MATLAB Function Reference

Uicontrol Properties Modifying Properties

You can set and query graphics object properties in two ways:

- The <u>Property Inspector</u> is an interactive tool that enables you to see and change object property values. The Property inspector is available from GUIDE, or use the <u>inspect</u> function at the command line.
- The <u>set</u> and <u>get</u> commands enable you to set and query the values of properties

To change the default value of properties see<u>Setting Default Property Values</u>. You can also set default <u>uicontrol</u> properties on the root and figure levels:

```
set(0,'DefaultUicontrolProperty',PropertyValue...)
set(gcf,'DefaultUicontrolProperty',PropertyValue...)
```

where *Property* is the name of the <u>uicontrol</u> property whose default value you want to set and *PropertyValue* is the value you are specifying as the default. Use <u>set</u> and <u>get</u> to access <u>uicontrol</u> properties.

For information on using these uicontrols within GUIDE, the MATLAB GUI development environment, see

- <u>Setting Component Properties --- the Property Inspector</u>
- Programming Callbacks for GUI Components

Uicontrol Properties

This section lists all properties useful to <u>uicontrol</u> objects along with valid values and descriptions of their use. Curly braces {} enclose default values.

Property	Purpose
BackgroundColor	Object background color
BusyAction	Callback routine interruption
ButtonDownFcn	Button-press callback routine
<u>Callback</u>	Control action
<u>CData</u>	Truecolor image displayed on the control
<u>Children</u>	Uicontrol objects have no children
<u>CreateFcn</u>	Callback routine executed during object creation
DeleteFcn	Callback routine executed during object deletion
Enable	Enable or disable the <mark>uicontrol</mark>
FontAngle	Character slant
<u>FontName</u>	Font family



FontSize	Font size
<u>FontUnits</u>	Font size units
<u>FontWeight</u>	Weight of text characters
<u>ForegroundColor</u>	Color of text
<u>HandleVisibility</u>	Whether handle is accessible from command line and GUIs
<u>HitTest</u>	Whether selectable by mouse click
HorizontalAlignment	Alignment of label string
<u>Interruptible</u>	Callback routine interruption mode
<u>KeyPressFcn</u>	Key press callback routine
ListboxTop	Index of top-most string displayed in list box
Max	Maximum value (depends on uicontrol object)
Min	Minimum value (depends on uicontrol object)
Parent	Uicontrol object's parent
Position	Size and location of uicontrol object
<u>Selected</u>	Whether object is selected
<u>SelectionHighlight</u>	Object highlighted when selected
<u>SliderStep</u>	Slider step size
<u>String</u>	Uicontrol object label, also list box and pop-up menu items
<u>Style</u>	Type of uicontrol object
Tag	User-specified object identifier
<u>TooltipString</u>	Content of object's tooltip
<u>Type</u>	Class of graphics object
<u>UIContextMenu</u>	Uicontextmenu object associated with the uicontrol
<u>Units</u>	Units to interpret position vector
<u>UserData</u>	User-specified data
<u>Value</u>	Current value of uicontrol object
<u>Visible</u>	Uicontrol visibility

BackgroundColor

ColorSpec

Object background color. The color used to fill the <u>uicontrol</u> rectangle. Specify a color using a three–element RGB vector or one of the MATLAB predefined names. The default color is determined by system settings. See<u>ColorSpec</u> for more information on specifying color.

BusyAction

cancel | {queue}

Callback routine interruption. If a callback is executing and the user triggers an event (such as a mouse click) on an object for which a callback is defined, the callback associated with the new event uses the value of BusyAction to decide whether or not to attempt to interrupt the executing callback.

- If the value is cancel, the event is discarded and the second callback does not execute.
- If the value is queue, and the Interruptible property of the first callback is on, the second callback is added to the event queue and executes in its turn after the first callback finishes execution.

Note If the interrupting callback is a DeleteFcn or CreateFcn callback or a figure's CloseRequest Or ResizeFcn callback, it interrupts an executing callback regardless of the value of that object's Interruptible property. See the Interruptible property for information about controlling a callback's interruptibility.

