



## Lines and boxes

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## Introduction

Lines and boxes are only available in v4 and higher versions of Pine Script™. They are useful to draw support and resistance levels, trend lines, price ranges. Multiple small line segments are also useful to draw complex geometric forms.

The flexibility lines and boxes allow in their positioning mechanism makes them particularly well-suited to drawing objects at points in the past that are detected a variable number of bars after the fact.

Lines and boxes are objects, like [labels](#) and [tables](#). Like them, they are referred to using an ID, which acts like a pointer. Line IDs are of “line” type, and box IDs are of “box” type. As with other Pine Script™ objects, lines and box IDs are “time series” and all the functions used to manage them accept “series” arguments, which makes them very

flexible.

## Note

On TradingView charts, a complete set of *Drawing Tools* allows users to create and modify drawings using mouse actions. While they may sometimes look similar to drawing objects created with Pine Script™ code, they are unrelated entities. Lines and boxes created using Pine Script™ code cannot be modified with mouse actions, and



Lines can be horizontal or at an angle, while boxes are always rectangular. Both share many common characteristics:

- They can start and end from any point on the chart, including the future.
- The functions used to manage them can be placed in conditional or loop structures, making it easier to control their behavior.
- They can be extended to infinity, left or right of their anchoring coordinates.
- Their attributes can be changed during the script's execution.
- The x coordinates used to position them can be expressed as a bar index or a time value.
- In the x coordinate, they start and stop on the middle of the bar.
- Different pre-defined styles can be used for line patterns and end points, and box borders.
- A maximum of 500 of each can be drawn on the chart at any given time. The default is ~50, but you can use the `max_lines_count` and `max_boxes_count` parameters in your `indicator()` or `strategy()` declaration statement to specify up to 500. Lines and boxes, like labels, are managed using a garbage collection mechanism which deletes the oldest ones on the chart, such that only the most recently displayed are visible.

This script draws both lines and boxes:



```

//@version=5
indicator("Opening bar's range", "", true)
string tfInput = input.timeframe("D", "Timeframe")
// Initialize variables on bar zero only, so they preserve their values across bars.
var hi = float(na)
var lo = float(na)
var line hiLine = na
var line loLine = na
var box hiLoBox = na
// Detect changes in timeframe.
bool newTF = ta.change(time(tfInput))
if newTF
    // New bar in higher timeframe; reset values and create new lines and box.
    hi := high
    lo := low
    hiLine := line.new(bar_index - 1, hi, bar_index, hi, color = color.green, width = 1)
    loLine := line.new(bar_index - 1, lo, bar_index, lo, color = color.red, width = 2)
    hiLoBox := box.new(bar_index - 1, hi, bar_index, lo, border_color = na, bgcolor = color.silver)
else
    // On other bars, extend the right coordinate of lines and box.
    line.set_x2(hiLine, bar_index)
    line.set_x2(loLine, bar_index)
    box.set_right(hiLoBox, bar_index)
    // Change the color of the boxes' background depending on whether high/low is higher/lower.
    boxColor = high > hi ? color.green : low < lo ? color.red : color.silver
    box.set_bgcolor(hiLoBox, color.new(boxColor, 50))
    int(na)

```

Note that:

- We are detecting the first bar of a user-defined higher timeframe and saving its **high** and **low** values.
- We draw the **hi** and **low** levels using one line for each.
- We fill the space in between with a box.
- Every time we create two new lines and a box, we save their ID in variables **hiLine**, **loLine** and **hiLoBox**, which we then use in the calls to the setter functions to prolong these objects as new bars come in during the higher timeframe.
- We change the color of the boxes' background ( **boxColor** ) using the position of the bar's **high** and **low** with relative to the opening bar's same values. This entails that our script is repainting, as the boxes' color on past bars will change, depending on the current bar's values.
- We artificially make the return type of both branches of our **if** structure **int(na)** so the compiler doesn't complain about them not returning the same type. This occurs because **box.new()** in the first branch returns a result of type "box", while **box.set\_bgcolor()** in the second branch returns type "void". See the [Matching local block type requirement](#) section for more information.

## Lines

Lines are managed using built-in functions in the **line** namespace. They include:

- **line.new()** to create them.
- **line.set\_\*()** functions to modify the properties of an line.
- **line.get\_\*()** functions to read the properties of an existing line.
- **line.copy()** to clone them.
- **line.delete()** to delete them.
- The **line.all** array which always contains the IDs of all the visible lines on the chart. The array's size will depend on the maximum line count for your script and how many of those you have drawn. **array.size(line.all)** will return the array's size.

