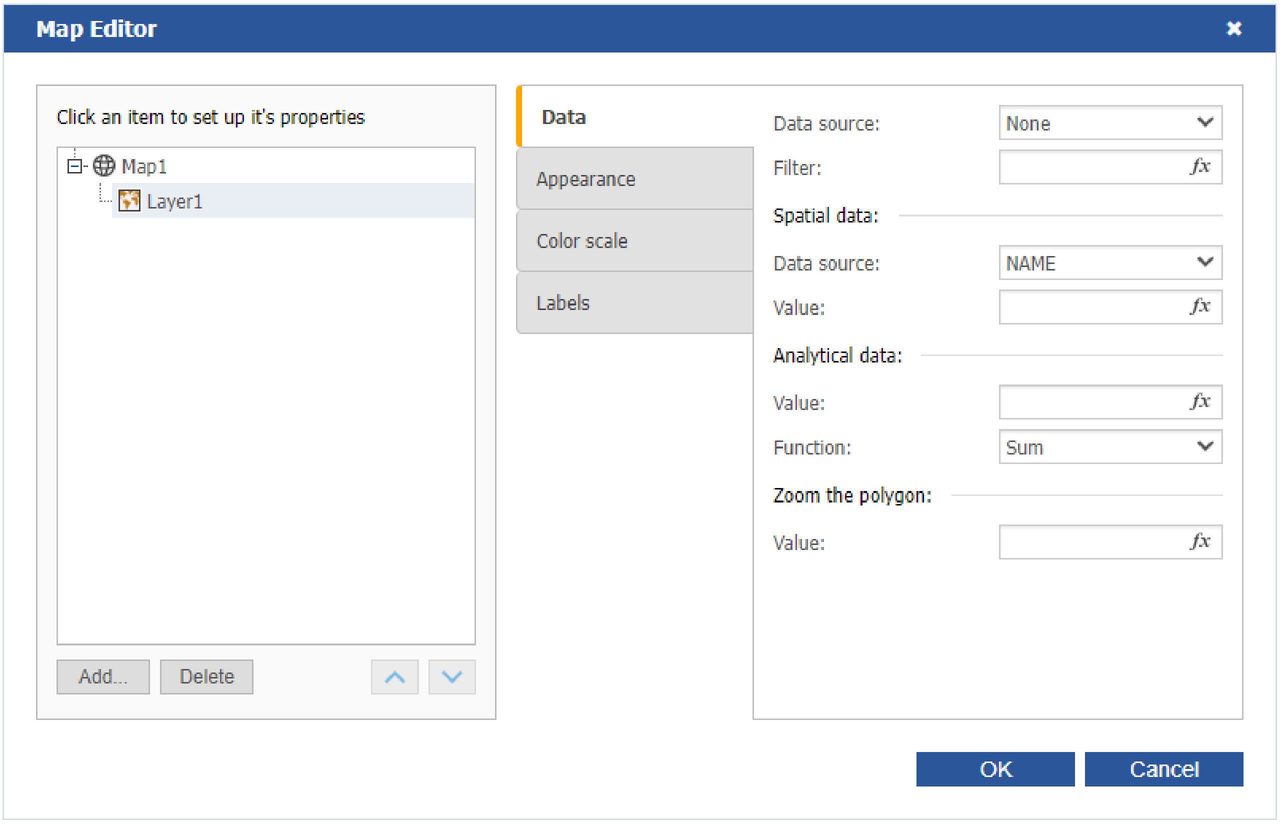
- zoom in and out using the mouse wheel;
- pan the map by dragging the left mouse button;
- change a polygon's properties in the "Properties" window by clicking the left mouse button inside a map polygon.

The minimum and maximum zoom values can be set in the `MinZoom` and `MaxZoom` properties. These properties are changed in the "Properties" window.

> The map cannot be controlled in the asp.net report viewer.

The "Map" object editor

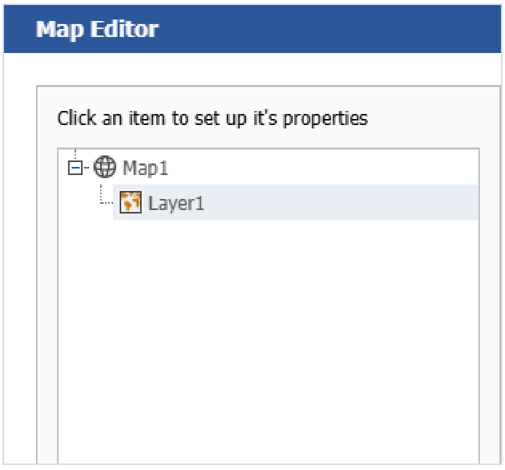
The "Map" object has many properties, which can be set in the object editor. The editor is opened by double-clicking on the object, or from its context menu:



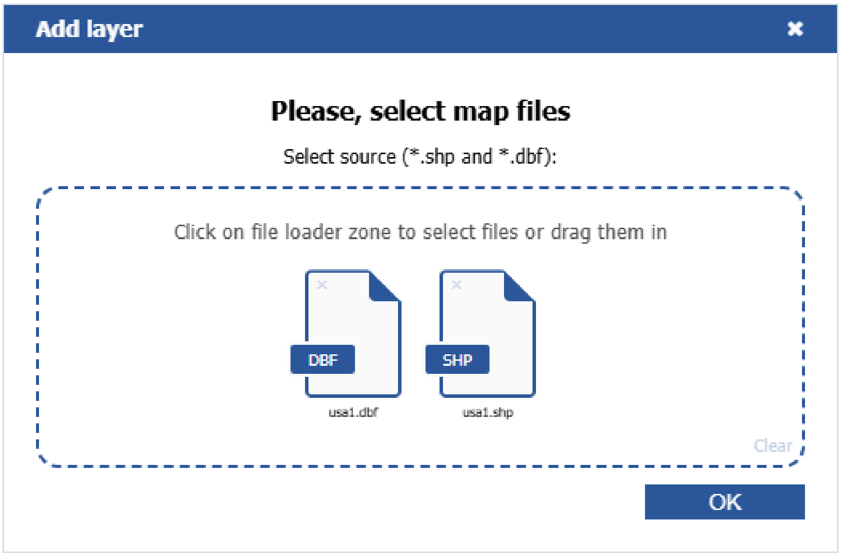
Data source: None
Filter:
Spatial data:
Data source: NAME
Value:
Analytical data:
Value:
Function: Sum
Zoom the polygon:
Value:

Adding map layers

The "Map" object can contain one or more layers. The layer structure is displayed in the upper left part of the editor window:



To add a new layer, click on the "Add..." button, which opens the following dialog:


Add layer
Please, select map files
Select source (*.shp and *.dbf):
Click on file loader zone to select files or drag them in
DBF
usa1.dbf
SHP
usa1.shp
Clear
OK

The map from an ESRI shapefile is the most commonly used type for maps. For example, you can display the world map and highlight some countries in color, depending on the sales level for these countries.

In Online Designer, the whole map data is embedded in the report file. In this case the report file (.frx) may be large.

> Large map files (more than 30Mb) or map files containing a lot of polygons (more than 20,000) slow down report generation.

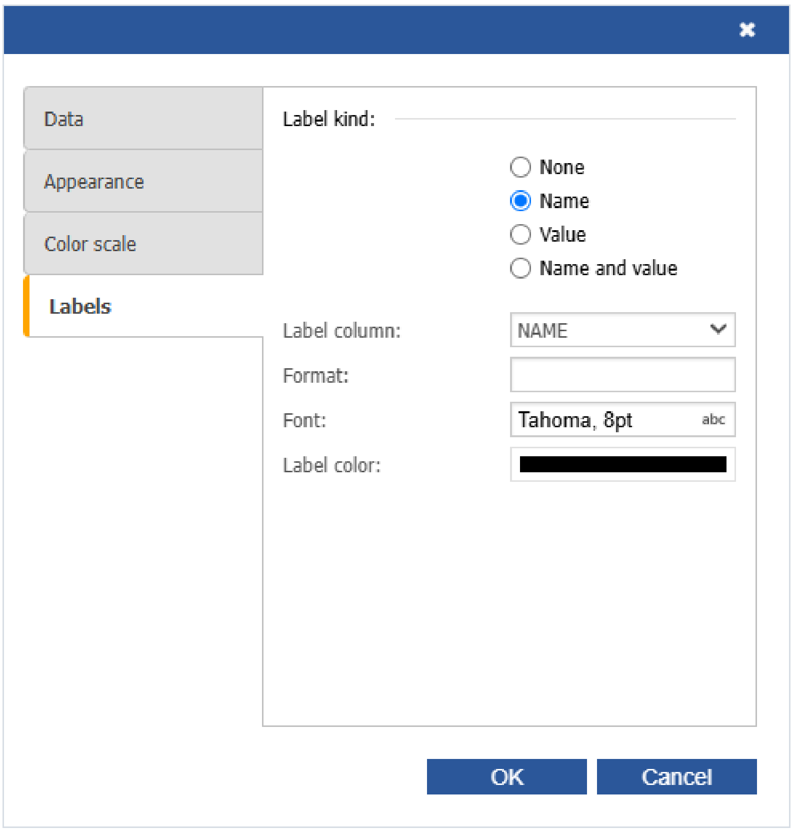
Setting up the layer appearance

To set the layer appearance, choose the layer and switch to the "Appearance" tab:

Set the border color and style of the map polygons and choose the color palette. Note that the palette is ignored if you configure the color scale (more about this later).

Setting up label display

The map can display labels, such as country names. Set the label type and appearance on the "Labels" tab:



Data

Appearance

Color scale

Labels

Label kind:

- ( ) None
- (●) Name
- ( ) Value
- ( ) Name and value

Label column:	NAME
Format:	
Font:	Tahoma, 8pt
Label color:	■

If the "ESRI shapefile" layer type is chosen set the field name which contains the displayed information. As a rule, it's a "NAME" field. The world map included in the FastReport demo program contains the following fields:

- NAME (eg: Germany)
- ABBREV (eg: Ger.)
- ISO_A2 (eg: DE)
- ISO_A3 (eg: DEU)

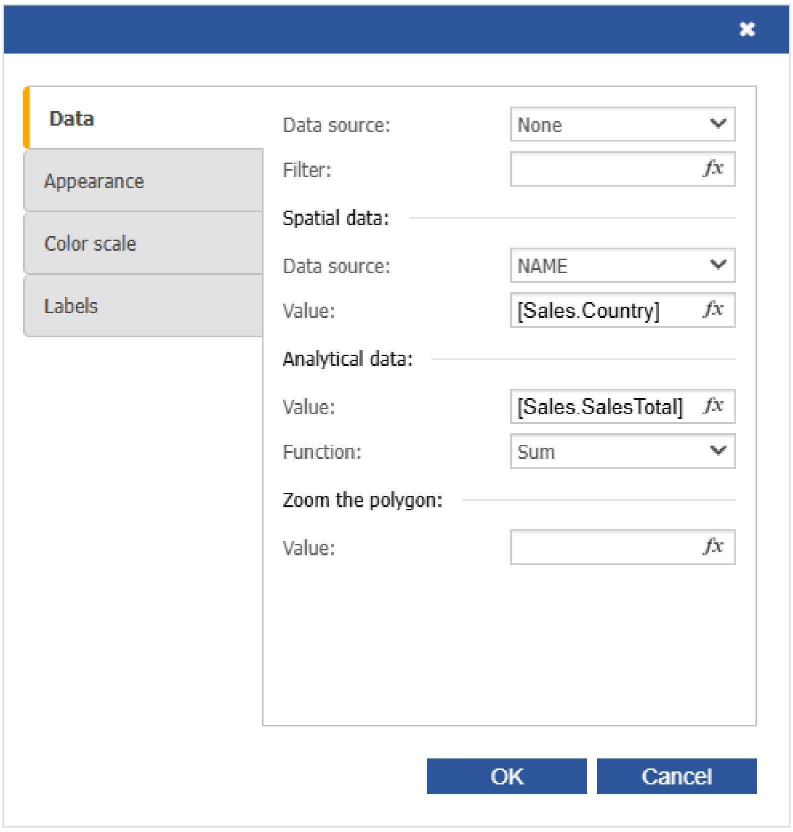
Other maps will have a different set of fields.

If the "application geodata" layer type is chosen set the minimum zoom value for displaying the labels. The default value is 1, meaning the labels are always displayed.

Connecting the map layer to data

Most reports use the "Map" object to display analytical data, for example sales levels in various countries. So a map layer must be connected to a data source using the map object editor window. Select the layer from the layers tree and switch to the "Data" tab. Data appropriate for the map layer type must be provided:

- the "Data" tab looks like:



Data source: None
Filter:
Spatial data:
Data source: NAME
Value: [Sales.Country]
Analytical data:
Value: [Sales.SalesTotal]
Function: Sum
Zoom the polygon:
Value:

The data required is:

- name (eg: the country name);
- numeric value (eg: sales volume in this country).

For example, a "Sales" data source may have this data:

Country	SalesTotal
USA	500000
Germany	1200000
Russia	300000

Set up the "Data" tab in the following way:

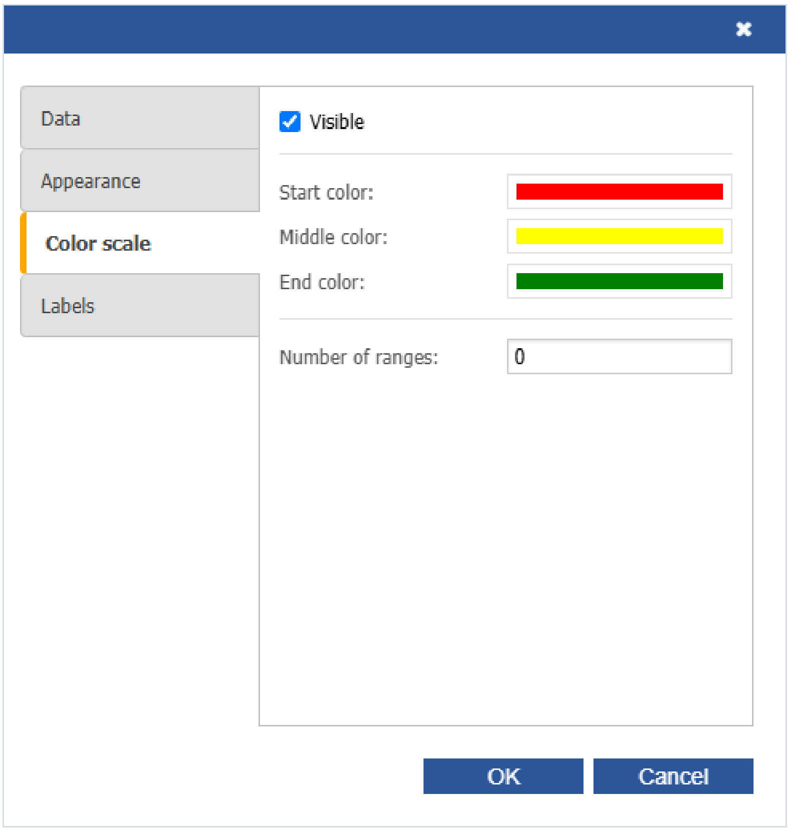
- data source - Sales;
- spatial data, column name - select the column containing country names; usually this is the `NAME` column;
- spatial data, value - `[Sales.Country]`;

- analytical data, value - `[Sales.SalesTotal]` ;
- analytical data, function - `Sum` ; this function is used if you have several values per country.

The "Zoom the polygon" edit box allows zooming of the polygon with a given name, so it occupies the whole "Map" object workspace. For example, to zoom Germany on the world map, type "Germany" (with quotes) in this edit box.

Highlighting data using colors

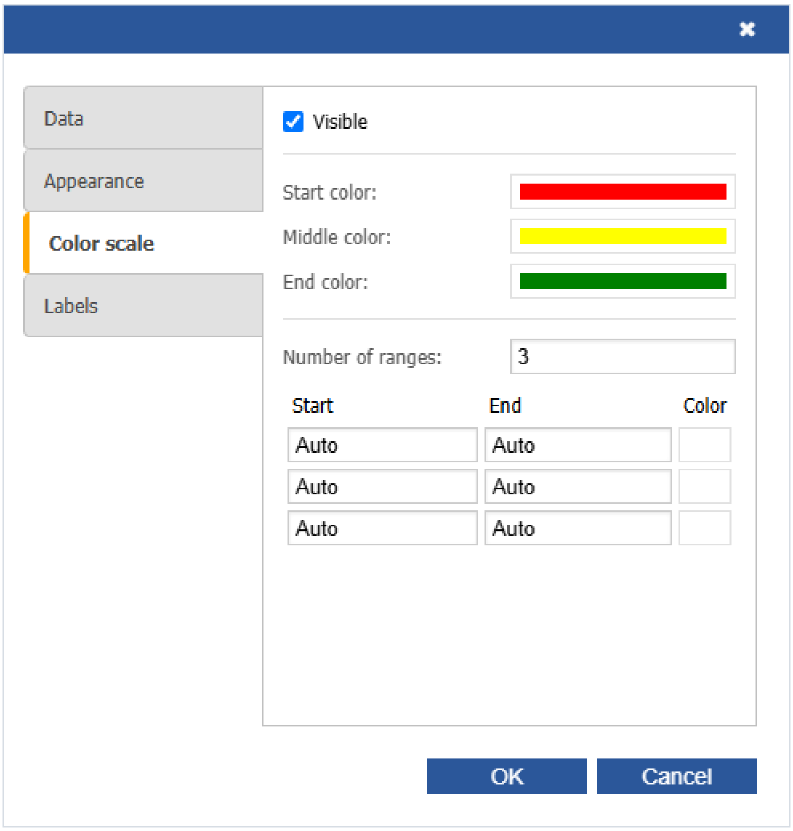
After you have finished connecting a layer to its data, the next question is - how to display analytical data (for example the sales volumes in various countries)? The easiest way is to set up labels displaying a country name and its sales (see "Setting up label display"). More visual impact can be achieved by painting each country with a color, dependent on its sales volume. For example, low sales as red, mid sales as yellow and high sales as green. This is done by setting up the color scale on the "Color scale" tab:



Visible: ✓

Start color:	🟥
Middle color:	🟨
End color:	🟩
Number of ranges:	0

The color scale consists of several ranges. Each range has the following properties: min value, max value and color. You can use as many ranges as you need. To set up the color scale set the number of ranges first and then the properties for each range.