ButtonDownFcn property) string or function handle (GUIDE sets this

Button–press callback routine. A callback routine that can execute when you press a mouse button while the pointer is on or near aucontrol. Specifically:

- If the uicontrol's Enable property is set to on, the ButtonDownFon callback executes when you click the right or left mouse button in a 5-pixel border around theuicontrol or when you click the right mouse button on the control itself.
- If the <u>uicontrol</u>'s Enable property is set to inactive or off, the ButtonDownFcn executes when you click the right or left mouse button in the 5-pixel border or on the control itself.

This is useful for implementing actions to interactively modify control object properties, such as size and position, when they are clicked on (using selectmoveresize, for example).

Define this routine as a string that is a valid MATLAB expression or the name of an M–file. The expression executes in the MATLAB workspace.

To add a ButtonDownFcn callback in GUIDE, select View Callbacks from the Layout Editor **View** menu, then select ButtonDownFcn. GUIDE sets this property to the appropriate string and adds the callback to the M-file the next time you save the GUI. Alternatively, you can set this property to the string %automatic. The next time you save the GUI, GUIDE sets this property to the appropriate string and adds to the M-file.

Use the Callback property to specify the callback routine that executes when you activate the enabled uicontrol (e.g., click on a push button).

Callback

string (GUIDE sets this property)

Control action. A routine that executes whenever you activate the uicontrol object (e.g., when you click on a push button or move a slider). Define this

routine as a string that is a valid MATLAB expression or the name of an M–file. The expression executes in the MATLAB workspace.

To execute the callback routine for an edit text control, type in the desired text and then do one of the following:

- Click another component, the menu bar, or the background of the GUI.
- For a single line editable text box, press Enter, or
- For a multiline editable text box, press Ctl+Enter.

Callback routines defined for static text do not execute because no action is associated with these objects.

CData

matrix

Truecolor image displayed on control A three–dimensional matrix of RGB values that defines a truecolor image displayed on either a push button or toggle button. Each value must be between 0.0 and 1.0.

Children matrix

The empty matrix; uicontrol objects have no children.

Clipping {on} | off

This property has no effect on uicontrols.

CreateFcn String

Callback routine executed during object creation The specified function executes when MATLAB creates auicontrol object. MATLAB sets all property values for the uiconrtol before executing the CreateFcn callback so these values are available to the callback. Within the function, usegcbo to get the handle of the uicontrol being created.

Setting this property on an existing uicontrol object has no effect.

You can define a defaultCreateFcn callback for all new uicontrols. This default applies unless you override it by specifying a differentCreateFcn callback when you call <u>uicontrol</u>. For example, the code

set(0,'DefaultUicontrolCreateFcn','set(gcbo,...
''BackgroundColor'',''white'')')

creates a default CreateFon callback that runs whenever you create a new uicontrol. It sets the default background color of all new uicontrols.

To override this default and create auicontrol whose BackgroundColor is set to a different value, call uicontrol with code similar to

```
hpt = uicontrol(...,'CreateFcn','set(gcbo,...
''BackgroundColor'','blue'')')
```

Note To override a defaultCreateFcn callback you must provide a new callback and not just provide different values for the specified properties. This is because theCreateFcn callback runs after the property values are set, and can override property values you have set explicitly in the uicontrol call. In the example above, if instead of redefining theCreateFcn property for this uicontrol, you had explicitly set BackgroundColor to blue, the defaultCreateFcn callback would have set BackgroundColor back to the default, i.e., white.

See <u>Function Handle Callbacks</u> for information on how to use function handles to define a callback function.

DeleteFcn String

Delete <u>uicontrol</u> callback routine. A callback routine that executes when you delete the <u>uicontrol</u> object (e.g., when you issue a<u>delete</u> command or clear the figure containing the <u>uicontrol</u>). MATLAB executes the routine before destroying the object's properties so these values are available to the callback routine.

The handle of the object whose DeleteFcn is being executed is accessible only through the root <u>CallbackObject</u> property, which you can query using<u>acbo</u>.

See <u>Function Handle Callbacks</u> for information on how to use function handles to define a callback function.

Enable

{on} | inactive | off

*Enable or disable the***uicontrol**. This property controls how uicontrols respond to mouse button clicks, including which callback routines execute.

- on The uicontrol is operational (the default).
- inactive The uicontrol is not operational, but looks the same as when Enable is on.
- off The uicontrol is not operational and its image (set by thecdata property) is grayed out.