# Creating lines

The `line.new()` function creates a new line. It has the following signature:

```
line.new(x1, y1, x2, y2, xloc, extend, color, style, width) → series line
```

Lines are positioned on the chart according to x (bars) and y (price) coordinates. Five parameters affect this behavior:

`x1`, `y1`, `x2`, `y2` and `xloc`:

## `x1` and `x2`

They are the x coordinates of the line's start and end points. They are either a bar index or a time value, as determined by the argument used for `xloc`. When a bar index is used, the value can be offset in the past (maximum of 5000 bars) or in the future (maximum of 500 bars). Past or future offsets can also be calculated when using time values. The `x1` and `x2` values of an existing line can be modified using `line.set_x1()`, `line.set_x2()`, `line.set_xy1()` or `line.set_xy2()`.

## `xloc`

Is either `xloc.bar_index` (the default) or `xloc.bar_time`. It determines which type of argument must be used with `x1` and `x2`. With `xloc.bar_index`, `x1` and `x2` must be absolute bar indices. With `xloc.bar_time`, `x1` and `x2` must be a UNIX timestamp in milliseconds corresponding to the `time` value of a bar's `open`. The `xloc` value of an existing line can be modified using `line.set_xloc()`.

## `y1` and `y2`

They are the y coordinates of the line's start and end points. While they are called price levels, they must be of values that make sense in the script's visual space. For an RSI indicator, they would typically be between 0 and 100, for example. When an indicator is running as an overlay, then the price scale will usually be that of the chart's symbol. The `y1` and `y2` values of an existing line can be modified using `line.set_y1()`, `line.set_y2()`, `line.set_xy1()` or `line.set_xy2()`.

The remaining four parameters in `line.new()` control the visual appearance of lines:

## `extend`

Determines if the line is extended past its coordinates. It can be `extend.none`, `extend.left`, `extend.right` or `extend.both`.

## `color`

Is the line's color.

## `style`

Is the style of line. See this page's [Line styles](#) section.

## `width`

Determines the width of the line in pixels.

This is how you can create lines in their simplest form. We connect the preceding bar's `high` to the current bar's `low`:

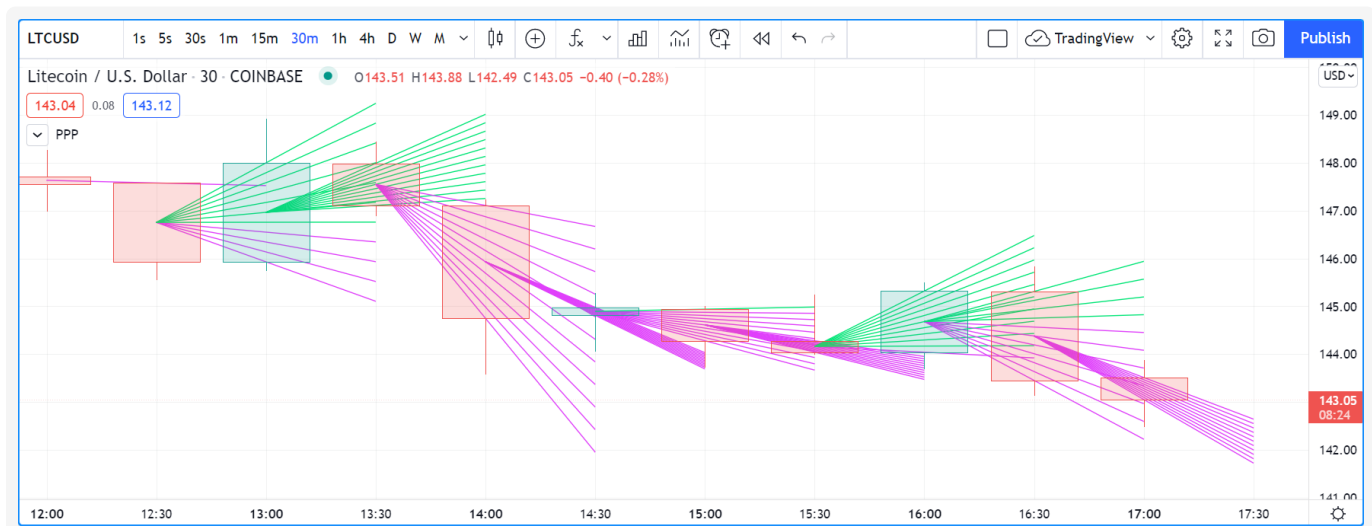


```
//@version=5
indicator("", "", true)
line.new(bar_index - 1, high[1], bar_index, low, width = 3)
```