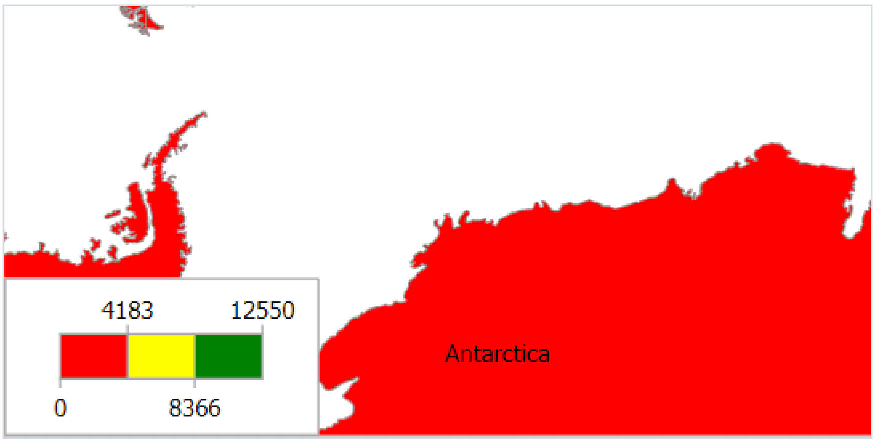
☑ Visible

Start color:	🟥
Middle color:	🟨
End color:	🟩
Number of ranges:	3

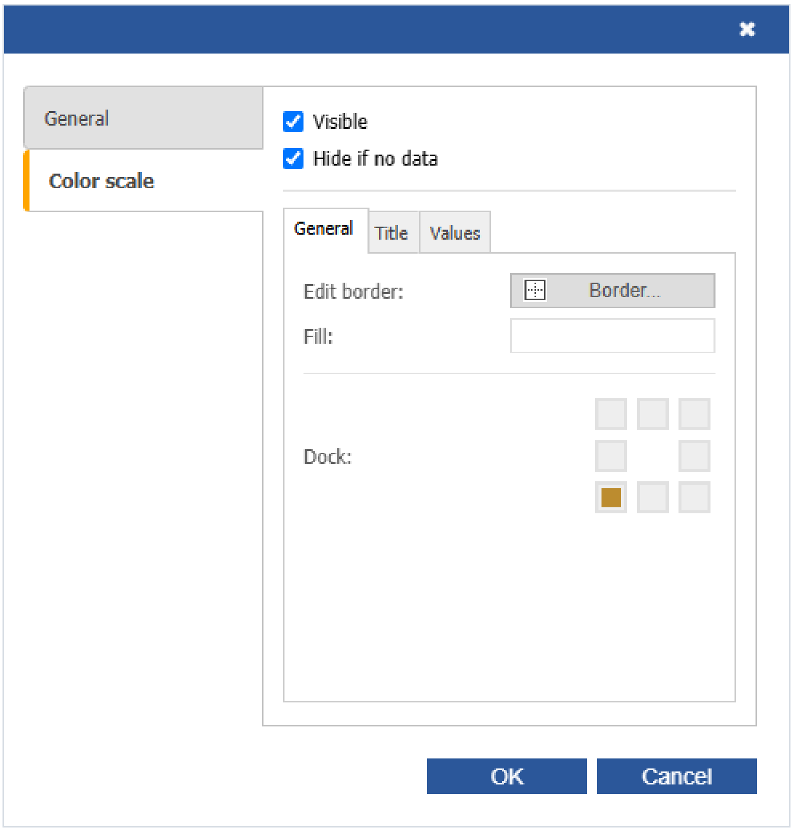
Start	End	Color
Auto	Auto	
Auto	Auto	
Auto	Auto	

By default all range properties are set to `Auto`, meaning FastReport calculates the minimum and maximum values for each range automatically. The auto color is chosen from three presets ("Start color", "Middle color", "End color"). The `Auto` mode may be suitable in most cases.

When a color scale is set up, an indicator control is displayed in the bottom part of the "Map" object:

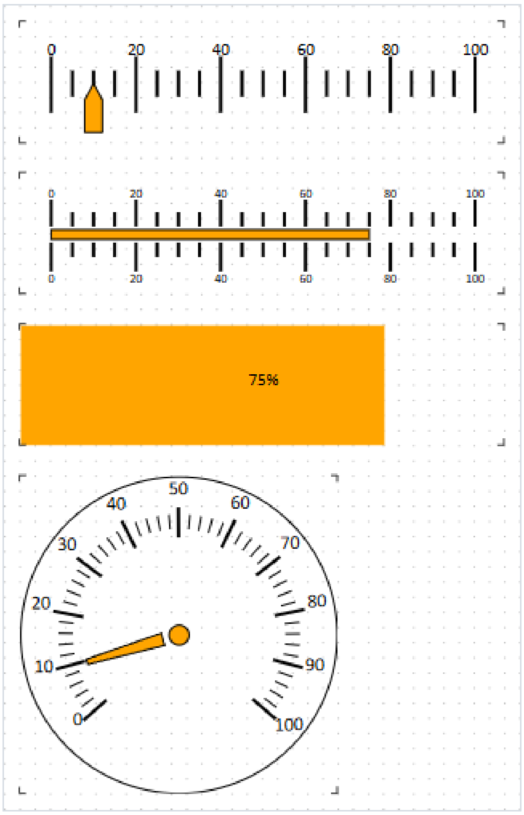


To set the appearance and position of the indicator, select the "Map" element in the layers tree control and switch to the "Color scale" tab:


General
Color scale
[✓] Visible
[✓] Hide if no data
General | Title | Values
Edit border: Border...
Fill:
Dock:
OK
Cancel

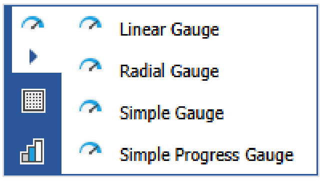
Gauge objects

These objects are intended to visually display any value. Here's what the four different gauge types currently supported look like:



- Linear Gauge;
- Simple Gauge;
- Radial Gauge;
- Simple Progress Gauge.

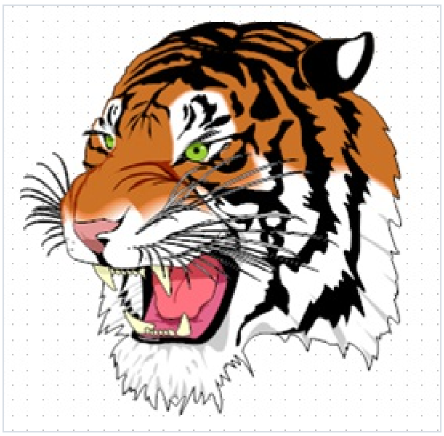
To add the Gauge object to your report, select one of the options from the submenu that opens when you click button:



You can change some aspects of the gauge's appearance, such as the color of the pointer using the Properties panel.

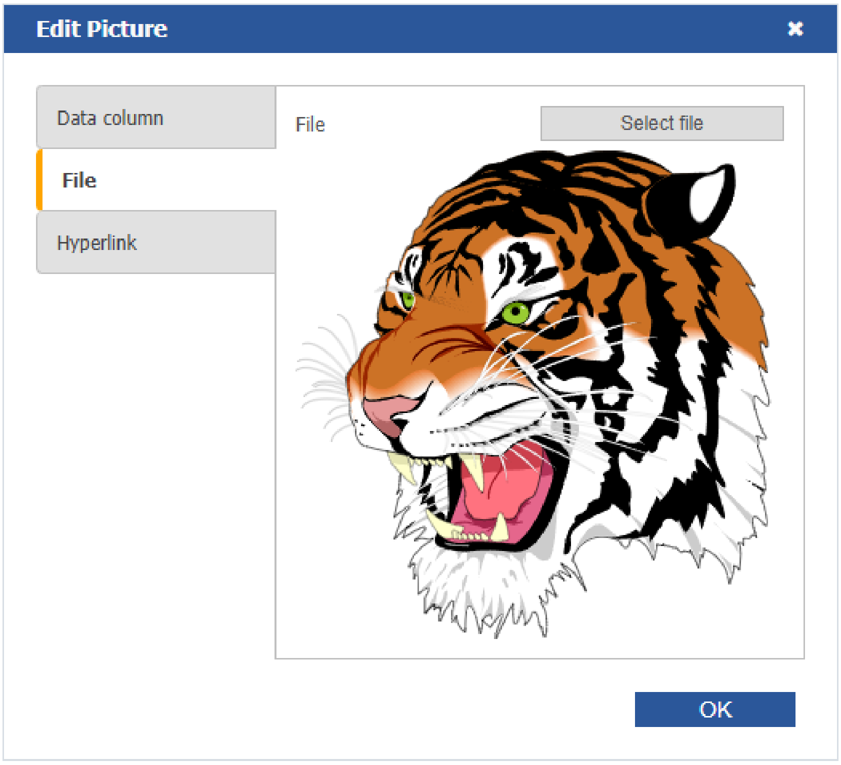
SVG object

This object is used for displaying vector images in SVG format. An example of such an image:



To add an SVG image, add an SVG object to your report using the following button in the object panel: SVG

After that click on the object twice, or select "Edit" in the context menu. This will open the Image Editor, which is similar to the Image Object Editor.



In this editor you can set the image that will be shown by the object. You can include an image in the report template (the "Open" button on the "Image" tab), select an SVG image from the data table (the "Data Field" tab), establish a connection to an external SVG file (the "File name" tab, in this case you need to distribute this file together with the template) or set a hyperlink from the address from which the image will be obtained (the "Hyperlink" tab).

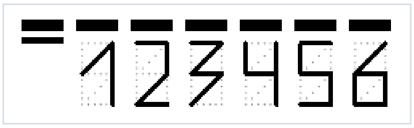
The SVG object supports the same sizing modes as the Picture object: `AutoSize` , `CenterImage` , `Normal` , `StretchImage` , `Zoom` .

A detailed description of these modes is given in the description of the "Picture" object.

The "Zip Code" object

The "Zip Code" object allows to print a zip code on envelopes. It may display numeric characters (0-9).

The object is as follows:



You can connect an object to data by using one of the following methods:

- set the zipcode data in the `Text` property;
- bind the object to a data column using the `DataColumn` property;
- set the expression that returns the zipcode data in the `Expression` property.

The "Zip Code" object has the following properties:

Property	Description
SegmentCount	The number of segments in a code. This property is set to 6 by default.
SegmentWidth, SegmentHeight	The size of a single code segment. The default size is 0.5x1cm.
Spacing	This property determines a distance between two segment's origins. The default value is 0.9cm.
ShowGrid	Determines whether it is necessary to display a grid.
ShowMarkers	Determines whether it is necessary to display the markers (bold horizontal lines above the zipcode).
DataColumn	The data column which this object is bound to.
Expression	The expression that returns the zipcode data.
Text	The text containing a zipcode.

Report creation

In this chapter we will look at the methods of creating common types of reports. In order to create any report, as a rule, you need to do the following:

1. Choose or create data, which will be used in the report.
2. Create the report structure, by adding the needed bands into the report.
3. Connect the band to a data source.
4. Place the "Text" objects on the bands to print data.
5. Setup the appearance, formatting.

Dynamic layout

It is necessary often to print a text whose size is not known when creating a report. For example, this can be a description of goods. In this case, the following tasks will need to be solved:

- calculate the height of the object, such that it encloses the whole text;
- calculate the height of the band, such that it encloses the object with a variable amount of texts;
- move or change the height of other objects, which are contained on the band, such that, they do not disturb the general design of the report.

These tasks can be solved by using some object and band properties:

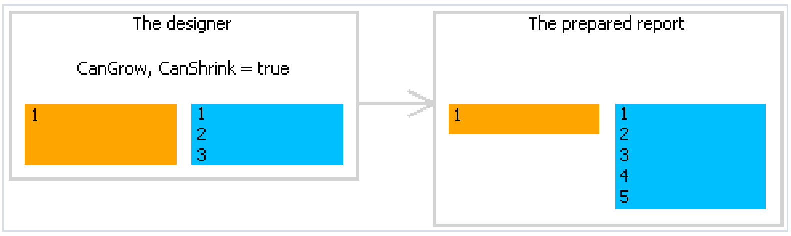
- "CanGrow" and "CanShrink" properties allow calculating the height of the object automatically;
- "ShiftMode" property allows moving objects that are located under the objects that expand;
- "GrowToBottom" property allows resizing an object to the bottom edge of the band;
- "Anchor" and "Dock" properties allow controlling the size of objects depending on the size of the band.

All these properties will be looked at below.

CanGrow and CanShrink properties

Every band and report object has these properties. They determine whether an object can grow or shrink depending on the size of its contents. If both properties are disabled, the object always has the size specified in the designer.

These properties are very useful, if it is needed to print a text whose size is not known when designing. In order for an object to accommodate the entire text, it needs to have the "CanGrow" and "CanShrink" properties enabled:

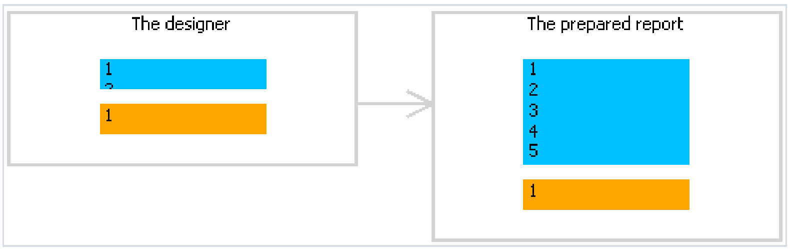


The following objects can affect the height of a band:

- "Text";
- "Rich Text";
- "Picture" (with "AutoSize" property enabled);
- "Table".

ShiftMode property

Every report object has this property. This property is accessible only in the "Properties" window. An object, whose "ShiftMode" property is enabled, will be moving up and down, if the object above on can either grow or shrink.



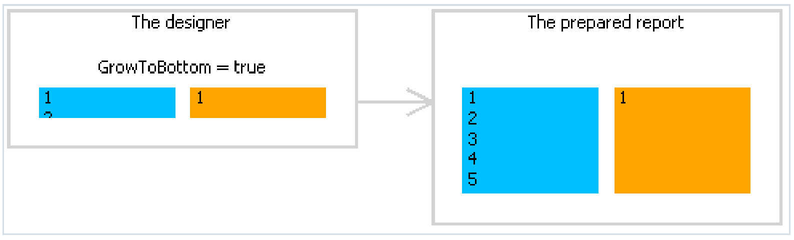
The "ShiftMode" property can have one of the following values:

- Always (by default). Meaning that the object needs to shift always.
- Never. Implies that the object does not need to shift.
- WhenOverlapped. Implies that the object needs to shift in that case, if the expanding object is located exactly over it (that is, both objects overlap horizontally).

This property is convenient to use when printing information in a table form, when several cells of the table are located on top of each other and can have a variable amount of text.

GrowToBottom property

Every report object has this property. When printing an object with this property, it stretches up to the bottom edge of a band:



This is needed when printing information in a table form. In a table row there can be several objects which can stretch. This property makes it possible to set all objects' height to the maximum height of the band.

Anchor property

Every report object has this property. It determines how the object will be changing its position and/or its size when the container on which it is laying will be changing its size. By using Anchor, it can be done in such a way that, the object expands or moves synchronously with its container.

The container, being referred to, in many cases will be the band. But this is not a must - this can also be the "Table" or "Matrix" objects.

The "Anchor" property can have one of the following values, and also any combination of them:

Value	Description
Left	Anchors the left edge of the object. When the container's size will be changing, the object will not be moving left/right.
Top	Anchors the top edge of the object .When the container's height will be changing, the object will not be moving up/down.
Right	Anchors the right edge of the object .When the container's width will be changing , the distance between the right edge of the object and the container will be constant. If the left edge of the container is anchored as well, then the object will be growing and shrinking synchronously with container.
Bottom	Anchors the bottom edge of the object. When the container's height will be changing, the distance between the bottom edge of the object and the container will be constant. If the top edge of the object is anchored as well, the object will be growing and shrinking synchronously with container.