When you left-click on a uicontrol whose Enable property is on, MATLAB performs these actions in this order:

- 1. Sets the figure's SelectionType property.
- 2. Executes the **uicontrol**'s ClickedCallback routine.
- 3. Does not set the figure's CurrentPoint property and does not execute either the control's ButtonDownFcn or the figure's WindowButtonDownFcn callback.

When you left-click on a uicontrol whose Enable property is off, or when you right-click a uicontrol whose Enable property has any value, MATLAB performs these actions in this order:

- 1. Sets the figure's SelectionType property.
- 2. Sets the figure's CurrentPoint property.
- 3. Executes the figure's WindowButtonDownFcn callback.

Extent

position rectangle (read only)

Size of uicontrol character string. A four–element vector that defines the size and position of the character string used to label the uicontrol. It has the form:

[0,0,width,height]

The first two elements are always zero.width and height are the dimensions of the rectangle. All measurements are in units specified by the Units property.

Since the Extent property is defined in the same units as the uicontrol itself, you can use this property to determine proper sizing for the uicontrol with regard to its label. Do this by

- Defining the string property and selecting the font using the relevant properties.
- Getting the value of the Extent property.
- Defining the width and height of the Position property to be somewhat larger than the width and height of the Extent.

For multiline strings, the Extent rectangle encompasses all the lines of text. For single line strings, the Extent is returned as a single line, even if the string wraps when displayed on the control.

FontAngle

{normal} | italic | oblique

Character slant MATLAB uses this property to select a font from those available on your particular system. Setting this property toitalic or oblique selects a slanted version of the font, when it is available on your system.

FontName

string

Font family. The name of the font in which to display the String. To display and print properly, this must be a font that your system supports. The default font is system dependent.

To use a fixed-width font that looks good in any locale (and displays properly in Japan, where multibyte character sets are used), seFontName to the string FixedWidth (this string value is case sensitive):

set(uicontrol_handle, 'FontName', 'FixedWidth')

This parameter value eliminates the need to hard code the name of a fixed-width font, which may not display text properly on systems that do not use ASCII character encoding (such as in Japan). A properly written MATLAB application that needs to use a fixed-width font should setFontName to FixedWidth and rely on the rootFixedWidthFontName property to be set correctly in the end user's environment.

End users can adapt a MATLAB application to different locales or personal environments by setting the root FixedWidthFontName property to the appropriate value for that locale fromstartup.m. Setting the root FixedWidthFontName property causes an immediate update of the display to use the new font.

FontSize

size in FontUnits

Font size. A number specifying the size of the font in which to display the

String, in units determined by the FontUnits property. The default point size is system dependent.

FontUnits	{points}	normalized	inches
	centimeter	s pixels	

Font size units. This property determines the units used by theFontSize property. Normalized units interpret FontSize as a fraction of the height of the uicontrol. When you resize the uicontrol, MATLAB modifies the screen FontSize accordingly. pixels, inches, centimeters, and points are absolute units (1 point = 1/72 inch).

FontWeight	light	{normal}	demi	bold
------------	-------	----------	------	------

Weight of text characters MATLAB uses this property to select a font from those available on your particular system. Setting this property tobold causes MATLAB to use a bold version of the font, when it is available on your system.

```
ForegroundColor
```

<u>ColorSpec</u>

Color of text. This property determines the color of the text defined for the String property (the uicontrol label). Specify a color using a three–element RGB vector or one of MATLAB 's predefined names. The default text color is black. See <u>ColorSpec</u> for more information on specifying color.

HandleVisibility {on} | callback | off

Control access to object's handle. This property determines when an object's handle is visible in its parent's list of children. When a handle is not visible in its parent's list of children, it is not returned by functions that obtain handles by searching the object hierarchy or querying handle properties. This includesret, <u>findobj</u>, <u>gca</u>, <u>gcf</u>, <u>gco</u>, <u>newplot</u>, <u>cla</u>, <u>clf</u>, and <u>close</u>. Neither is the handle visible in the parent figure's <u>CurrentObject</u> property. Handles that are hidden are still valid. If you know an object's handle, you can <u>set</u> and <u>get</u> its properties, and pass it to any function that operates on handles.