Note that:

- We use a different `x1` and `x2` value: `bar_index - 1` and `bar_index`. This is necessary, otherwise no line would be created.
- We make the width of our line 3 pixels using `width = 3`.
- No logic controls our `line.new()` call, so lines are created on every bar.
- Only approximately the last 50 lines are shown because that is the default value for the `max_lines_count` parameter in `indicator()`, which we haven't specified.
- Lines persist on bars until your script deletes them using `line.delete()`, or garbage collection removes them.

In this next example, we use lines to create probable travel paths for price. We draw a user-selected quantity of lines from the previous bar's center point between its `close` and `open` values. The lines project one bar after the current bar, after having been distributed along the `close` and `open` range of the current bar:



```

//@version=5
indicator("Price path projection", "PPP", true, max_lines_count = 100)
qtyOfLinesInput = input.int(10, minval = 1)

y2Increment = (close - open) / qtyOfLinesInput
// Starting point of the fan in y.
lineY1 = math.avg(close[1], open[1])
// Loop creating the fan of lines on each bar.
for i = 0 to qtyOfLinesInput
    // End point in y if line stopped at current bar.
    lineY2 = open + (y2Increment * i)
    // Extrapolate necessary y position to the next bar because we extend lines one bar
    lineY2 := lineY2 + (lineY2 - lineY1)
    lineColor = lineY2 > lineY1 ? color.lime : color.fuchsia
    line.new(bar_index - 1, lineY1, bar_index + 1, lineY2, color = lineColor)

```

Note that:

- We are creating a set of lines from within a `for` structure.
- We use the default `xloc = xloc.bar_index`, so our `x1` and `x2` values are bar indices.
- We want to start lines on the previous bar, so we use `bar_index - 1` for `x1` and `bar_index + 1` for `x2`.
- We use a “series color” value (its value can change in any of the loop’s iterations) for the line’s color. When the line is going up we make it lime; if not we make it fuchsia.
- The script will repaint in realtime because it is using the `close` and `open` values of the realtime bar to calculate line projections. Once the realtime bar closes, the lines drawn on elapsed realtime bars will no longer update.
- We use `max_lines_count = 100` in our `indicator()` call to preserve the last 100 lines.

## Modifying lines

The `setter` functions allowing you to change a line’s properties are:

- `line.set_x1()`
- `line.set_y1()`
- `line.set_xy1()`
- `line.set_x2()`
- `line.set_y2()`
- `line.set_xy2()`
- `line.set_xloc()`
- `line.set_extend()`
- `line.set_color()`
- `line.set_style()`
- `line.set_width()`

They all have a similar signature. The one for `line.set_color()` is:

```
line.set_color(id, color) → void
```

where:

- `id` is the ID of the line whose property is to be modified.
- The next parameter is the property of the line to modify. It depends on the setter function used. `line.set_xy1()` and `line.set_xy2()` change two properties, so they have two such parameters.

In the next example we display a line showing the highest `high` value in the last `lookbackInput` bars. We will be using setter functions to modify an existing line:



```
//@version=5
MAX_BARS_BACK = 500
indicator("Last high", "", true, max_bars_back = MAX_BARS_BACK)

repaintInput = input.bool(false, "Position bars in the past")
lookbackInput = input.int(50, minval = 1, maxval = MAX_BARS_BACK)

// Keep track of highest `high` and detect when it changes.
hi = ta.highest(lookbackInput)
newHi = ta.change(hi)
// Find the offset to the highest `high` in last 50 bars. Change it's sign so it is pos
highestBarOffset = - ta.highestbars(lookbackInput)
// Create label on bar zero only.
var lbl = label.new(na, na, "", color = color(na), style = label.style_label_left)
var lin = line.new(na, na, na, na, xloc = xloc.bar_time, style = line.style_arrow_right)
// When a new high is found, move the label there and update its text and tooltip.
if newHi
    // Build line.
    lineX1 = time[highestBarOffset + 1]
    // Get the `high` value at that offset. Note that `highest(50)` would be equivalent
    // but it would require evaluation on every bar, prior to entry into this `if` stru
    lineY = high[highestBarOffset]
    // Determine line's starting point with user setting to plot in past or not.
    line.set_xy1(lin, repaintInput ? lineX1 : time[1], lineY)
    line.set_xy2(lin, repaintInput ? lineX1 : time, lineY)

    // Reposition label and display new high's value.
    label.set_xy(lbl, bar_index, lineY)
    label.set_text(lbl, str.tostring(lineY, format.mintick))
else
    // Update line's right end point and label to current bar's.
    line.set_x2(lin, time)
    label.set_x(lbl, bar_index)

// Show a blue dot when a new high is found.
plotchar(newHi, "newHighFound", "•", location.top, size = size.tiny)
```