By default, the value of this property is Left, Top. This means that, when the container's size will be changing, the object will not be changing. In the table below, combinations of some frequent used values are given:

Value	Description
Left, Top	Value by default. The object does not change when the size of the container changes.
Left, Bottom	The object moves up/down when the height of the container changes. The position of the object in relation to the bottom edge of the container does not change.
Left, Top, Bottom	When the height of the container is changing, the height of the object synchronously changes with it.
Left, Top, Right, Bottom	When the width and the height of the container are changing, the object grows or shrinks synchronously with it.

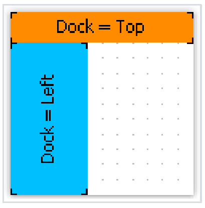
Dock property

Every report object has this property. This property determines on which side of the container the object will be docked.

The "Dock" property can have one of the following values:

Value	Description
None	Value by default. The object is not docked.
Left	The object is docked to the left edge of the container. The height of the object will be equal to the height of the container*.
Top	The object is docked to the top edge of the container. The width of the object will be equal to the width of the container*.
Right	The object is docked to the right edge of the container. The height of the object will be equal to the height of the container*.
Bottom	The object is docked to the lower edge of the container. The width of the object will be equal to the width of the container*.
Fill	The object occupies all the free space of the container.

- This is not quite so, if several objects have been docked at the same time. The figure below shows two objects, the first one has been docked to the top edge of the container and the second - to the left:



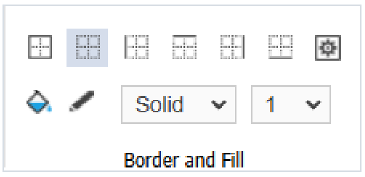
As seen, the height of the second object is equal to height of the free space, which remains after docking the first object.

The docking behavior depends on the object's creation order. You can change the order in the context menu of an object. To do this, select either the "Bring to front" or "Send to back" menu items.

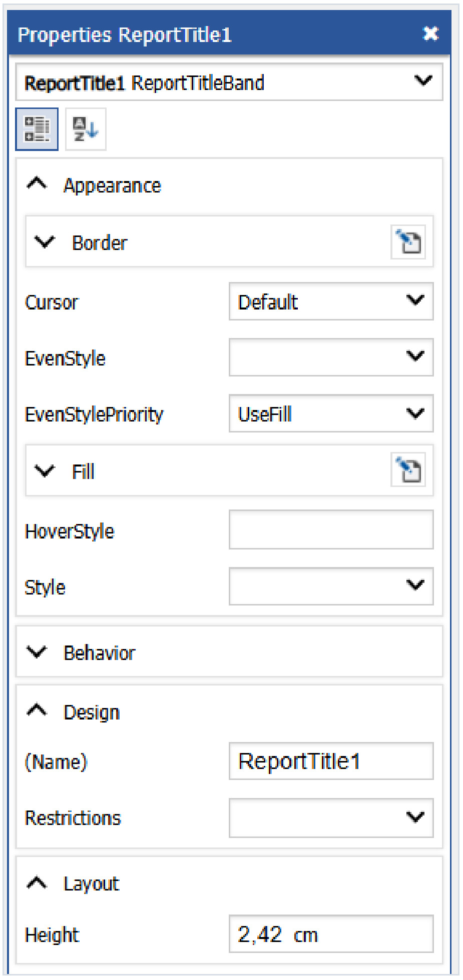
Formatting

Border and fill

Almost all report objects have the border and fill. To work with these properties, use the "Borders" toolbar:



The object's border consists of four lines. Each line can have different width, color and style. The toolbar buttons affect all lines of frame. The color, width and style can be set for each border line separately (in the Properties window).



Properties ReportTitle1

ReportTitle1 ReportTitleBand

Appearance

Border

Cursor	Default
EvenStyle	
EvenStylePriority	UseFill

Fill

HoverStyle	
Style	

Behavior

Design

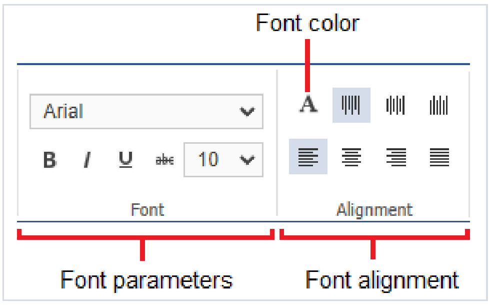
(Name)	ReportTitle1
Restrictions	

Layout

Height	2,42 cm

Text formatting

The toolbars "Font" and "Alignment" are located on the tab "Home":



Here you can: choose and customize the font, change the position of text within a component (left, right, center) vertically and horizontally, set the text color.

Data formatting

The text component displays data in the format in which they are stored in the data source. It is not always convenient. For example, when the date contains the time. To display only the date, it is necessary to resort to formatting the data. This can be done through using system functions String.Format. Print the current date without time:

```
Today [String.Format("{0:d}", [Date])]
```

Hiding values

The "Text" object has the "HideZeros" property which can be used to hide zero values. Lets look at an object with the following contents:

```
Total elements: [CountOfElements]
```

If the value of variable CountOfElements is equal to 0, and the property HideZeros is set to true, the object will be printed as follows:

```
Total elements:
```

The "Text" object also has the "HideValue" property which can be used to hide the value of an expression which is equal to the given value. For example, if the property value is "0", then all the zero fields will be hidden. This property can also be used for hiding zero dates. As a rule, it's a date like "1.1.0001" or "1.1.1900". In this case the value of "HideValue" property must be like this:

```
1.1.1900 0:00:00
```

As you can see, apart from the date, you need to indicate time as well. This is necessary because the value of the date in .Net contains time also.

> Important note: this mechanism depends on the regional settings of your system, which can be set in the control panel. This happens because FastReport compares strings using the "ToString()" method. This method converts an expression value into a string. In relation with this, be careful when building reports which can be launched on a computer with different regional settings.

Finally, the "NullValue" property of the "Text" object allows to print some text instead of a null value. It is often used to print the dash instead of a null value. Lets look at an object with the following contents:

```
Total elements: [CountOfElements]
```

If the value of variable CountOfElements is null, and the property NullValue is set to --, the object will be printed as follows:

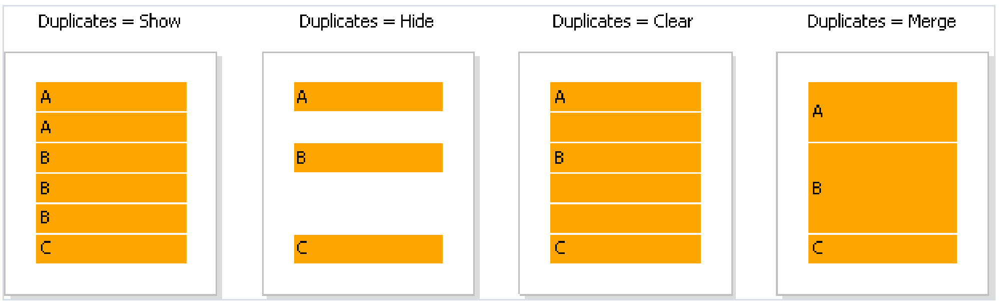
```
Total elements: --
```

The "Text" object has "Duplicates" property which allows to control how duplicate values will be printed. This property can be used if the "Text" object is on the "Data" band. The values considered duplicate if they are printed in the near by data rows.

The "Duplicates" property can have one of the following values:

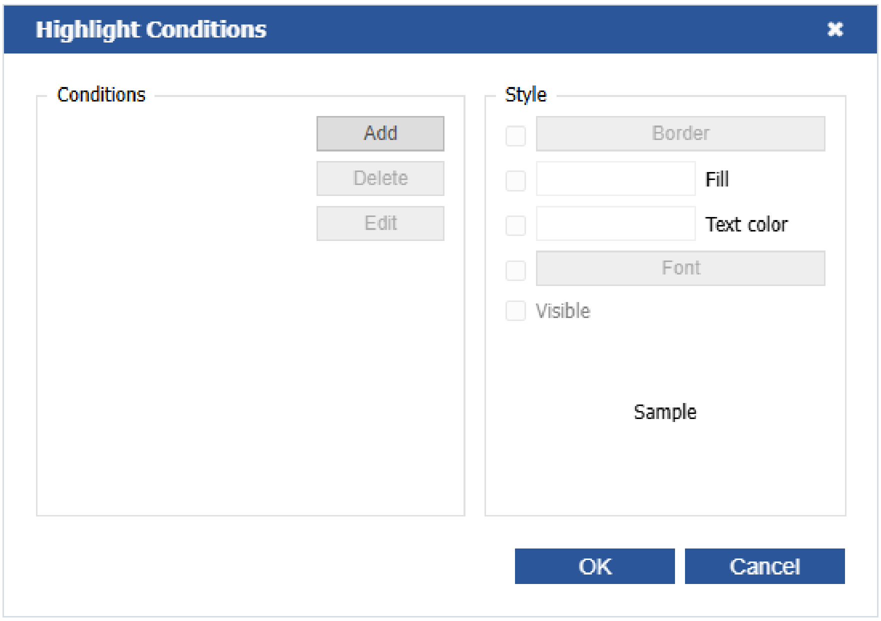
- Show - show the duplicates (by default).
- Hide - hide the object with duplicate value.
- Clear - clear the object's text, but show the object.
- Merge - merge several objects with the same value.

The difference between these modes in shown in the figure below:



Conditional highlighting

There is an possibility to change the "Text" object's appearance depending on the given conditions. For example, an object can be highlighted with red color if it has a negative value. This feature is called "conditional highlighting". To set up it, select the "Text" object and click the "Highlight" field button on the properties panel. You will see the following dialog window:

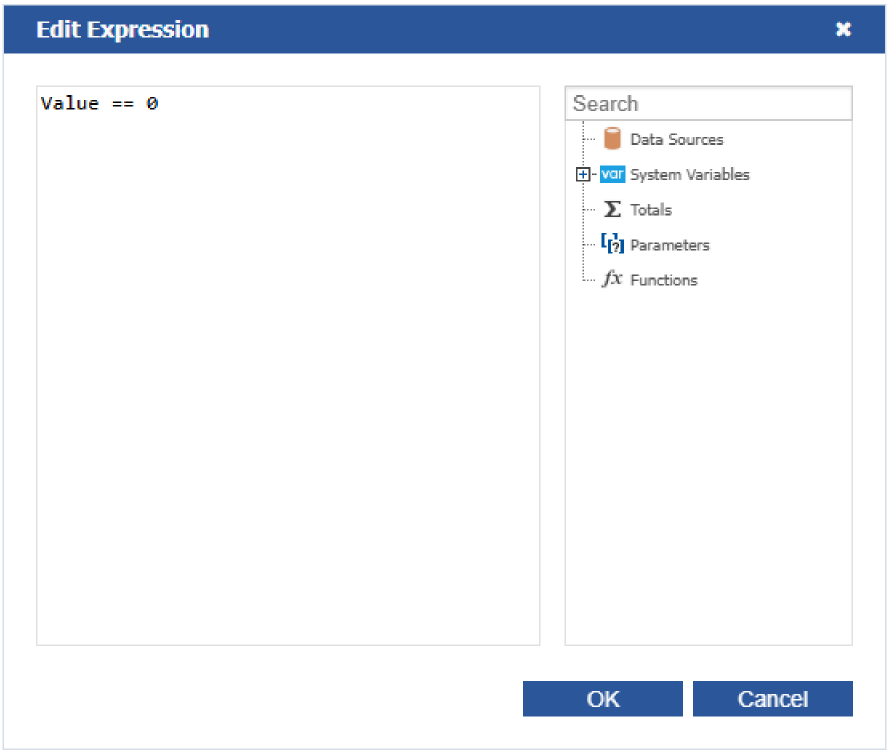


It is possible to define one or several conditions and set up the style for every condition. Style can contain one or several settings:

- fill;
- text color;
- font;
- object's visibility.

You can indicate, which settings need to be changed when the condition is met. For this, check the needed setting using the checkbox. By default, a new style contains one setting - the text color.

In order to create a new condition, click the "Add" button. You will see an expression editor:



```
Value == 0
```

Here, it is possible to write any expression which returns a boolean result. In many cases you will use the `Value` variable, which contains the currently printing value.

Let us look at the following example: we have a "Text" object, in which we print the amount of products in stock:

```
[Products.UnitsInStock]
```

We want to paint the object red, if the amount of products = 0. For this, we create the following condition:

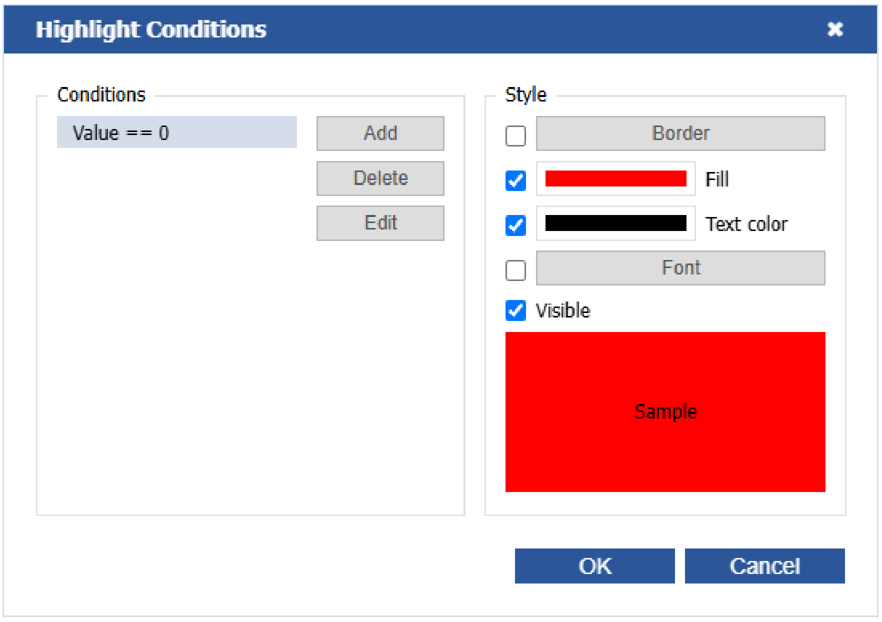
```
Value == 0
```

In the given case, we used the `Value` variable, which has got a printed value. If there are several expressions in an object, then this variable will have the value of the last expression. Instead of `Value`, you can use a data column:

```
[Products.UnitsInStock] == 0
```

> The expression is written in C# style. This is so, if the chosen report language is C#. For VisualBasic.NET you must use the single `=` sign. The report language can be changed in the "Report|Options..." menu.

Configure the style for the given condition in such a way that only fill can be used, and choose the red color:



Value == 0

[ ] Border
[✓] Fill
[✓] Text color
[ ] Font
[✓] Visible

When printing an object which has a zero value, it will be red. Let us make our example more complex, we will add another condition. If the units in stock is less than 10, it must be printed yellow. To do this, open the condition editor and click the "Add" button. The second condition will be like this:

```
Value < 10
```

In case where several conditions have been indicated, FastReport checks all the conditions, starting from the first one. If a certain condition is met, FastReport applies its style settings to the object, and the process stops. It is important to put the conditions in a correct order. The order which we have seen in this example is correct:

```
1. Value == 0
2. Value < 10
```

If we swap conditions, then the highlighting will work wrongly.

```
1. Value < 10
2. Value == 0
```

In the given case, the `Value==0` will not be executed, because when the value is zero, then the first condition will be met.

Highlight odd/even data rows

In order to improve the appearance of a report, you can highlight even data rows in different colors. This can be done by using the `EvenStyle` property of the band or its objects. The property contains a style name, which will be used to highlight even band rows.

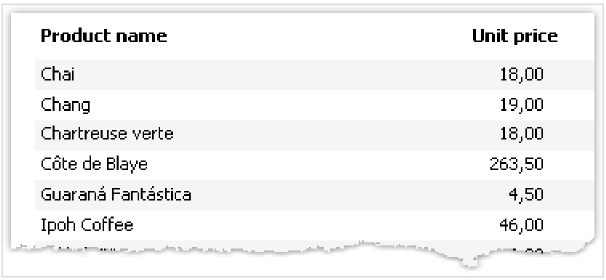
> It is preferable to use the `EvenStyle` property of the object instead of the band. This avoids possible problems when exporting the report.

In order to configure the highlighting, do the following:

1. Define the style, which will be used for highlighting the rows. This can be done in the "Report|Styles..." menu.
2. Indicate the name of the new style in the `EvenStyle` property of the band or its objects.

By default, objects use only a fill property of the style given in the `EvenStyle` property. This behavior is defined in the `EvenStylePriority` property - by default it is `UseFill`. If you need to use the rest of the style parameters, set this property to `UseAll`.