- Handles are always visible when HandleVisibility is on.
- Setting HandleVisibility to callback causes handles to be visible from within callback routines or functions invoked by callback routines, but not from within functions invoked from the command line. This provides a means to protect GUIs from command-line users, while allowing callback routines to have complete access to object handles.
- Setting HandleVisibility to off makes handles invisible at all times. This may be necessary when a callback routine invokes a function that might potentially damage the GUI (such as evaluating a user-typed string), and so temporarily hides its own handles during the execution of that function.

You can set the root <u>ShowHiddenHandles</u> property to on to make all handles visible, regardless of theirHandleVisibility settings. This does not affect the values of the HandleVisibility properties.

Note Radio buttons and toggle buttons that are managed by a uibuttongroup should not be accessed outside the button group. Set the HandleVisibility of such radio buttons and toggle buttons to off to prevent inadvertent access.

HitTest	on	}	off

Selectable by mouse click. This property has no effect on uicontrol objects.

HorizontalAlignment left | {center} | right

Horizontal alignment of label string This property determines the justification of the text defined for the string property (the uicontrol label):

- left -- Text is left justified with respect to the uicontrol.
- center -- Text is centered with respect to the uicontrol.
- right -- Text is right justified with respect to the uicontrol.

On Microsoft Windows systems, this property affects only ${\tt edit}$ and ${\tt text}$ uicontrols.

Interruptible {on} | off

Callback routine interruption mode If a callback is executing and the user triggers an event (such as a mouse click) on an object for which a callback is defined, that callback attempts to interrupt the first callback. MATLAB processes the callbacks according to these factors:

- The Interruptible property of the object whose callback is executing
- Whether the executing callback contains drawnow, figure, getframe, pause, OF waitfor statements
- The <u>BusyAction</u> property of the object whose callback is waiting to execute

If the Interruptible property of the object whose callback is executing is on (the default), the callback can be interrupted. Whenever the callback calls one of the drawnow, figure, getframe, pause, or waitfor functions, the function processes any events in the event queue, including the waiting callback, before performing its defined task.

If the Interruptible property of the object whose callback is executing is off, the callback cannot be interrupted (except by certain callbacks; see the note below). The BusyAction property of the object whose callback is waiting to execute determines what happens to the callback.

Note If the interrupting callback is a DeleteFcn Or CreateFcn callback or a figure's CloseRequest Or ResizeFcn callback, it interrupts an executing callback regardless of the value of that object's Interruptible property. The interrupting callback starts execution at the next drawnow, figure, getframe, pause, Or waitfor statement. A figure's WindowButtonDownFcn callback routine, or an object's ButtonDownFcn Or Callback routine are processed according to the rules described above.

KeyPressFcn

string or function handle

Key press callback function. A callback routine invoked by a key press when the callback's <u>uicontrol</u> object has focus. Focus is denoted by a border or a dotted border, respectively, in UNIX and Microsoft Windows. If no<u>uicontrol</u> has focus, the figure's key press callback function, if any, is invoked. KeyPressFcn can be a function handle, the name of an M–file, or any legal MATLAB expression.

If the specified value is the name of an M–file, the callback routine can query the figure's <u>CurrentCharacter</u> property to determine what particular key was pressed and thereby limit the callback execution to specific keys.

information about the key that was pressed from its event data structure argument.

If the specified value is a function handle, the callback routine can retrieve

Event Data	Description	Examples:			
Structure Field		а	=	Shift	Shift/a
Character	Character interpretation of the key that was pressed.	'a'	' = '	, ,	'A'
Modifier	Current modifier, such as 'control', or an empty cell array if there is no modifier	{1x0 cell}	{1x0 cell}	{'shift'}	{'shift'}
Кеу	Name of the key that was pressed.	'a'	'equal'	'shift'	'a'

See <u>Function Handle Callbacks</u> for information on how to use function handles to define the callback function.

ListboxTop

scalar

Index of top-most string displayed in list box. This property applies only to the listbox style of uicontrol. It specifies which string appears in the top-most position in a list box that is not large enough to display all list entries. ListboxTop is an index into the array of strings defined by thestring property and must have a value between 1 and the number of strings. Noninteger values are fixed to the next lowest integer.