Note that:







- We plot the line starting on the bar preceding the point where the new high is found. We draw the line from the preceding bar so that we see a one bar line when a new high is found.
- We only start the line in the past, from the actual highest point, when the user explicitly chooses to do so through the script's inputs. This gives the user control over the repainting behavior of the script. It also avoids

misleading traders into thinking that our script is prescient and can know in advance if a high point will still be the high point in the lookback period  $n$  bars later.

- We manage the historical buffer to avoid runtime errors when referring to bars too far away in the past. We do two things for this: we use the `max_bars_back` parameter in our `indicator()` call, and we cap the input for `lookbackInput` using `maxval` in our `input.int()` call. Rather than use the `500` literal in two places, we create a `MAX_BARS_BACK` constant for it.
- We create our line and label on the first bar only, using `var`. From that point on, we only need to update their properties, so we are moving the same line and label along, resetting their position and the label's text when a new high is found, and then only updating their x coordinates as new bars come in. We use the `line.set_xy1()` and `line.set_xy2()` functions when we find a new high, and `line.set_x2()` on other bars, to extend the line.
- We use time values for `x1` and `x2` because our `line.new()` call specifies `xloc = xloc.bar_time`.
- We use `style = line.style_arrow_right` in our `line.new()` call to display a right arrow line style.
- Even though our label's background is not visible, we use `style = label.style_label_left` in our `label.new()` call so that the price value is positioned to the right of the chart's last bar.
- To better visualize on which bars a new high is found, we plot a blue dot using `plotchar()`. Note that this does not necessarily entail the bar where it appears is the new highest value. While this may happen, a new highest value can also be calculated because a long-standing high has dropped off from the lookback length and been replaced by another high that may not be on the bar where the blue dot appears.
- Our chart cursor points to the bar with the highest value in the last 50 bars.
- When the user does not choose to plot in the past, our script does not repaint.

## Line styles

Various styles can be applied to lines with either the `line.new()` or `line.set_style()` functions:

Argument	Line			Argument	Line	
<code>line.style_solid</code>				<code>line.style_arrow_left</code>		
<code>line.style_dotted</code>				<code>line.style_arrow_right</code>		
<code>line.style_dashed</code>				<code>line.style_arrow_both</code>		

## Getting line properties

The following *getter* functions are available for lines:

- `line.get_price()`
- `line.get_x1()`
- `line.get_y1()`
- `line.get_x2()`
- `line.get_y2()`

The signature for `line.get_price()` is:

```
line.get_price(id, x) → series float
```

where:

- `id` is the line whose `x1` value is to be retrieved
- `x` is the bar index of the point on the line whose `y` coordinate is to be returned.

The last four functions all have a similar signature. The one for `line.get_x1()` is:



```
line.get_x1(id) → series int
```

where `id` is the ID of the line whose `x1` value is to be retrieved.