A ready report, which uses this technique, can look like this:



Product name	Unit price
Chai	18,00
Chang	19,00
Chartreuse verte	18,00
Côte de Blaye	263,50
Guaraná Fantástica	4,50
Ipoh Coffee	46,00

Subreports

Sometimes at a certain place of the main report, extra data needs to be shown, this can be a separate report with a very complicated structure. You can try to solve this task by using FastReport's rich collection of bands. However, in certain cases, it is preferable to use the "Subreport" object. Component "Subreport" looks like this:

The "Subreport" object is an ordinary report object, which can be placed on one of the bands. When you do this, FastReport adds an extra page into the report and connects it with the subreport. On this page it is possible to create an extra report, having any structure.

When printing the report, in which there is the "Subreport" object, the following will be done:

1. The main report will be printed, while the "Subreport" object is not met;
2. The subreport bands will be printed;
3. Printing of the main report will continue.

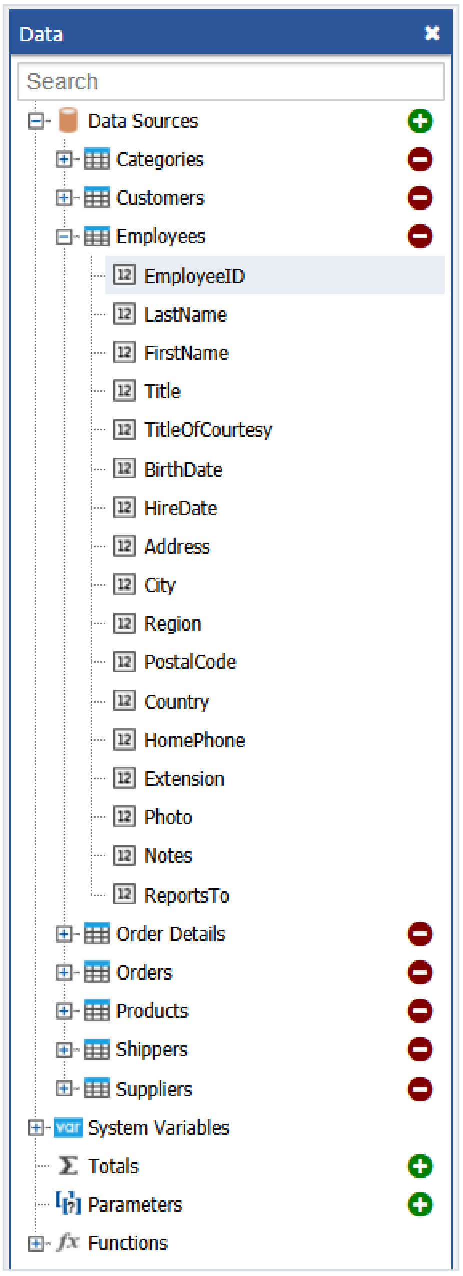
> Since subreport is formed on the sheet of the main report, it cannot contain the following bands: "Report header/footer", "Page header/footer", "Column header/footer", "Overlay".

Working with data

Data source

Please, note that the database user that is used to create the connection must have limited rights to modify the database, as well as rights to view private data. Otherwise, you allow full access to the database to any user who runs the report generator with this template.

FastReport Online Designer does not have the ability to add data sources, but you can create a connection through the connection wizard by setting the required connector on the server. Also, if you open a report with a data source added, it will be shown in the Data window. You can drag fields from a data source onto the report page. This will create a text object with a link to the data field.



The source data can contain related tables. That is, the tables have a relationship on the key field that allows you to create reports of type "Master-detail". One record in the primary table will match one or more records in the detail table. FastReport Online Designer cannot create the relationship, but allows to use them when working with the already created reports.

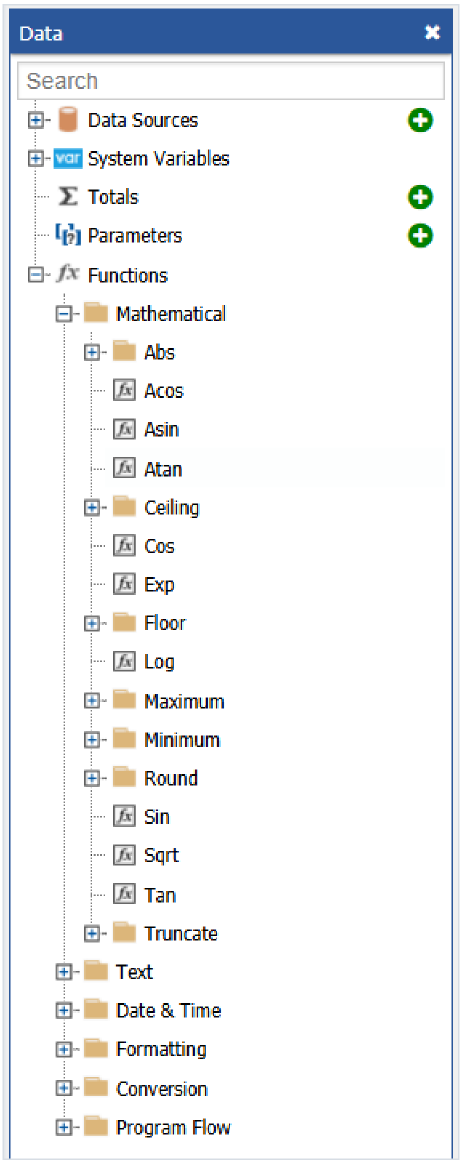
System variables

There is a list of system variables that can be used in a report:

Variable	Description	
Date	Date and time of the report's start.	
Page	Current page number.	
TotalPages	Total number of pages in the report. To use this variable, you need to enable the report's double pass. You can do this in "Report	Properties..." menu.
PageN	Page number in the form: "Page N".	
PageNofM	Page number in the form: "Page N of M".	
Row#	Data row number inside the group. This value is reset at the start of a new group.	
AbsRow#	Absolute number of data row. This value is never reset at the start of a new group.	
Page#	Current page number. If you join several prepared reports into one package, this variable will return current page number in a package.This variable is actually a macro. It value is substituted when the component is viewed in the preview window. That means you cannot use it in an expression.	
TotalPages#	Total number of pages in the report. If you join several prepared reports into one package, this variable will return the number of pages in a package. You don't need to use double pass to get the correct value.This variable is actually a macro. It value is substituted when the component is viewed in the preview window. That means you cannot use it in an expression.	
HierarchyLevel	Current level of hierarchy in a hierarchical report. The top level is equal to 1.	
HierarchyRow#	Full row number like "1.2.1" in a hierarchical report.	

Functions

FastReport.Net contains a lot of built-in functions (over 60). All functions are splitted to several categories and are accessible through the "Data" window:



You may use a function in any expression, in the script (see the "Script" chapter), or print its value in the "Text" object. For example, the following text in the "Text" object:

```
[Sqrt(4)]
```

will be printed as "2" (square root of 4).

The following expression will return 4:

```
Sqrt(4) + 2
```

Let us look at the ways to insert a function in a report:

- you may drag&drop a function from the "Data" window to a report page. The "Text" object will be created, which contains a function call. You have to edit the text to add parameters to the function call;
- you can drag&drop a function to the script code;
- in the expression editor, you can see a copy of the "Data" window which acts the same way - you may drag items from it and drop them in the expression text.

Below we will describe each function in details.

Mathematical

Abs

Function	Parameters	Return value
`Abs`	`sbyte value`	`sbyte`
`Abs`	`short value`	`short`
`Abs`	`int value`	`int`
`Abs`	`long value`	`long`
`Abs`	`float value`	`float`
`Abs`	`double value`	`double`
`Abs`	`decimal value`	`decimal`

Returns the absolute value.

Example:

```
Abs(-2.2) = 2.2
```

Acos

Function	Parameters	Return value
`Acos`	`double d`	`double`

Returns the angle (in radians) whose cosine is d. d must be in range between -1 and 1.

> Multiply the return value by 180 / Math.PI to convert from radians to degrees.

Example:

```
Acos(0) * 180 / Math.PI = 90
```

Asin

Function	Parameters	Return value
`Asin`	`double d`	`double`

Returns the angle (in radians) whose sine is d. d must be in range between -1 and 1.

> Multiply the return value by 180 / Math.PI to convert from radians to degrees.

Example:

```
Asin(0) = 0
```

Atan

Function	Parameters	Return value
`Atan`	`double d`	`double`

Returns the angle (in radians) whose tangent is d.

> Multiply the return value by 180 / Math.PI to convert from radians to degrees.

Example:

```
Atan(1) * 180 / Math.PI = 45
```

Ceiling

Function	Parameters	Return value
`Ceiling`	`double d`	`double`
`Ceiling`	`decimal d`	`decimal`

Returns the smallest integer greater than or equal to d.

Example:

```
Ceiling(1.7) = 2
```

Cos

Function	Parameters	Return value
`Cos`	`double d`	`double`

Returns the cosine of the specified angle (d). The angle must be in radians.

> Multiply by Math.PI / 180 to convert degrees to radians.

Example:

```
Cos(90 * Math.PI / 180) = 0
```

Exp

Function	Parameters	Return value
`Exp`	`double d`	`double`

Returns e (2.71828), raised to the specified power d.

Example:

```
Exp(1) = 2.71828
```

Floor

Function	Parameters	Return value
`Floor`	`double d`	`double`
`Floor`	`decimal d`	`decimal`

Returns the largest integer less than or equal to d.

Example:

```
Floor(1.7) = 1
```

Log

Function	Parameters	Return value
`Log`	`double d`	`double`

Returns the logarithm of a specified number d.

Example:

```
Log(2.71828) = 1
```

Maximum

Function	Parameters	Return value
`Maximum`	`int val1,``int val2`	`int`
`Maximum`	`long val1,``long val2`	`long`
`Maximum`	`float val1,``float val2`	`float`
`Maximum`	`double val1,``double val2`	`double`
`Maximum`	`decimal val1,``decimal val2`	`decimal`

Returns the larger of val1, val2.

Example:

```
Maximum(1,2) = 2
```

Minimum

Function	Parameters	Return value
`Minimum`	`int val1,``int val2`	`int`
`Minimum`	`long val1,``long val2`	`long`
`Minimum`	`float val1,``float val2`	`float`
`Minimum`	`double val1,``double val2`	`double`
`Minimum`	`decimal val1,``decimal val2`	`decimal`

Returns the smaller of val1, val2.

Example:

```
Minimum(1,2) = 1
```

Round

Function	Parameters	Return value
`Round`	`double d`	`double`
`Round`	`decimal d`	`decimal`

Rounds d to the nearest integer.

Example:

```
Round(1.47) = 1
```

Function	Parameters	Return value
`Round`	`double d,``int digits`	`double`
`Round`	`decimal d,``int digits`	`decimal`

Rounds d to a precision specified in the "digits" parameter.

Example:

```
Round(1.478, 2) = 1.48
```

Sin

Function	Parameters	Return value
`Sin`	`double d`	`double`

Returns the sine of the specified angle (d). The angle must be in radians.

> Multiply by Math.PI / 180 to convert degrees to radians.

Example:

```
Sin(90 * Math.PI / 180) = 1
```

Sqrt

Function	Parameters	Return value
`Sqrt`	`double d`	`double`

Returns the square root of d.

Example:

```
Sqrt(4) = 2
```

Tan

Function	Parameters	Return value
`Tan`	`double d`	`double`

Returns the tangent of the specified angle (d). The angle must be in radians.

> Multiply by Math.PI / 180 to convert degrees to radians.

Example:

```
Tan(45 * Math.PI / 180) = 1
```

Truncate

Function	Parameters	Return value
`Truncate`	`double d`	`double`
`Truncate`	`decimal d`	`decimal`

Calculates the integral part of d.

Example:

```
Truncate(1.7) = 1
```

Text

Note:

- these functions do not modify the string value passed in. Instead, they return a new modified string;
- the first character in a string has 0 index. Keep it in mind when working with functions that take the character index, such as Insert.

Asc

Function	Parameters	Return value
`Asc`	`char c`	`int`

Returns an Integer value representing the character code corresponding to a character.

Example:

```
Asc('A') = 65
```

Chr

Function	Parameters	Return value
`Chr`	`int i`	`char`

Returns the character associated with the specified character code.

Example:

```
Chr(65) = 'A'
```

Insert

Function	Parameters	Return value
`Insert`	`string s, ``int startIndex,``string value`	`string`

Inserts a "value" substring into the "s" string at a specified index position "startIndex" and returns a new string.

Example:

```
Insert("ABC", 1, "12") = "A12BC"
```

Length

Function	Parameters	Return value
`Length`	`string s`	`int`

Returns the length of "s".

Example:

```
Length("ABC") = 3
```

LowerCase

Function	Parameters	Return value
`LowerCase`	`string s`	`string`

Converts all characters of "s" to lower case and returns a result.

Example:

```
LowerCase("ABC") = "abc"
```

PadLeft

Function	Parameters	Return value
`PadLeft`	`string s, ``int totalWidth`	`string`

Right-aligns the characters in the "s" string, padding with spaces on the left for a total width specified in the "totalWidth" parameter.

Example:

```
PadLeft("ABC", 5) = "  ABC"
```

Function	Parameters	Return value
`PadLeft`	`string s, ``int totalWidth,``char paddingChar`	`string`

Right-aligns the characters in the "s" string, padding with "paddingChar" characters on the left for a total width specified in the "totalWidth" parameter.

Example:

```
PadLeft("ABC", 5, '0') = "00ABC"
```

PadRight

Function	Parameters	Return value
`PadRight`	`string s, ``int totalWidth`	`string`

Left-aligns the characters in the "s" string, padding with spaces on the right for a total width specified in the "totalWidth" parameter.

Example:

```
PadRight("ABC", 5) = "ABC  "
```

Function	Parameters	Return value
`PadRight`	`string s, ``int totalWidth,``char paddingChar`	`string`

Left-aligns the characters in the "s" string, padding with "paddingChar" characters on the right for a total width specified in the "totalWidth" parameter.

Example:

```
PadRight("ABC", 5, '0') = "ABC00"
```

Remove

Function	Parameters	Return value
`Remove`	`string s, ``int startIndex`	`string`

Deletes all the characters from the "s" string beginning at "startIndex" position and continuing through the last position.

Example:

```
Remove("ABCD", 3) = "ABC"
```

Function	Parameters	Return value
`Remove`	`string s, ``int startIndex,``int count`	`string`

Deletes a number of characters specified in the "count" parameter from the "s" string, beginning at a "startIndex" position.

Example:

```
Remove("A00BC", 1, 2) = "ABC"
```

Replace

Function	Parameters	Return value
`Replace`	`string s, ``string oldValue, ``string newValue`	`string`

Returns a string "s" in which a specified substring "oldValue" has been replaced with another substring "newValue".

Example:

```
Replace("A00", "00", "BC") = "ABC"
```

Substring

Function	Parameters	Return value
`Substring`	`string s, ``int startIndex`	`string`

Retrieves a substring from the "s" string. The substring starts at a character position specified in the "startIndex" parameter.

Example:

```
Substring("ABCDEF", 4) = "EF"
```

Function	Parameters	Return value
`Substring`	`string s, ``int startIndex,``int length`	`string`

Retrieves a substring from the "s" string. The substring starts at a character position specified in the "startIndex" parameter and has a length specified in the "length" parameter.

Example:

```
Substring("ABCDEF", 1, 3) = "BCD"
```

TitleCase

Function	Parameters	Return value
`TitleCase`	`string s`	`string`

Converts the specified string to titlecase.

Example:

```
TitleCase("john smith") = "John Smith"
```

Trim

Function	Parameters	Return value
`Trim`	`string s`	`string`

Removes all occurrences of white space characters from the beginning and end of the "s" string.

Example:

```
Trim("  ABC  ") = "ABC"
```

UpperCase

Function	Parameters	Return value
`UpperCase`	`string s`	`string`

Converts all characters of "s" to upper case and returns a result.

Example:

```
UpperCase("abc") = "ABC"
```

Date & Time

AddDays

Function	Parameters	Return value
`AddDays`	`DateTime date,``double value`	`DateTime`

Adds the specified number of days ("value") to the "date" date and returns a new date.

Example:

```
AddDays(#7/29/2009#, 1) = #7/30/2009#
```

AddHours

Function	Parameters	Return value
`AddHours`	`DateTime date,``double value`	`DateTime`

Adds the specified number of hours ("value") to the "date" date and returns a new date.

Example:

```
AddHours(#7/29/2009 1:30#, 1) = #7/29/2009 2:30#
```

AddMinutes

Function	Parameters	Return value
`AddMinutes`	`DateTime date,``double value`	`DateTime`

Adds the specified number of minutes ("value") to the "date" date and returns a new date.

Example:

```
AddMinutes(#7/29/2009 1:30#, 1) = #7/29/2009 1:31#
```

AddMonths

Function	Parameters	Return value
`AddMonths`	`DateTime date,``int value`	`DateTime`

Adds the specified number of months ("value") to the "date" date and returns a new date.

Example:

```
AddMonths(#7/29/2009#, 1) = #8/29/2009#
```

AddSeconds

Function	Parameters	Return value
`AddSeconds`	`DateTime date,``double value`	`DateTime`

Adds the specified number of seconds ("value") to the "date" date and returns a new date.