Max

scalar

Maximum value. This property specifies the largest value allowed for thevalue property. Different styles of uicontrols interpretMax differently:

• Check boxes – Max is the setting of the Value property while the check box is selected.

- Editable text If Max Min > 1, then editable text boxes accept multiline input. If $Max Min \le 1$, then editable text boxes accept only single line input.
- \bullet List boxes If ${\tt Max}$ ${\tt Min}$ > 1, then list boxes allow multiple item selection. If
 - $Max Min \le 1$, then list boxes do not allow multiple item selection.
- Radio buttons Max is the setting of the Value property when the radio button is selected.
- Sliders Max is the maximum slider value and must be greater than the Min property. The default is 1.
- Toggle buttons Max is the value of the Value property when the toggle button is selected. The default is 1.
- Pop-up menus, push buttons, and static text do not use the Max property.

Min

scalar

Minimum value. This property specifies the smallest value allowed for thevalue property. Different styles of uicontrols interpretMin differently:

- Check boxes Min is the setting of the Value property while the check box is not selected.
- Editable text If Max Min > 1, then editable text boxes accept multiline input. If Max Min <= 1, then editable text boxes accept only single line input.
- List boxes If ${\tt Max}$ ${\tt Min}$ > 1, then list boxes allow multiple item selection. If

 $Max - Min \le 1$, then list boxes allow only single item selection.

- Radio buttons Min is the setting of the Value property when the radio button is not selected.
- \bullet Sliders Min is the minimum slider value and must be less than Max. The default is 0.
- Toggle buttons Min is the value of the Value property when the toggle button is not selected. The default is 0.
- Pop-up menus, push buttons, and static text do not use the Min property.

Parent

handle

Uicontrol parent The handle of the uicontrol's parent object. You can move a uicontrol object to another figure, uipanel, or uibuttongroup by setting this property to the handle of the new parent.

Position

position rectangle

Size and location of <u>uicontrol</u>. The rectangle defined by this property specifies the size and location of the control within the parent figure window, uipanel, or uibuttongroup. Specify Position as

[left bottom width height]

left and bottom are the distance from the lower-left corner of the parent object to the lower-left corner of the uicontrol object. width and height are the dimensions of the uicontrol rectangle. All measurements are in units specified by the Units property.

On Microsoft Windows systems, the height of pop-up menus is automatically determined by the size of the font. The value you specify for the height of the Position property has no effect.

The width and height values determine the orientation of sliders. If width is greater than height, then the slider is oriented horizontally, If height is greater than width, then the slider is oriented vertically.

```
Selected on | {off} (read only)
```

Is object selected. When this property is on, MATLAB displays selection handles if the SelectionHighlight property is also on. You can, for example, define the ButtonDownFcn to set this property, allowing users to select the object with the mouse.

SelectionHighlight {on} | off

Object highlight when selected When the selected property is on, MATLAB indicates the selected state by drawing four edge handles and four corner handles. When SelectionHighlight is off, MATLAB does not draw the handles.

SliderStep

[min_step max_step]

Slider step size. This property controls the amount the slidervalue changes when you click the mouse on the arrow button (min_step) or on the slider trough (max_step) . Specify sliderstep as a two-element vector; each value must be in the range [0, 1]. The actual step size is a function of the specified sliderstep and the total slider range (Max - Min). The default, [0.01 0.10], provides a 1 percent change for clicks on the arrow button and a 10 percent change for clicks in the trough.

For example, if you create the following slider,

```
uicontrol('Style','slider','Min',1,'Max',7,...
'SliderStep',[0.1 0.6])
```

clicking on the arrow button moves the indicator by,

0.1*(7-1) ans = 0.6000

and clicking in the trough moves the indicator by,

```
0.6*(7-1)
ans =
3.6000
```

Note that if the specified step size moves the slider to a value outside the range, the indicator moves only to the Max or Min value.

See also the Max, Min, and Value properties.

String

string

Uicontrol label, list box items, pop-up menu choices. For check boxes, editable text, push buttons, radio buttons, static text, and toggle buttons the text displayed on the object. For list boxes and pop-up menus, the set of entries or items displayed in the object.

For **uicontrol** objects that display only one line of text if the string value is specified as a cell array of strings or padded string matrix, only the first string of a cell array or of a padded string matrix is displayed; the rest are ignored. Vertical slash ('|') characters are not interpreted as line breaks and instead show up in the text displayed in the uicontrol.