## Cloning lines

The `line.copy()` function is used to clone lines. Its syntax is:

```
line.copy(id) → void
```

## Deleting lines

The `line.delete()` function is used to delete lines. Its syntax is:

```
line.delete(id) → void
```

To keep only a user-defined quantity of lines on the chart, one could use code like this, where we are drawing a level every time RSI rises/falls for a user-defined quantity of consecutive bars:



```

//@version=5
int MAX_LINES_COUNT = 500
indicator("RSI levels", max_lines_count = MAX_LINES_COUNT)

int linesToKeepInput = input.int(10, minval = 1, maxval = MAX_LINES_COUNT)
int sensitivityInput = input.int(5, minval = 1)

float myRSI = ta.rsi(close, 20)
bool myRSIRises = ta.rising(myRSI, sensitivityInput)
bool myRSIFalls = ta.falling(myRSI, sensitivityInput)
if myRSIRises or myRSIFalls
    color lineColor = myRSIRises ? color.new(color.green, 70) : color.new(color.red, 70)
    line.new(bar_index, myRSI, bar_index + 1, myRSI, color = lineColor, width = 2)
    // Once the new line is created, delete the oldest one if we have too many.
    if array.size(line.all) > linesToKeepInput
        line.delete(array.get(line.all, 0))
    int(na)
else
    // Extend all visible lines.
    int lineNo = 0
    while lineNo < array.size(line.all)
        line.set_x2(array.get(line.all, lineNo), bar_index)
        lineNo += 1
    int(na)

plot(myRSI)
hline(50)
// Plot markers to show where our triggering conditions are `true`.
plotchar(myRSIRises, "myRSIRises", "⬆️", location.top, color.green, size = size.title)
plotchar(myRSIFalls, "myRSIFalls", "⬆️", location.bottom, color.red, size = size.title)

```

Note that:

- We define a `MAX_LINES_COUNT` constant to hold the maximum quantity of lines a script can accommodate. We use that value to set the `max_lines_count` parameter's value in our `indicator()` call, and also as the `maxval` value in our `input.int()` call, to cap the user value.
- We use the `myRSIRises` and `myRSIFalls` variables to hold the states determining when we create a new level. After that, we delete the oldest line in the `line.all` built-in array that is automatically maintained by the Pine Script™ runtime and contains the ID of all the visible lines drawn by our script. We use the `array.get()` function to retrieve the array element at index zero (the oldest visible line ID). We then use `line.delete()` to delete the line referenced by that ID.
- Again, we need to artificially return `int(na)` in both local blocks of our `if` structure so the compiler doesn't complain. See the [Matching local block type requirement](#) section for more information.
- This time, we mention the type of variables explicitly when we declare them, as in `float myRSI = ta.rsi(close, 20)`. The declarations are functionally redundant, but they can help make your intention clear to readers of your code – you being the one who will read it the most frequently.

## Boxes

Boxes are managed using built-in functions in the `box` namespace. They include:

- `box.new()` to create them.
- `box.set_*()` functions to modify the properties of a box.
- `box.get_*()` functions to read some of the properties of an existing box.
- `box.copy()` to clone them.
- `box.delete()` to delete them.
- The `box.all` array which always contains the IDs of all the visible boxes on the chart. The array's size will

depend on the maximum box count for your script and how many of those you have drawn.

`array.size(box.all)` will return the array's size.

## Creating boxes

The `box.new()` function creates a new line. It has the following signature:

```
box.new(left, top, right, bottom, border_color, border_width, border_style, extend, xloc,
```

Boxes are positioned on the chart according to x (bars) and y (price) coordinates. Five parameters affect this behavior: `left`, `top`, `right`, `bottom` and `xloc`:

### `left` and `right`

They are the x coordinates of the line's start and end points. They are either a bar index or a time value, as determined by the argument used for `xloc`. When a bar index is used, the value can be offset in the past (maximum of 5000 bars) or in the future (maximum of 500 bars). Past or future offsets can also be calculated when using time values. The `left` and `right` values of an existing line can be modified using `box.set_left()`, `box.set_right()`, `box.set_lefttop()` or `box.set_rightbottom()`.

### `xloc`

Is either `xloc.bar_index` (the default) or `xloc.bar_time`. It determines which type of argument must be used with `left` and `right`. With `xloc.bar_index`, `left` and `right` must be absolute bar indices. With `xloc.bar_time`, `left` and `right` must be a UNIX timestamp in milliseconds corresponding to a value between the bar's `time` (opening time) and `time_close` (closing time) values.

### `top` and `bottom`

They are the y coordinates of the boxes' top and bottom levels (boxes are always rectangular). While they are called price levels, they must be of values that make sense in the script's visual space. For an RSI indicator, they would typically be between 0 and 100, for example. When an indicator is running as an overlay, then the price scale will usually be that of the chart's symbol. The `top` and `bottom` values of an existing line can be modified using `box.set_top()`, `box.set_bottom()`, `box.set_lefttop()` or `box.set_rightbottom()`.