Example:

```
AddSeconds(#7/29/2009 1:30:01#, 1) = #7/29/2009 1:30:02#
```

AddYears

Function	Parameters	Return value
`AddYears`	`DateTime date,``int value`	`DateTime`

Adds the specified number of years ("value") to the "date" date and returns a new date.

Example:

```
AddYears(#7/29/2009#, 1) = #7/29/2010#
```

DateDiff

Function	Parameters	Return value
`DateDiff`	`DateTime date1,``DateTime date2`	`TimeSpan`

Returns the interval (number of days, hours, minutes, seconds) between two dates.

Example:

```
DateDiff(#1/2/2009#, #1/1/2009#) = 1.00:00:00
```

DateSerial

Function	Parameters	Return value
`DateSerial`	`int year,``int month,``int day`	`DateTime`

Creates a new DateTime value from the specified year, month and day.

Example:

```
DateSerial(2009, 7, 29) = #7/29/2009#
```

Day

Function	Parameters	Return value
`Day`	`DateTime date`	`int`

Gets the day of the month (1-31) represented by the specified date.

Example:

```
Day(#7/29/2009#) = 29
```

DayOfWeek

Function	Parameters	Return value
`DayOfWeek`	`DateTime date`	`string`

Gets the localized name of the day of the week represented by the specified date.

Example:

```
DayOfWeek(#7/29/2009#) = "wednesday"
```

DayOfYear

Function	Parameters	Return value
`DayOfYear`	`DateTime date`	`int`

Gets the day of the year (1-365) represented by the specified date.

Example:

```
DayOfYear(#7/29/2009#) = 210
```

DaysInMonth

Function	Parameters	Return value
`DaysInMonth`	`int year,``int month`	`int`

Returns the number of days in the specified month and year.

Example:

```
DaysInMonth(2009, 7) = 31
```

Hour

Function	Parameters	Return value
`Hour`	`DateTime date`	`int`

Gets the hour component (0-23) represented by the specified date.

Example:

```
Hour(#7/29/2009 1:30#) = 1
```

Minute

Function	Parameters	Return value
`Minute`	`DateTime date`	`int`

Gets the minute component (0-59) represented by the specified date.

Example:

```
Minute(#7/29/2009 1:30#) = 30
```

Month

Function	Parameters	Return value
`Month`	`DateTime date`	`int`

Gets the month component (1-12) represented by the specified date.

Example:

```
Month(#7/29/2009#) = 7
```

MonthName

Function	Parameters	Return value
`MonthName`	`int month`	`string`

Gets the localized name of the specified month (1-12).

Example:

```
MonthName(1) = "January"
```

Second

Function	Parameters	Return value
`Second`	`DateTime date`	`int`

Gets the seconds component (0-59) represented by the specified date.

Example:

```
Second(#7/29/2009 1:30:05#) = 5
```

Year

Function	Parameters	Return value
`Year`	`DateTime date`	`int`

Gets the year component represented by the specified date.

Example:

```
Year(#7/29/2009#) = 2009
```

Formatting

Format

Function	Parameters	Return value
`Format`	`string format,``params object[] args`	`string`

Replaces the format item in a specified "format" string with the value of a corresponding Object instance in a specified "args" array.

For example, the following function call:

```
Format("Name = {0}, hours = {1:hh}", myName, DateTime.Now)
```

contains the following format items: "{0}" and "{1:hh}". They will be replaced with values of myName and DateTime.Now. The result may look as follows:

```
Name = Alex, hours = 12
```

Each format item takes the following form:

```
{index[,alignment][:formatString]}
```

- index - a zero-based integer that indicates which element in a list of objects to format;
- alignment - an optional integer indicating the minimum width of the region to contain the formatted value. If the length of the formatted value is less than alignment, then the region is padded with spaces. If alignment is negative, the formatted value is left justified in the region; if alignment is positive, the formatted value is right justified;
- formatString -an optional string of format specifiers.

The following table describes the standard numeric format strings.

Format Specifier	Name	Description
C or c	Currency	The number is converted to a string that represents a currency amount. `Format("{0:C}", 10) = "$10.00"`
D or d	Decimal	This format is supported for integral types only. The number is converted to a string of decimal digits (0-9). `Format("{0:D}", 10) = "10"`
E or e	Scientific	The number is converted to a string of the form "-d.ddd...E+ddd" or "-d.ddd...e+ddd", where each 'd' indicates a digit (0-9). `Format("{0:E}", 10) = "1,000000E+001"`

Format Specifier	Name	Description
F or f	Fixed-point	The number is converted to a string of the form "-ddd.ddd..." where each 'd' indicates a digit (0-9). `Format("{0:F}", 10) = "10.00"`
G or g	General	The number is converted to the most compact notation. `Format("{0:G}", 10) = "10"`
N or n	Number	The number is converted to a string of the form "-d,ddd,ddd.ddd...", where each 'd' indicates a digit (0-9). `Format("{0:N}", 1234.56) = "1,234.56"`
P or p	Percent	The number is converted to a string that represents a percent. The converted number is multiplied by 100 in order to be presented as a percentage. `Format("{0:P}", 0.15) = "15.00%"`
X or x	Hexadecimal	The number is converted to a string of hexadecimal digits. The case of the format specifier indicates whether to use uppercase or lowercase characters for the hexadecimal digits greater than 9. For example, use 'X' to produce "ABCDEF", and 'x' to produce "abcdef". `Format("{0:X}", 26) = "1A"`

If you format the floating-point values, you may indicate a number of decimal places after the format string:

```
Format("{0:C1}", 12.23) = "$12.2"
```

If the standard numeric format specifiers do not provide the type of formatting you require, you can use custom format strings:

Format character	Description
0	Zero placeholder. If the value being formatted has a digit in the position where the '0' appears in the format string, then that digit is copied to the result string. The position of the leftmost '0' before the decimal point and the rightmost '0' after the decimal point determines the range of digits that are always present in the result string.
#	Digit placeholder. If the value being formatted has a digit in the position where the '#' appears in the format string, then that digit is copied to the result string. Otherwise, nothing is stored in that position in the result string.
.	Decimal point. The first '.' character in the format string determines the location of the decimal separator in the formatted value.
,	Thousand separator. If the format string contains a ',' character, then the output will have thousand separators inserted between each group of three digits to the left of the decimal separator.
%	Percentage placeholder. The presence of a '%' character in a format string causes a number to be multiplied by 100 before it is formatted.
;	Section separator. The ';' character is used to separate sections for positive, negative, and zero numbers in the format string.

Examples of use:

```
Format("{0:$#,##0.00}", 1024.25) = "$1,024.25"
Format("{0:00%}", 0.25) = "25%"
Format("{0:$#,##0.00;($#,##0.00);Zero}", 1024.25) = "$1,024.25"
Format("{0:$#,##0.00;($#,##0.00);Zero}", -1024.25) = "($1,024.25)"
Format("{0:$#,##0.00;($#,##0.00);Zero}", 0) = "Zero"
```

The following table describes the standard format specifiers for formatting the DateTime values:

Format Specifier	Name	Example
d	Short date pattern	"8/9/2009"
D	Long date pattern	"Sunday, August 09, 2009"
f	Full date/time pattern (short time)	"Sunday, August 09, 2009 2:44 PM"
F	Full date/time pattern (long time)	"Sunday, August 09, 2009 2:44:01 PM"
g	General date/time pattern (short time)	"8/9/2009 2:44 PM"
G	General date/time pattern (long time)	"8/9/2009 2:44:01 PM"
t	Short time pattern	"2:44 PM"
T	Long time pattern	"2:44:01 PM"

The following table describes the custom date/time format specifiers and the results they produce.

Format Specifier	Description
d	Displays the current day of the month, measured as a number between 1 and 31, inclusive. If the day is a single digit only (1-9), then it is displayed as a single digit.
dd	Displays the current day of the month, measured as a number between 1 and 31, inclusive. If the day is a single digit only (1-9), it is formatted with a preceding 0 (01-09).
ddd	Displays the abbreviated name of the day.
dddd	Displays the full name of the day.
f or F	Displays the most significant digit of the seconds fraction.
h	Displays the hour in the range 1-12. If the hour is a single digit (1-9), it is displayed as a single digit.
hh	Displays the hour in the range 1-12. If the hour is a single digit (1-9), it is formatted with a preceding 0 (01-09).
H	Displays the hour in the range 0-23. If the hour is a single digit (1-9), it is displayed as a single digit.
HH	Displays the hour in the range 0-23. If the hour is a single digit (1-9), it is formatted with a preceding 0 (01-09).

Format Specifier	Description
m	Displays the minute in the range 0-59. If the minute is a single digit (0-9), it is displayed as a single digit.
mm	Displays the minute in the range 0-59. If the minute is a single digit (0-9), it is formatted with a preceding 0 (01-09).
M	Displays the month, measured as a number between 1 and 12, inclusive. If the month is a single digit (1-9), it is displayed as a single digit.
MM	Displays the month, measured as a number between 1 and 12, inclusive. If the month is a single digit (1-9), it is formatted with a preceding 0 (01-09).
MMM	Displays the abbreviated name of the month.
MMMM	Displays the full name of the month.
s	Displays the seconds in the range 0-59. If the second is a single digit (0-9), it is displayed as a single digit only.
ss	Displays the seconds in the range 0-59. If the second is a single digit (0-9), it is formatted with a preceding 0 (01-09).
t	Displays the first character of the A.M./P.M. designator.
tt	Displays the A.M./P.M. designator.
y	Displays the year as a maximum two-digit number. The first two digits of the year are omitted. If the year is a single digit (1-9), it is displayed as a single digit.
yy	Displays the year as a maximum two-digit number. The first two digits of the year are omitted. If the year is a single digit (1-9), it is formatted with a preceding 0 (01-09).
yyyy	Displays the year, including the century. If the year is less than four digits in length, then preceding zeros are appended as necessary to make the displayed year four digits long.
z	Displays the time zone offset for the system's current time zone in whole hours only. The offset is always displayed with a leading sign (zero is displayed as "+0"), indicating hours ahead of Greenwich mean time (+) or hours behind Greenwich mean time (-). The range of values is –12 to +13. If the offset is a single digit (0-9), it is displayed as a single digit with the appropriate leading sign.
zz	Displays the time zone offset for the system's current time zone in whole hours only. The offset is always displayed with a leading or trailing sign (zero is displayed as "+00"), indicating hours ahead of Greenwich mean time (+) or hours behind Greenwich mean time (-). The range of values is –12 to +13. If the offset is a single digit (0-9), it is formatted with a preceding 0 (01-09) with the appropriate leading sign.
zzz	Displays the time zone offset for the system's current time zone in hours and minutes. The offset is always displayed with a leading or trailing sign (zero is displayed as "+00:00"), indicating hours ahead of Greenwich mean time (+) or hours behind Greenwich mean time (-). The range of values is –12:00 to +13:00. If the offset is a single digit (0-9), it is formatted with a preceding 0 (01-09) with the appropriate leading sign.
:	Time separator.
/	Date separator.

Examples of use:

```
Format("{0:d MMM yyyy}", DateTime.Now) = "9 Aug 2009"
Format("{0:MM/dd/yyyy}", DateTime.Now) = "08/09/2009"
Format("{0:MMMM, d}", DateTime.Now) = "August, 9"
Format("{0:HH:mm}", DateTime.Now) = "16:07"
Format("{0:MM/dd/yyyy hh:mm tt}", DateTime.Now) = "08/09/2009 04:07 PM"
```

FormatCurrency

Function	Parameters	Return value
`FormatCurrency`	`object value`	`string`

Formats the specified value as a currency, using the Windows regional settings.

Example:

```
FormatCurrency(1.25) = "$1.25"
```

Function	Parameters	Return value
`FormatCurrency`	`object value,``int decimalDigits`	`string`

Formats the specified value as a currency. The "decimalDigits" parameter indicates how many places are displayed to the right of the decimal.

Example:

```
FormatCurrency(1.25, 1) = "$1.3"
```

FormatDateTime

Function	Parameters	Return value
`FormatDateTime`	`DateTime value`	`string`

Formats the specified value as a date/time, using the Windows regional settings. This function does not include neutral values in the resulting string.

Example:

```
FormatDateTime(#1/1/2009#) = "01/01/2009"
FormatDateTime(#1/1/2009 1:30#) = "01/01/2009 1:30:00 AM"
FormatDateTime(#1:30#) = "1:30:00 AM"
```

Function	Parameters	Return value
`FormatDateTime`	`DateTime value,``string format`	`string`

Formats the specified value as a date/time, using the named format specified in the "format" parameter. The valid values for this parameter are:

"Long Date"

"Short Date"

"Long Time"

"Short Time"

Example:

```
FormatDateTime(#1/1/2009 1:30#, "Long Date") = "Thursday, January 01, 2009"
FormatDateTime(#1/1/2009#, "Short Date") = "01/01/2009"
FormatDateTime(#1:30#, "Short Time") = "01:30 AM"
FormatDateTime(#1:30#, "Long Time") = "1:30:00 AM"
```

FormatNumber

Function	Parameters	Return value
`FormatNumber`	`object value`	`string`

Formats the specified value as a number, using the Windows regional settings.

Example:

```
FormatNumber(1234.56) = "1,234.56"
```

Function	Parameters	Return value
`FormatNumber`	`object value,``int decimalDigits`	`string`

Formats the specified value as a number. The "decimalDigits" parameter indicates how many places are displayed to the right of the decimal.

Example:

```
FormatNumber(1234.56, 1) = "1,234.6"
```

FormatPercent

Function	Parameters	Return value
`FormatPercent`	`object value`	`string`

Formats the specified value as a percent, using the Windows regional settings.

Example:

```
FormatPercent(0.15) = "15.00%"
```

Function	Parameters	Return value
`FormatPercent`	`object value,``int decimalDigits`	`string`

Formats the specified value as a percent. The "decimalDigits" parameter indicates how many places are displayed to the right of the decimal.

Example:

```
FormatPercent(0.15, 0) = "15%"
```

Conversion

ToBoolean

Function	Parameters	Return value
`ToBoolean`	`object value`	`bool`

Converts the specified value to boolean.

Example:

```
ToBoolean(1) = true
ToBoolean(0) = false
```

ToByte

Function	Parameters	Return value
`ToByte`	`object value`	`byte`

Converts the specified value to byte.

Example:

```
ToByte("55") = 55
```

ToChar

Function	Parameters	Return value
`ToChar`	`object value`	`char`

Converts the specified value to char.

Example:

```
ToChar(65) = 'A'
```

ToDateTime

Function	Parameters	Return value
`ToDateTime`	`object value`	`DateTime`

Converts the specified value to date/time.

Example:

```
ToDateTime("1/1/2009") = #1/1/2009#
```

ToDecimal

Function	Parameters	Return value
`ToDecimal`	`object value`	`decimal`

Converts the specified value to decimal.

Example:

```
ToDecimal(1) = 1m
ToDecimal("1") = 1m
```

ToDouble

Function	Parameters	Return value
`ToDouble`	`object value`	`double`

Converts the specified value to double.

Example:

```
ToDouble(1) = 1
ToDouble("1") = 1
```

ToInt32

Function	Parameters	Return value
`ToInt32`	`object value`	`int`

Converts the specified value to int.

Example:

```
ToInt32(1f) = 1
ToInt32("1") = 1
```

ToRoman

Function	Parameters	Return value
`ToRoman`	`object value`	`string`

Converts the specified numeric value to its roman representation. The value must be in range 1-3998.

Example:

```
ToRoman(9) = "IX"
```

ToSingle

Function	Parameters	Return value
`ToSingle`	`object value`	`float`

Converts the specified value to float.

Example:

```
ToSingle(1m) = 1f
ToSingle("1") = 1f
```

ToString

Function	Parameters	Return value
`ToString`	`object value`	`string`

Converts the specified value to string.

Example:

```
ToString(false) = "False"
ToString(DateTime.Now) = "08/09/2009 4:45:00 PM"
```

ToWords

Function	Parameters	Return value
`ToWords`	`object value`	`string`

Converts the specified currency value to words.

Example:

```
ToWords(1024.25) = "One thousand and twenty-four dollars and 25 cents"
```

Function	Parameters	Return value
`ToWords`	`object value,``string currencyName`	`string`

Converts the specified currency value to words. The "currencyName" parameter indicates the currency. Valid values for this parameter are:

"USD"

"EUR"

"GBP"

Example:

```
ToWords(1024.25, "EUR") = "One thousand and twenty-four euros and 25 cents"
```

Function	Parameters	Return value
`ToWords`	`object value,``string one,``string many`	`string`

Converts the specified integer value to words. The "one" parameter contains the name in singular form; the "many" parameter contains the name in plural form.

Example:

```
ToWords(124, "page", "pages") = "One hundred and twenty-four pages"
ToWords(1, "page", "pages") = "One page"
```

ToWordsEnGb

Function	Parameters	Return value
`ToWordsEnGb`	`object value`	`string`

Converts the specified currency value to words in Great Britain english. There are the following differences between this function and ToWords:

- the GBP currency is used by default;
- different words used when converting milliards and trilliards.