For multiple line editable text or static text controls line breaks occur between each row of the string matrix, each cell of a cell array of strings, and after any n characters embedded in the string. Vertical slash ('l') characters are not interpreted as line breaks, and instead show up in the text displayed in the uicontrol.

For multiple items on a list box or pop-up menu you can specify items as a cell array of strings, a padded string matrix, or within a string vector separated by vertical slash ('|') characters. Use the value property to set the index of the initial item selected.

For **check boxes**, **push buttons**, **radio buttons**, **toggle buttons**, and the selected item in **popup menus**, when the specified text is clipped because it is too long for the **uicontrol**, an ellipsis (...) is appended to the text in the active GUI to indicate that it has been clipped.

For **editable text**, this property value is set to the string entered by the user.

Setting the String Property to a Reserved Word

To set the String property to one of the reserved wordsdefault, remove, or factory, you must precede the word with the backslash character. For example,

h = uicontrol('Style','edit','String','\default');

For more information see<u>Setting Default Values</u> in the MATLAB documentation.

Style radiobutton	{pushbutton} togglebutton		
frame	checkbox edit text slider		
	listbox popupmenu		

Style of <u>uicontrol</u> object to create. The style property specifies the kind of uicontrol to create. See the <u>uicontrol</u> <u>Description</u> section for information on each type.

Tag

string (GUIDE sets this property)

User-specified object label. The Tag property provides a means to identify graphics objects with a user-specified label. This is particularly useful when constructing interactive graphics programs that would otherwise need to define object handles as global variables or pass them as arguments between callback routines. You can define Tag as any string.

TooltipString

string

Content of tooltip for object. The TooltipString property specifies the text of the tooltip associated with the uicontrol. When the user moves the mouse pointer over the control and leaves it there, the tooltip is displayed.

Туре

string (read only)

Class of graphics object. For uicontrol objects, Type is always the string 'uicontrol'.

UIContextMenu handle

Associate a context menu with <u>uicontrol</u>. Assign this property the handle of a uicontextmenu object. MATLAB displays the context menu whenever you right-click over the <u>uicontrol</u>. Use the <u>uicontextmenu</u> function to create the context menu.

Units {pixels} | normalized | inches | centimeters | points | characters (GUIDE default:normalized)

Units of measurement MATLAB uses these units to interpret theExtent and Position properties. All units are measured from the lower-left corner of the parent object.

- Normalized units map the lower-left corner of the parent object to (0,0) and the upper-right corner to (1.0,1.0).
- pixels, inches, centimeters, and points are absolute units (1 point = 1/72 inch).
- Character units are characters using the default system font; the width of one character is the width of the letter x, the height of one character is the distance between the baselines of two lines of text.

If you change the value of Units, it is good practice to return it to its default value after completing your computation so as not to affect other functions that assume Units is set to the default value.

UserData

matrix

User–specified data. Any data you want to associate with the **uicontrol** object. MATLAB does not use this data, but you can access it using <u>set</u> and <u>get</u>.

Value

scalar or vector

Current value of uicontrol. The uicontrol style determines the possible values this property can have:

- Check boxes set Value to Max when they are on (when selected) and Min when off (not selected).
- List boxes set value to a vector of indices corresponding to the selected list entries, where 1 corresponds to the first item in the list.
- Pop-up menus set value to the index of the item selected, where 1 corresponds to the first item in the menu. The <u>Examples section</u> shows how to use the value property to determine which item has been selected.

- Radio buttons set Value to Max when they are on (when selected) and Min when off (not selected).
- Sliders set Value to the number indicated by the slider bar.
- Toggle buttons set Value to Max when they are down (selected) and Min when up (not selected).
- Editable text, push buttons, and static text do not set this property.

Set the value property either interactively with the mouse or through a call to the set function. The display reflects changes made tovalue.

Visible

{on} | off

Uicontrol visibility. By default, all uicontrols are visible. When set tooff, the uicontrol is not visible, but still exists and you can query and set its properties.

Note Setting Visible to off for uicontrols that are not displayed initially in the GUI, can result in faster startup time for the GUI.

uicontrol

uigetdir 🔶

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