Example:

```
ToWordsEnGb(121) = "One hundred and twenty-one pounds and 00 pence"
```

Function	Parameters	Return value
`ToWordsEnGb`	`object value,``string currencyName`	`string`

Converts the specified currency value to words in Great Britain english. The "currencyName" parameter indicates the currency. Valid values for this parameter are:

"USD"

"EUR"

"GBP"

Example:

```
ToWordsEnGb(1024.25, "EUR") = "One thousand and twenty-four euros and 25 cents"
```

Function	Parameters	Return value
`ToWordsEnGb`	`object value,``string one,``string many`	`string`

Converts the specified integer value to words in Great Britain english. The "one" parameter contains the name in singular form; the "many" parameter contains the name in plural form.

Example:

```
ToWordsEnGb(124, "page", "pages") = "One hundred and twenty-four pages"
ToWordsEnGb(1, "page", "pages") = "One page"
```

ToWordsRu

Function	Parameters	Return value
`ToWordsRu`	`object value`	`string`

Converts the specified currency value to words in russian.

Example:

```
ToWordsRu(1024.25) = "Одна тысяча двадцать четыре рубля 25 копеек"
```

Function	Parameters	Return value
`ToWordsRu`	`object value,``string currencyName`	`string`

Converts the specified currency value to words in russian. The "currencyName" parameter indicates the currency. Valid values for this parameter are:

"RUR"

"UAH"

"USD"

"EUR"

Example:

```
ToWordsRu(1024.25, "EUR") = "Одна тысяча двадцать четыре евро 25 евроцентов"
```

Function	Parameters	Return value
`ToWordsRu`	`object value,``bool male,``string one,``string two,``string many`	`string`

Converts the specified integer value to words in russian. The "male" parameter indicates the gender of the name. The "one", "two" and "five" parameters contain a form of the name used with "1", "2" and "5" numbers.

Example:

```
// the "страница" word is of female gender, male = false
ToWordsRu(122, false, "страница", "страницы", "страниц") =
"Сто двадцать две страницы"
// the "лист" word is of male gender, male = true
ToWordsRu(122, true, "лист", "листа", "листов") =
"Сто двадцать два листа"
```

Program Flow

Choose

Function	Parameters	Return value
`Choose`	`double index,``params object[] choice`	`object`

Returns an element of the "choice" array with the index specified in the "index" parameter. The first array element has 1 index.

Example:

```
Choose(2, "one", "two", "three") = "two"
```

IIf

Function	Parameters	Return value
`IIf`	`bool expression,``object truePart,``object falsePart`	`object`

Returns the "truePart" value, if the "expression" is true. Otherwise, returns the "falsePart" value.

Example:

```
IIf(2 > 5, "true", "false") = "false"
```

Switch

Function	Parameters	Return value
`Switch`	`params object[] expressions`	`object`

The argument supplied to expressions consists of paired expressions and values. The Switch function evaluates the odd-numbered expressions from lowest to highest index, and returns the even-numbered value associated with the first expression that evaluates to True.

Example:

```
// returns one of the following values - "a greater than 0",
// "a less than 0", "a equals to 0", depending on "a" value
Switch(
  a > 0, "a greater than 0",
  a < 0, "a less than 0",
  a == 0, "a equals to 0")
```

Totals

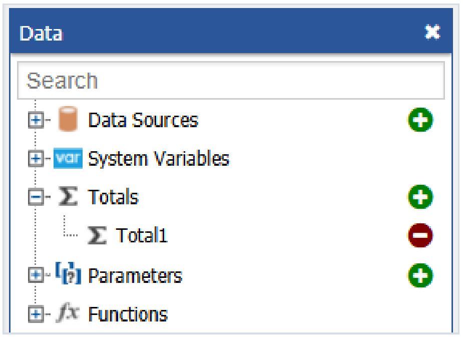
In many reports, we may need to show some total information: sum of the group, number of rows in the list, and many others. FastReport uses totals to perform this task. For the total, you need to indicate the following parameters:

- The total function type;
- The expression, which is supposed to be calculated. For the "Count" function, you do not need to indicate the expression;
- The condition. The function will be calculated if the condition is met. It's not obligatory to set up the condition.
- The data band, for which the function will be processed;
- The band, in which the total value will be printed.

The list of total functions is given below:

Function	Description
Sum	Calculates the sum of the expression.
Min	Calculates the minimum value of the expression.
Max	Calculates the maximum value of the expression.
Average	Calculates the average value of the expression.
Count	Returns the number of rows.

To add Total, you should open the window "Data". Click on the green icon with a plus sign in front of Totals node:



After that, set the above parameters in the "Properties" window. Then, drag the added Total to the report page. To remove added Total, use the red icon with a minus sign.

Report parameters

You can define parameters in a report. Parameter is a variable, the value of which can be defined both in a report itself and outside of it (a program, calling a report can transfer parameters values into it. See details in "Programmer's manual"). A parameter can be used in expressions and be displayed in report objects like the "Text" object.

Most common methods of using parameters:

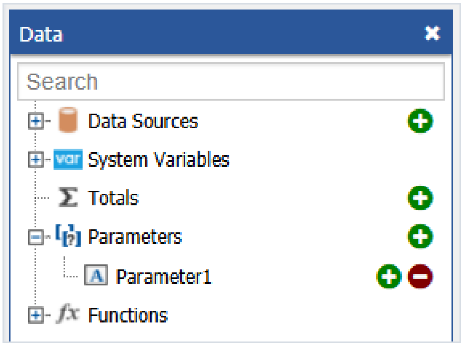
- data filtering by condition set in a parameter;
- printing parameter value in a report.

A parameter has the following properties:

Property	Description
Name	Parameter's name can have any symbols except dot ".".
DataType	Parameter data type.
Expression	Expression which returns parameter's value. More details about expressions can be found in the "Expression" chapter. This expression will be processed when calling a parameter.
Value	Parameter value. This property is not available in the designer and can be filled programmatically.

You have to set up "Name" and "DataType" properties. The "Expression" property can be left empty. In this case parameter's value should be passed programmatically.

To add a parameter, you should open the window "Data". Click on the green icon with a plus sign in front of Parameters node. After that, set the above parameters in the "Properties" window. Now, you can drag a parameter to the desired location on the report page, or use it to filter the data.



To remove a parameter, use the red icon with a minus sign.

Expressions

In many places in FastReport, expressions are used. For example, the "Text" object can contain expressions in square brackets.

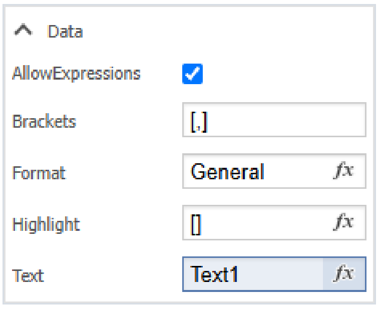
An expression is a code in C# or VB.Net language, which returns any value. For example:

```
2 + 2
```

An expression should be written in a language chosen as a script in a report. By default, it is C#.

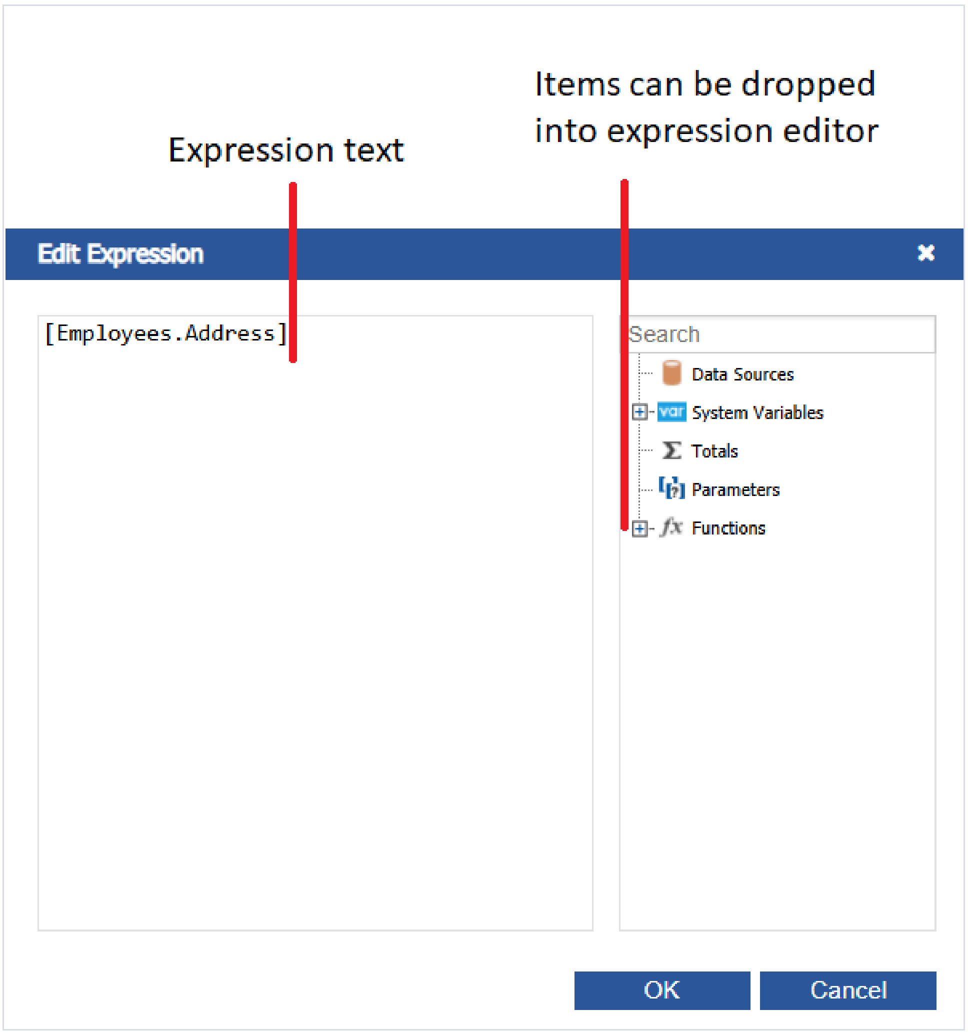
Expression editor

For the convenience of writing expressions use the Expression Editor. It can be opened by double clicking on the text object or by using the button *fx* in the properties.



AllowExpressions	✓
Brackets	[,]
Format	General
Highlight	[]
Text	Text1

The expression editor is a window in which you can enter text expression or insert the items from the "Data" window:



```
[Employees.Address]
```

Reference to report objects

For referring to report objects, use the object's name. The following example will return the height of the Text1 object:

```
Text1.Height
```

For referring to report properties, use Report variable. The following example returns file name from which a report was loaded.

```
Report.FileName
```

Besides, you can refer to nested object properties. The following example will return a report name:

```
Report.ReportInfo.Name
```

Using .Net functions

You can use any.Net objects in expressions. The following example demonstrates Max function use:

```
Math.Max(5, 10)
```

By default a report uses the following .Net assemblies:

```
System.dll
System.Drawing.dll
System.Windows.Forms.dll
System.Data.dll
System.Xml.dll
```

You have access to all .Net objects declared in these assemblies. If you need to have access to another assembly, add its name in report assemblies list (it can be done in the desktop version of FastReport designer).

For example, if you want to use a function in your report which was declared in your application, add application assembly (.exe or .dll) in a report assemblies list. After that you can call the function by using namespace of your application. For example, if the following function is defined in application:

```
namespace Demo
{
  public static class MyFunctions
  {
    public static string Func1()
    {
      return "Hello!";
    }
  }
}
```

You can use it in your report in the following way:

```
Demo.MyFunctions.Func1()
```

If you add the "using Demo" line at the top of the report's script, it will allows you to shorten the syntax:

```
MyFunctions.Func1()
```

To refer to the function or variable that was defined in a script, just use its name:

```
myPrivateVariableThatIHaveDeclaredInScript
MyScriptFunction()
```

> You can use in an expression only those functions which return a value.

Reference to data elements

Apart from standard language elements, you can use the following report elements in expressions:

- data source columns;
- system variables;
- total values;
- report parameters.

All these elements are contained in the "Data" window. Any of these elements can be used in an expression, by including it in square brackets. For example:

```
[Page] + 1
```

This expression returns next printed page number. A system variable "Page", which returns current report page number, is used in the expression. It is enclosed in square brackets.

Reference to data sources

For reference to data source columns, the following format is used:

```
[DataSource.Column]
```

Source name is separated from column name by a period, for example:

```
[Employees.FirstName]
```

Source name can be compound in case, if we refer to a data source by using a relation. See more details in the "Data" section. For example, this is how you can refer to a related data source column:

```
[Products.Categories.CategoryName]
```

Let us look at the following example of using columns in an expression:

```
[Employees.FirstName] + " " + [Employees.LastName]
```

Here it should be noted that: every column has a definite data type, which is set in the "DataType" property (you can see it in the "Properties" window if to choose data column in the "Data" window beforehand). How a column can be used in an expression depends on its type. For instance, in above mentioned example, both columns - first name and last name - have got a string type and that is why they can be used in such a way. In the following example, we will try to use "Employees.Age" column of numeric type, which will lead to an error:

```
[Employees.FirstName] + " " + [Employees.Age]
```

The error occurs because, you never mix strings with numbers. For this, you need to convert the number into a string:

```
[Employees.FirstName] + " " + [Employees.Age].ToString()
```

In this case, we refer to the "Employees.Age" column as if it is an integer variable. And it is so. We know that all expressions are compiled. All non-standard things (like referring to data columns) from a compiler's point of view are converted into another type, which is understandable to a compiler. So, the last expression will be turned into the following form:

```
(string)(Report.GetColumnValue("Employees.FirstName")) + " " +
(int)(Report.GetColumnValue("Employees.Age")).ToString()
```

As seen, FastReport changes reference to data columns in the following way:

`[Employees.FirstName]` --> `(string)(Report.GetColumnValue("Employees.FirstName"))`

`[Employees.Age]` --> `(int)(Report.GetColumnValue("Employees.Age"))`

That is, we can use data column in an expressions as if it is a variable having a definite type. For example, the following expression will return the first symbol of an employee's name:

```
[Employees.FirstName].Substring(0, 1)
```

Reference to system variables

You can use the following system variables in expressions (they are accessible in the "Data" window):

Variable	.Net data type	Description	
Date	DateTime	Date and time of the report's start.	
Page	int	Current page number.	
TotalPages	int	Total number of pages in the report. To use this variable, you need to enable the report's double pass. You can do this in "Report	Properties..." menu.
PageN	string	Page number in the form: "Page N".	
PageNofM	string	Page number in the form: "Page N of M".	
Row#	int	Data row number inside the group. This value is reset at the start of a new group.	
AbsRow#	int	Absolute number of data row. This value is never reset at the start of a new group.	

Every variable has a data type. And on this, depends how it will be used in the expression. Here is an example of an expression where date is being used:

```
[Date].Year
```

This expression returns the current year. As "Date" variable has DateTime type, so we can refer to its "Year" property. We can get the current month similarly ([Date].Month).

FastReport converts reference to system variable into the following form (for example, the "Date" variable):

```
((DateTime)Report.GetVariableValue("Date"))
```

Reference to Total values

In order to refer to a total value, use its name:

```
[TotalSales]
```

FastReport converts reference to totals into the following form:

```
Report.GetTotalValue("TotalSales")
```

As you can see, the data type is not used here. It is so, because the total value is of FastReport.Variant type. It can be used directly in any expressions because it is automatically converted to any type. For example:

```
[TotalSales] * 0.2f
```

Reference to report parameters

In order to refer to report parameters, you should use its name:

```
[Parameter1]
```

Parameters can be nested. In this case, you should use both parent and child parameter names in the following form:

```
[ParentParameter.ChildParameter]
```

Parameters have a definite data type. It is set in the "DataType" property of the parameter. The way it can be used in an expression depends on parameter's data type.

FastReport converts reference to a report parameter into the following way:

```
((string)Report.GetParameterValue("Parameter1"))
```

Script

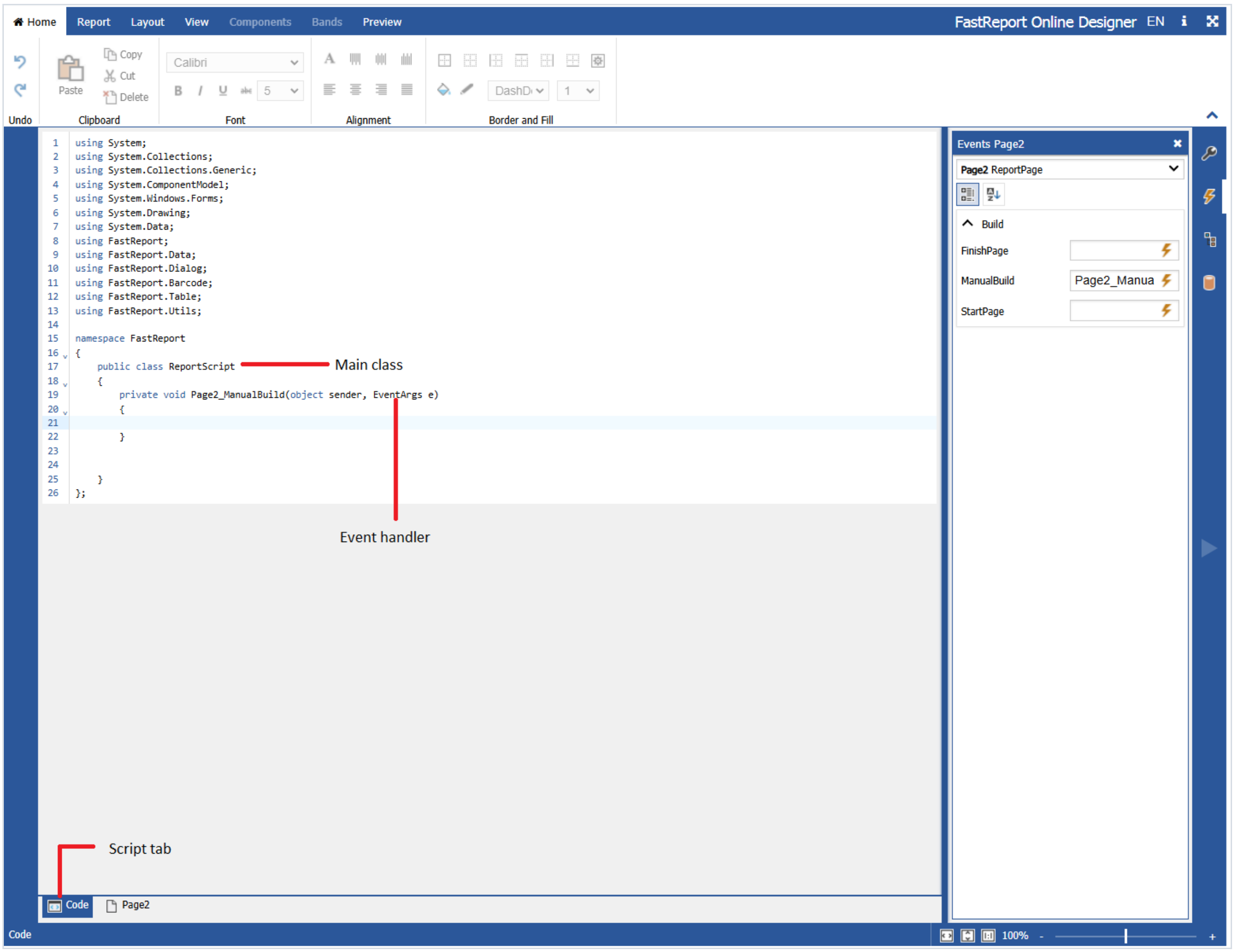
Script is a higher-level programming language, which is part of the report. Script can be written in one of the following .Net languages:

- C#
- VisualBasic.Net

A script is applicable in many places. Using the script, you can do the following:

- perform data handling, which cannot be done via regular means of the FastReport engine;
- control the printing of report pages and bands on the page;
- control the interaction between elements on dialogue forms;
- control the formation of dynamic "Table" objects;
- and many more.

In order to see the report's script, switch to the "Script" tab in the designer:



```
using System;
using System.Collections;
using System.Collections.Generic;
using System.ComponentModel;
using System.Windows.Forms;
using System.Drawing;
using System.Data;
using FastReport;
using FastReport.Data;
using FastReport.Dialog;
using FastReport.Barcode;
using FastReport.Table;
using FastReport.Utils;

namespace FastReport
{
    public class ReportScript
    {
        private void Page2_ManualBuild(object sender, EventArgs e)
        {

        }


    }
};
```

Events Page2

Page2 ReportPage

Build

FinishPage	
ManualBuild	Page2_Manua
StartPage	

In the figure you can see the "Events" window for the object Page1. This window allows you to create event handlers for components and bands.

In the script, you can:

- add your variables, methods and properties to the main script class;
- create a report object's events handler;
- add new classes to the script, if needed. A class can be added either before the ReportScript main class or

after it.

You cannot:

- delete, rename or change the visibility area of the ReportScript main class;
- rename a namespace in which the main class is located.

When the report is running, the following occurs:

- FastReport adds into the script a list of variables, whose names correspond with the names of the report objects. This is done before compiling the script and allows you to refer to the report objects by their names;
- an expression handler is added to the script, which handles all expressions found in the report;
- a script is compiled, if it is not empty;
- the script class is initialized;
- the report is run.

Events

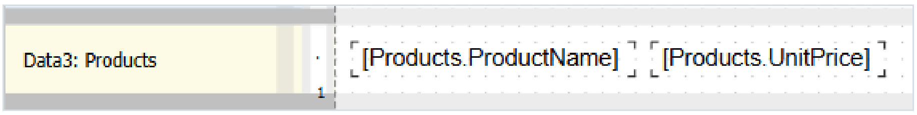
In order to control the report with maximum flexibility, every report object has got several events. For example, in a handler, connected to the "Data" band, you can filter records, that is, hide or show the band depending on certain conditions.

To add an event, select the report object and open the "Event" window. Select the handler and click on the icon ... . To delete an added event handler, delete the name in the "Event" window and the code of the handler in the "Script" tab.

The "Report" object has got events as well. This object can be chosen by the following method:

- select "Report" in the "Report Tree" window;
- select "Report" in the drop-down list in the "Properties" window.

Let us consider the events which are fired during the report generation process. As an example, we will take a simple report, containing one page, one "Data" band and two "Text" objects on the band:



In the beginning of the report, the "Report" object fires the StartReport event. Before formation of the report page, the StartPage event is fired. This event is fired once for every template page (do not confuse with prepared report page!). In our case, regardless of how many pages were in the prepared report - event is fired once, since the template report has got one page.

Further, printing of the "Data" band row starts. This happens in the following way:

1. the BeforePrint band event is fired;
2. the BeforePrint event of all objects lying on the band is fired;
3. all objects are filled with data;
4. the AfterData event of all objects lying on the band is fired;
5. the BeforeLayout band event is fired;
6. objects are placed on the band, the height of the band is calculated and band is stretched (if it can);
7. the AfterLayout band event is fired;
8. if the band cannot fit on a free space on the page, a new page is formed;
9. the band and all its objects are displayed on a prepared report page;
10. the AfterPrint band event is fired;
11. the AfterPrint event of all the band objects is fired.

Printing of the band row occurs as long as there is data in the source. After this, the formation of the report in our case ends. The FinishPage event of a page is fired and finally - the FinishReport event of the "Report" object.

So, by using events of different objects, you can control every step of report formation. The key to correct use of events - full understanding of the band printing process, expound in the eleven steps above. So, a lot of operations can be done, by using only the BeforePrint band - any change, done to the object, will also be displayed. But in this event, it is not possible to analyze, on which page will the band be printed, if it stretches, because the height of the band will be calculated on step 6. This can be done with the help of the AfterLayout event in step 7 or AfterPrint in step 10, but in the latter case, the band is already printed and operations with objects do not give out anything. In one word, you must clearly state, at what moment each event is fired and use, those, which correspond with the given task.

Reference to report objects

For referring to report objects (for example, "Text" object) use the name of the object. The following example returns the height of Text1 object:

```
float height = Text1.Height;
```

Note that report's native unit of measurement is screen pixels. Keep it in mind when using such object's properties like Left, Top, Width, and Height. To convert pixels into centimeters and back, use the constants, defined in the "Units" class:

```
float heightInPixels = Text1.Height;
float heightInCM = heightInPixels / Units.Centimeters;
Text1.Height = Units.Centimeters * 5; // 5см
```

Engine and Report objects

Apart from objects, which are contained in the report, there are two variables defined in the script: Report and Engine.

The Report variable refers to the current report. In the list below, a list of the report object's methods is given:

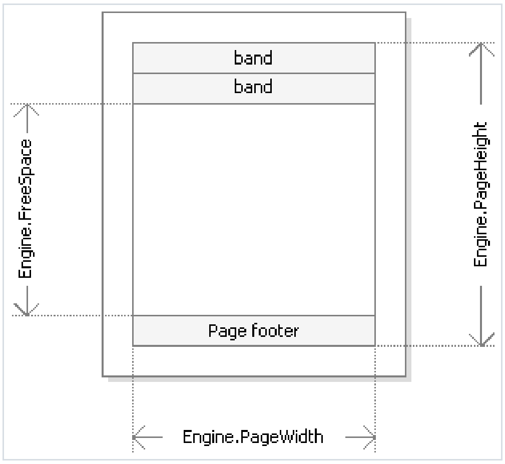
Method	Description
`object Calc(string expression)`	Calculates an expression and returns the value. When calling this method the first time, an expression gets compiled, which needs some time.
`object GetColumnValue(string complexName)`	Returns the value of the data column. The name must be presented in the "DataSource.Column" form. If the column has got the null value, it is converted into a value by default (0, empty string, false).
`object GetColumnValueNullable(string complexName)`	Returns the value of the data column. Contrary to the previous method, it does not get converted into a default value and may be null.
`Parameter GetParameter(string complexName)`	Returns the reports parameter with the indicated name. Name can be compounded when referring to the nested parameter: "MainParam.NestedParam".
`object GetParameterValue(string complexName)`	Returns the value of the report parameter with the indicated name.
`void SetParameterValue(string complexName, object value)`	Sets the value of the report parameter with the indicated name.
`object GetVariableValue(string complexName)`	Returns the value of the system variable, for example, "Date".
`object GetTotalValue(string name)`	Returns the value of the total, defined in the "Data" window, by its name.
`DataSourceBase GetDataSource(string alias)`	Returns the data source, defined in the report, by its name.

The Engine object is an engine that controls the report creation. By using the methods and properties of the engine, you can manage the process of placing bands onto the page. You can use the following properties of the Engine object:

Property	Description
`float CurX`	Current coordinates on the X-axis. This property can be assigned a value, so as to shift the printed object.
`float CurY`	Current printing position on the Y-axis. To this property, a value can be assigned so as to shift the printed object.
`int CurColumn`	Number of the current column in a multicolumn report. The first column has the number 0.

Property	Description
`int CurPage`	Number of the page being printed. This value can be received from the "Page" system variable.
`float PageWidth`	Width of the page minus the size of the left and right margins.
`float PageHeight`	Height of the page minus the size of the top and bottom margins.
`float PageFooterHeight`	Height of the page footer (and all its child bands).
`float ColumnFooterHeight`	Height of the column footer (and all of its child bands).
`float FreeSpace`	Size of the free space on the page.
`bool FirstPass`	Returns true, if the first (or only) report pass is being executed. Number of passes can be obtained from the Report.DoublePass property.
`bool FinalPass`	Returns true, if the last (or only) report pass is being executed.

On the figure below, you can see the meaning of some properties listed above.



Engine.PageWidth and Engine.PageHeight properties determine the size of the printing area, which is almost always less than the actual size of the page. Size of the printed area is determined by the page margins, which is given by the LeftMargin, TopMargin, RightMargin and BottomMargin page properties.

Engine.FreeSpace property determines the height of the free space on the page. If there is the "Page footer" band on the page, its height is considered when calculating the FreeSpace. Note that, after printing a band, free space is reduced.

How does the formation of a prepared report page take place? FastReport engine displays bands on the page until there is enough space for band output. When there is no free space, the "Report footer" band is printed and a new empty page is formed. Displaying a band starts from the current position, which is determined by the X and Y coordinates. This position is retuned by the Engine.CurX and Engine.CurY properties. After printing a band, CurY automatically increases by the height of the printed band. After forming a new page, the position of the CurY is set to 0. The position of the CurX changes when printing a multicolumn report.

Engine.CurX and Engine.CurY properties are accessible not only for reading, but also for writing. This means that you can shift a band manually by using one of the suitable events. Examples of using these properties can be seen in the "Examples" section.

> When working with properties, which return the size or position, remember that, these properties are measured in the screen pixels.

In the Engine object, the following methods are defined:

Method	Description
`void AddOutline(string text)`	Adds an element into the report outline and sets the current position to the added element.
`void OutlineRoot()`	Sets the current position on the root of the outline.
`void OutlineUp()`	Shifts the current position to a higher-level outline element.
`void AddBookmark(string name)`	Adds a bookmark.
`int GetBookmarkPage(string name)`	Returns the page number on which the bookmark with the indicated name is placed.
`void StartNewPage()`	Starts a new page. If the report is multicolumn, a new column is started.

By using the AddOutline, OutlineRoot, OutlineUp methods, you can form the report outline manually. Usually, this is done automatically with the help of the OutlineExpression property, which every band and report page have got.

The AddOutline method adds a child element to the current outline element, and makes it current. The current report page and the current position on the page are associated with the new element. If you call the AddOutline method several times, then you will have the following structure:

```
Item1
    Item2
        Item3
```

For controlling the current element, there are OutlineUp and OutlineRoot methods. The first method moves the pointer to the element, located on a higher level. So, the script

```
Engine.AddOutline("Item1");
Engine.AddOutline("Item2");
Engine.AddOutline("Item3");
Engine.OutlineUp();
Engine.AddOutline("Item4");
```

will create the following outline:

```
Item1
    Item2
        Item3
        Item4
```

The OutlineRoot method moves the current element to the root of the outline. For example, the following script:

```
Engine.AddOutline("Item1");
Engine.AddOutline("Item2");
Engine.AddOutline("Item3");
Engine.OutlineRoot();
Engine.AddOutline("Item4");
```

will create the following outline:

```
Item1
    Item2
        Item3
Item4
```

For working with bookmarks, the AddBookmark and GetBookmarkPage methods of the Engine object are used. Usually bookmarks are added automatically when using the Bookmark property, which all objects of the report have got.

By using the Add Bookmark method, you can add a bookmark programmatically. This method creates a bookmark on the current page at the current printing position.

The GetBookmarkPage method returns the page number on which the bookmark is placed. This method is often used when creating the table of contents, for displaying page numbers. In this case, the report must have a double pass.

Reference to data sources

Contrary to the FastReport expressions (covered in the "Expressions" section), never use square brackets in script for referring to the data sources. Instead of this, use the GetColumnValue method of the Report object, which returns the value of the column:

```
string productName = (string)Report.GetColumnValue("Products.Name");
```

As seen, you need to indicate the name of the source and its column. The name of the source can be compound in case, if we are referring to the data source by using a relation. For example, you can refer to a column of the related data source in this way:

```
string categoryName = (string)Report.GetColumnValue("Products.Categories.CategoryName");
```

For making the work easier, use the "Data" window. From it you can drag data elements into the script, during this FastReport automatically creates a code for referring to the element.

For referring to the data source itself, use the GetDataSource method of the Report object:

```
DataSourceBase ds = Report.GetDataSource("Products");
```

Help on properties and methods of the DataSourceBase class can be received from the FastReport.Net Class Reference help system. As a rule, this object is used in the script in the following way:

```
// get a reference to the data source
DataSourceBase ds = Report.GetDataSource("Products");
// initialize it
ds.Init();
// enum all rows
while (ds.HasMoreRows)
{
  // get the data column value from the current row
  string productName = (string)Report.GetColumnValue("Products.Name");
  // do something with it...
  // ...
  // go next data row
  ds.Next();
}
```

Reference to system variables

For reference to system variables, use the GetVariableValue method of the Report object:

```
DateTime date = (DateTime)Report.GetVariableValue("Date");
```

A list of system variables can be seen in the "Data" window. From it, you can drag a variable into a script, during this FastReport automatically creates a code for referring to the variable.

Reference to Total values

For reference to the total value, use the GetTotalValue method of the Report object:

```
float sales = Report.GetTotalValue("TotalSales");
```

A list of totals can be seen in the "Data" window. From it, you can drag a total into the script, during this FastReport automatically creates a code for referring to the total.

Total value has got the FastReport.Variant type. It can be used directly in any expression, because the FastReport.Variant type is automatically converted to any type. For example:

```
float tax = Report.GetTotalValue("TotalSales") * 0.2f;
```

Reference to the total value can be done at that time when, it is being processed. Usually the total is "ready to use" at the moment of printing the band, on which it is located in the report.

Reference to report parameters

For referring to report parameters, use the GetParameterValue method of the Report object:

```
int myParam = (int)Report.GetParameterValue("MyParameter");
```

Parameters can be nested. In this case, indicate the name of the parent parameter and after the period, the name of the child parameter:

```
Report.GetParameterValue("ParentParameter.ChildParameter")
```

Parameters have got a definite data type. It is given in the DataType property of the parameter. You must take this into account when referring to parameters. You can see a list of parameters in the "Data" window. From it, you can drag parameters into the script, during this FastReport automatically creates a code for referring to the parameters.

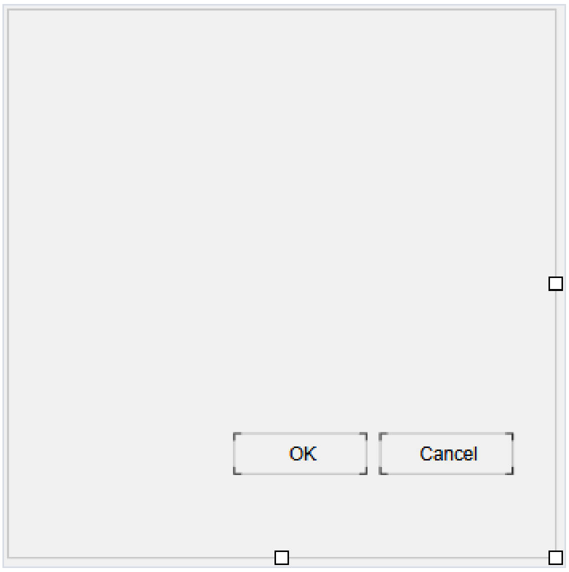
For changing the value of the parameter, use the SetParameterValue method of the report object:

```
Report.SetParameterValue("MyParameter", 10);
```

Dialogue forms

Apart from an ordinary page, a report can contain one or several dialogue forms. Such dialogue form will be shown when the report is started. In the dialogue, you can enter any type of information, needed for creating a report. Also, a dialogue may be used to filter data, which is shown in the report.

For adding a dialogue into a report, press the New Dialog icon on the toolbar in the tab “Report”. A new dialogue looks as follows:



To delete the dialogue, select the tab with dialogue form and press the Delete Page on the "Report" toolbar.

A report, having one or several dialogues, works like this:

- when started, the report shows the first dialogue;
- if the dialogue is closed with the help of the "OK" button, then the next dialogue is shown; otherwise, the report stops working;
- after all the dialogues have been shown, the report is built.

Controls

On a dialogue from, the following controls can be used:

Icon	Name	Description
	ButtonControl	Represents a Windows button control.
	CheckBoxControl	Represents a Windows CheckBox.
	CheckedListBoxControl	Displays a ListBox in which a check box is displayed to the left of each item.
	ComboBoxControl	Represents a Windows combo box control.
	DateTimePickerControl	Represents a Windows control that allows the user to select a date and a time and to display the date and time with a specified format.
	LabelControl	Represents a standard Windows label.
	ListBoxControl	Represents a Windows control to display a list of items.
	MonthCalendarControl	Represents a Windows control that enables the user to select a date using a visual monthly calendar display.
	RadioButtonControl	Enables the user to select a single option from a group of choices when paired with other RadioButton controls.
	TextBoxControl	Represents a Windows text box control.

All controls are a full analog of the standard Windows.Forms controls. The name of the element has got a Control suffix, in order to avoid duplicate names. So, the FastReport's ButtonControl corresponds with the standard Button control. Referencing to a control can be done by using its name:

```
TextBoxControl1.Text = "my text";
```

In fact, the FastReport's control is just a wrapper for the standard .Net control. It wraps many, but not all, properties of the standard control. If you need some property that is not implemented by the FastReport control, you may access a wrapped standard control in the following way:

- using the "Control" property, which is of System.Windows.Forms.Control type:

```
(TextBox1.Control as TextBox).ShortcutsEnabled = false;
```

- using the property which has the same name as the control itself, but without the "Control" suffix. For example, the TextBoxControl has got the "TextBox" property, which is of System.Windows.Forms.TextBox type and returns the wrapped TextBox control:

```
TextBox1.TextBox.ShortcutsEnabled = false;
```

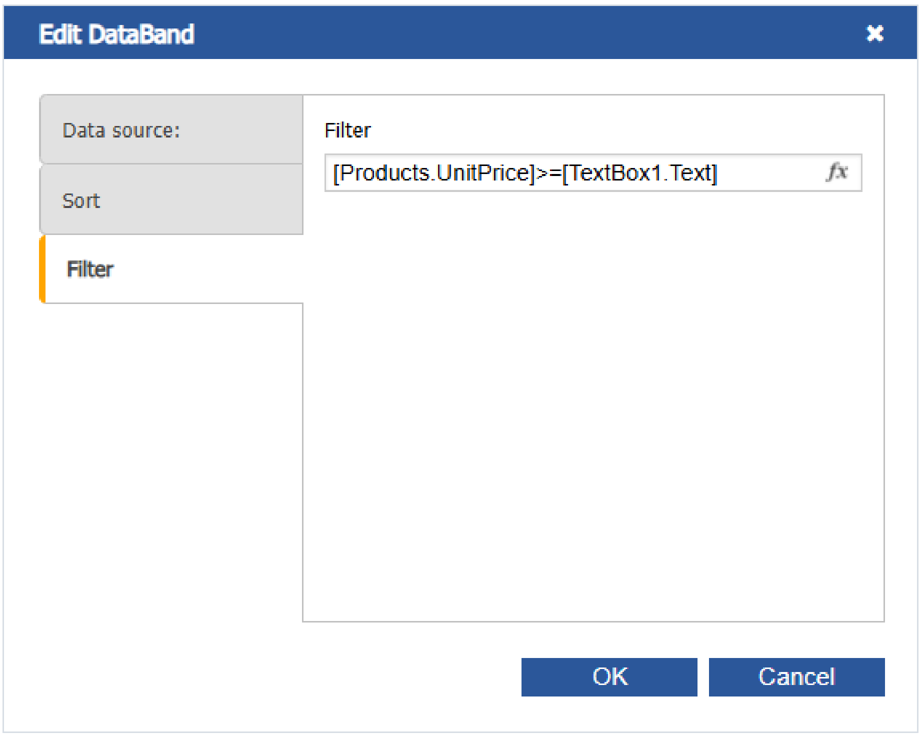
Help on properties and methods of the controls can be accessed from the MSDN.

Data filtering

Dialogs can be used to filter the data which is printed in a report. For example, you have a report, which prints a list of all the employees. By using a dialog, you can choose one or several from it, and then when building the report, the data is filtered so that only the chosen employees can be shown.

> For using the data filtering, it is necessary that the initial report contains all the data. The name "filtering" itself, assumes that, unnecessary data will not be printed when building the report.

The simplest method for organizing data filtering is to use the Filter property on the "Data" band. In the band editor, you can indicate the filter expression, for example:



Filter

```
[Products.UnitPrice]>=[TextBox1.Text]
```

By using the dialogue, you can ask a value from a user, and use it in the filtering expression.

This method can be used, if a simple value is needed. If the task is to display a list of values and inquire one or several from it, implementing this becomes difficult. You may think that, it is a simple task - showing a list of employees in the ListBoxControl control element and choosing one or several values. For implementing this, you need to use the script, which does the following:

- get the data source by its name;
- initialize data;
- fill the ListBoxControl with the data from data source;
- after choosing the employee, build a filter expression that will be used in the "Data" band.

FastReport can do this automatically. For this, automatic filtering is used, which we will observe now.

Automating filtering

Control is connected to the data column using the "DataColumn" property. If the control can display a list of values (for example, ListBoxControl), it fills with values from the indicated data column. This happens automatically when the dialogue is shown. Further, the user works with the dialogue, selects one or several items in the control and closes the dialogue. At this time, the data source which was indicated in the "DataColumn" property is filtered automatically.

> The advantage of this method is that, you can use it in any report without writing any code.

Automatic filtering is supported by the following controls:

Icon	Name
☑	CheckBoxControl
☰	CheckedListBoxControl
▤	ComboBoxControl
▦	DateTimePickerControl
▤	ListBoxControl
▦	MonthCalendarControl
◉	RadioButtonControl
▭	TextBoxControl

Filter operations

By default FastReport filters the data rows, which contain the value, equal to the value of the control. This behavior is defined in the "FilterOperation" property of the control. You can use the following operations:

Operation	Equivalent	Effect
Equal	=	Filter the value if it is equal to the control's value.
NotEqual	<>	Filter the value if it is not equal to the control's value.
LessThan	<	Filter the value if it is less than the control's value.
LessThanOrEqual	<=	Filter the value if it is less than or equal to the control's value.
GreaterThan	>	Filter the value if it is greater than the control's value.
GreaterThanOrEqual	>=	Filter the value if it is greater than or equal to the control's value.

For example, if the "FilterOperation" property of the control is set to "LessThanOrEqual" and you enter the value 5 in the control, then all the data rows will be chosen, for which the corresponding column value is less than or equal to 5.

For the data of "string" type, you can use extra operations:

Operation	Effect
Contains	Filter the value if it contains the control's value.
NotContains	Filter the value if it does not contain the control's value.
StartsWith	Filter the value if it starts with the control's value.
NotStartsWith	Filter the value if it does not start with the control's value.
EndsWith	Filter the value if it ends with the control's value.
NotEndsWith	Filter the value if it does not end with the control's value.

For example, if the "FilterOperation" property of the control is set to "StartsWith" and you enter the "A", then, all data rows whose corresponding data column's value starts with "A", will be chosen.

Filtering on data range

This method of filtering is comfortable for using when working with values, having a quantitative characteristic, for example, the cost. You can filter goods, having the cost less than or more than the given. In order to indicate, how to interpret the value entered in the element, use the "FilterOperation" property, looked at above.

Using two controls, which are connected to the same data column and have got different settings of the "FilterOperation" property, you can indicate the beginning and the ending of the data range. For the first control, you need to indicate the FilterOperation = GreaterThanOrEqual, for the second - LessThanOrEqual.

Filtering on related data column

As we know, between two data sources, a relation can be set. With the help of relation, it is possible to filter data in the source, by using a data column from a different source.

Assuming, you have placed on the dialogue a ListBoxControl and indicated the following data column in the "DataColumn" property:

```
Products.Categories.CategoryName
```

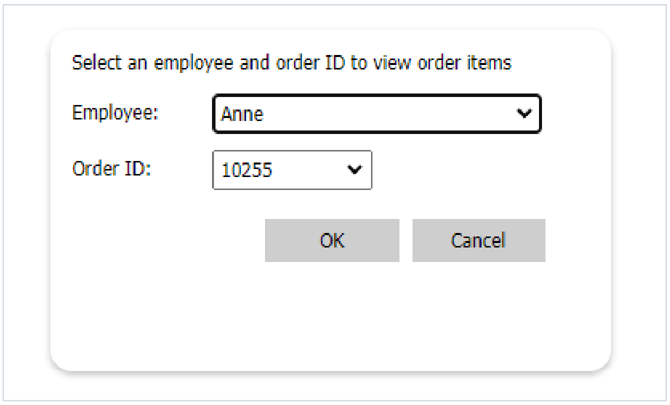
How will filtering work?

- when filling the control with values, the "CategoryName" column from the "Categories" data source will be used;
- the filter will be applied to the "Products" table. Those data rows will be filtered for which the following condition is correct:

```
the [Products.Categories.CategoryName] contains one of the values, selected by the user
```

Filtering with cascading lists

A cascading list is a list with choices that change based on the value a user selects in another list. For example, you have two lists on a form - one with categories, another one with products. When you choose a category in the first list, you will see in the second list the products in a chosen category.



Select an employee and order ID to view order items

Employee: Anne

Order ID: 10255

To create a cascading list, you need to use two data sources with master-detail relation between them. Attach the master list to a column in the master data source; attach the detail list to a column in the detail data source. Also set the master list's "DetailControl" property to the detail list.

Controlling the filtering from the code

Even if automatic filtering is enough for many cases, you have the possibility of managing it manually. For this, the following methods and properties are used.

The "AutoFill" property controls the filling of controls with data. It is used by controls, which can show a list of values, for example, the ListBoxControl. Before showing a dialogue, FastReport fills such controls with data. By default, the property is set to true. If it is disabled, the control will not be filled, and you must do it yourself, by calling the "FillData" method:

```
ListBox1.FillData();
```

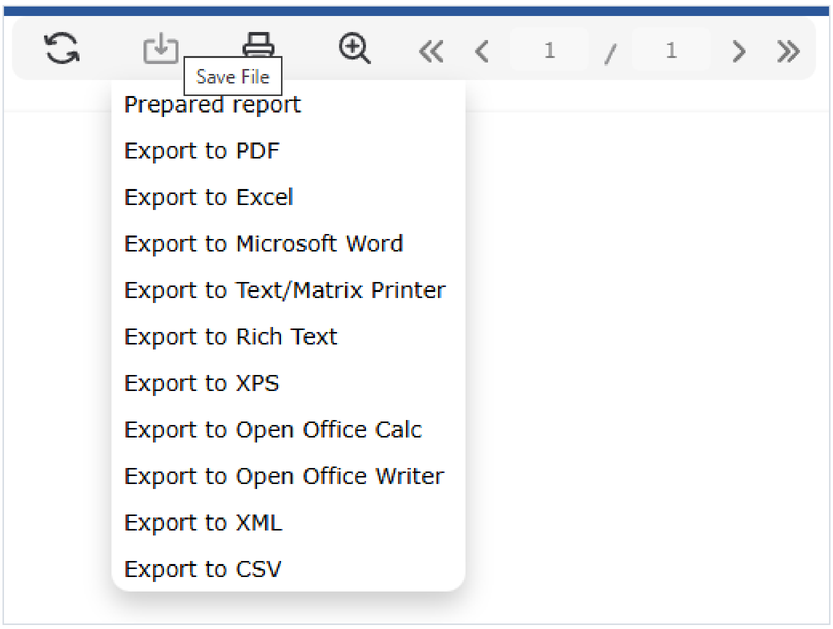
The "AutoFilter" property controls the data filtering. It is used by all controls. After the dialogue has been closed by the "OK" button, FastReport applies data filter automatically. By default, the property is set to true. If it is disabled, the filtering will not happen, and you must do it yourself, by calling the "FilterData" method:

```
ListBox1.FilterData();
```

Export

Rendered report can be saved in one of formats: a file prepared report (fpx), Adobe Acrobat (PDF), Microsoft Word 2007, Excel 2007, PowerPoint 2007, TXT, RTF, Microsoft XPS, OpenOffice Calc, OpenOffice Writer, MHT, HTML, Excel, XML, DBF table, CSV.

To select the export format, run the report in preview mode, hover the mouse pointer over the floppy icon, and select one of the formats in the drop-down list:



After that, the standard Windows file saving dialogue will be shown.

Also, you can print a report in preview mode. To do this, click on the printer icon in the toolbar. This opens the standard Windows printing dialogue.

Saving in FPX format

FPX format is FastReport's "native" format. The advantages of this format are as follows:

- saving the report without losing the quality. Opening an already saved file, you can do all operations with it, like print, export, editing;
- compact format based on XML, compressed with the help of ZIP;
- when needed, the report file can be unpacked by any archiver that supports the ZIP-format and corrected manually in any text editor.

The only thing lacking with the format is that, to view it, you need to have FastReport.Net.

In order to save in the FPX format, press the "Save" button in the preview window and choose the "Prepared report" file type.

Export to Adobe Acrobat (PDF)

PDF (Portable Document Format) is a platform-independent format of electronic documents created by Adobe Systems. The free Acrobat Reader package is used for viewing. This format is rather flexible – it allows the inclusion of necessary fonts, vector and bitmap images; it allows transferring and storage of documents intended for viewing and further printing.

Export method is a layered one.

Export to Excel 2007

MS Excel 2007, is an application for working with spreadsheets included in Microsoft Office 2007.

Export method: tabular.

Export to Microsoft Word 2007(DOCX)

A Microsoft Word 2007 - the text editor included in the package of the programs Microsoft Office 2007.

Export method: tabular.

Export to PowerPoint 2007

PowerPoint 2007 is an application for working with electronic presentations. It is included into Microsoft Office 2007.

Export method is a layered one.

Export to TXT

TXT is a regular text file that can be opened in any text editor, or printed to a dot-matrix printer.

Export method: tabular.

Export to RTF

RTF (Rich Text Format) was developed by Microsoft as a standard format for exchanging text information. At the moment RTF-documents are compatible with many new text editors and operation systems.

Export method: tabular.

Export to Microsoft XPS

XPS format is a graphics format fixed layout data based on XML. XPS file is similar to a file in PDF, but to describe the layout and metadata uses XML instead of PostScript. The advantage is a smaller file size compared to PDF.

Export method is a layered one.

Export to OpenOffice Calc

OpenDocument Format (ODF, OASIS Open Document Format for Office Application) was designed by OASIS and based on XML format used in OpenOffice.

FastReport supports export to table (.ods file). These files can be opened in OpenOffice.

Export method: tabular.

Export to OpenOffice Writer

OpenOffice Writer is a text processor open source from the OpenOffice Suite. Similar to Microsoft Office Word format. Has its own file format .odt.

The export method: tabular.

Export to MHT (web archive)

MHT, short for MIME HTML, is a web page archive format used to bind resources which are typically represented by external links (such as images, Flash animations, Java applets, audio files) together with HTML code into a single file. The content of an MHT file is encoded as if it were an HTML e-mail message, using the MIME type multipart/related.

Export method: tabular.

Export to Excel (XML)

Excel is an application for working with electronic worksheets. It is included into Microsoft Office.

Export method: tabular.

Export to DBF

The DBF format is designed for storing and transferring data. It is a standard way to store data in some DBMS. Also, supports a variety of tabular editors, such as Microsoft Excel.

The export method: tabular.

Export to CSV

The CSV file is used for the digital storage of data structured in a table of lists form. Each line in the CSV file corresponds to a row in the table. Within a line, fields are separated by commas, each field belonging to one table column. CSV files are often used for moving tabular data between two different computer programs, for example between a database program and a spreadsheet program.

Export method: tabular.