The remaining five parameters in `box.new()` control the visual appearance of boxes:

### `border_color`

Is the border's color. It defaults to `color.blue`.

### `border_width`

Determines the width of the border in pixels.

### `border_style`

Is the style of border. See this page's [Box styles](#) section.

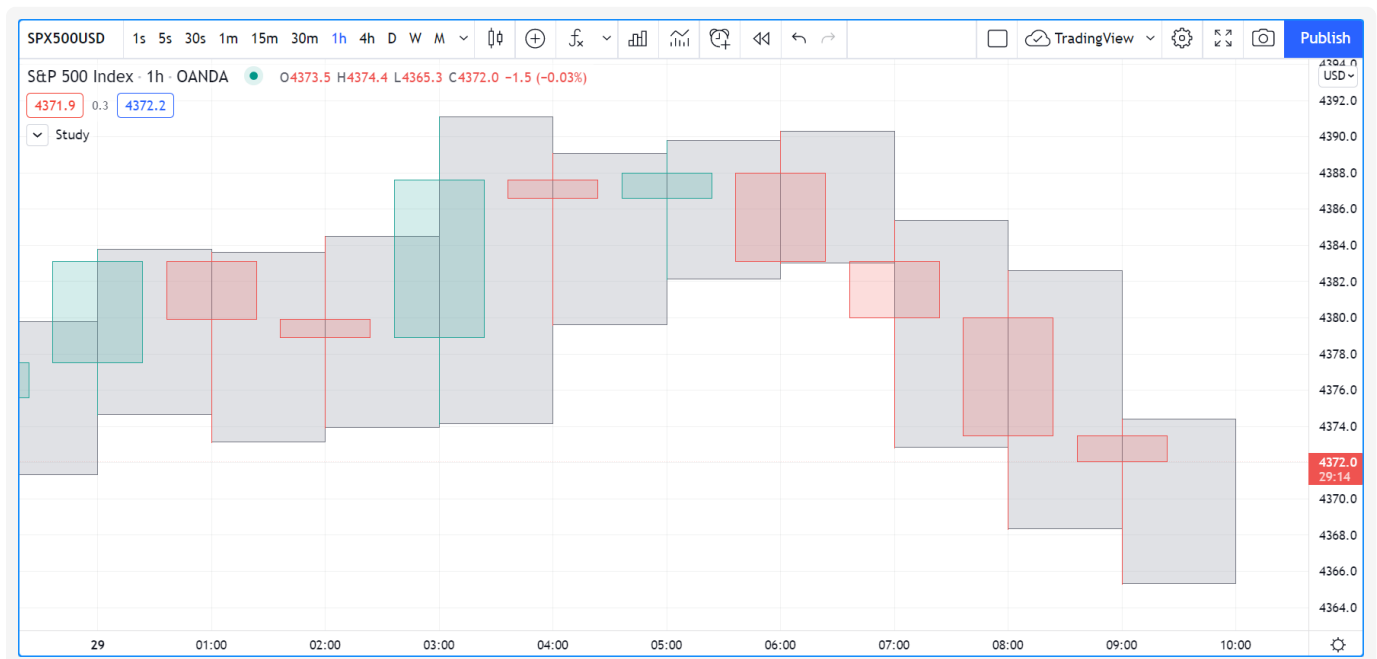
### `extend`

Determines if the borders is extended past the box's coordinates. It can be `extend.none`, `extend.left`, `extend.right` or `extend.both`.

### `bgcolor`

Is the background color of the box. It defaults to `color.blue`.

Let's create simple boxes:



```
//@version=5
indicator("", "", true)
box.new(bar_index, high, bar_index + 1, low, border_color = color.gray, bgcolor = color
```

Note that:

- The start and end points of boxes, like lines, are always the horizontal **center** of bars.
- We start these boxes at `bar_index` and end them on `bar_index + 1` (the following bar in the future) so that we get an actual box. If we used `bar_index` for both coordinates, only a vertical line would be drawn in the center of the bar.
- No logic controls our `box.new()` call, so boxes are created on every bar.
- Only approximately the last 50 boxes are shown because that is the default value for the `max_boxes_count` parameter in `indicator()`, which we haven't specified.
- Boxes persist on bars until your script deletes them using `box.delete()`, or garbage collection removes them.

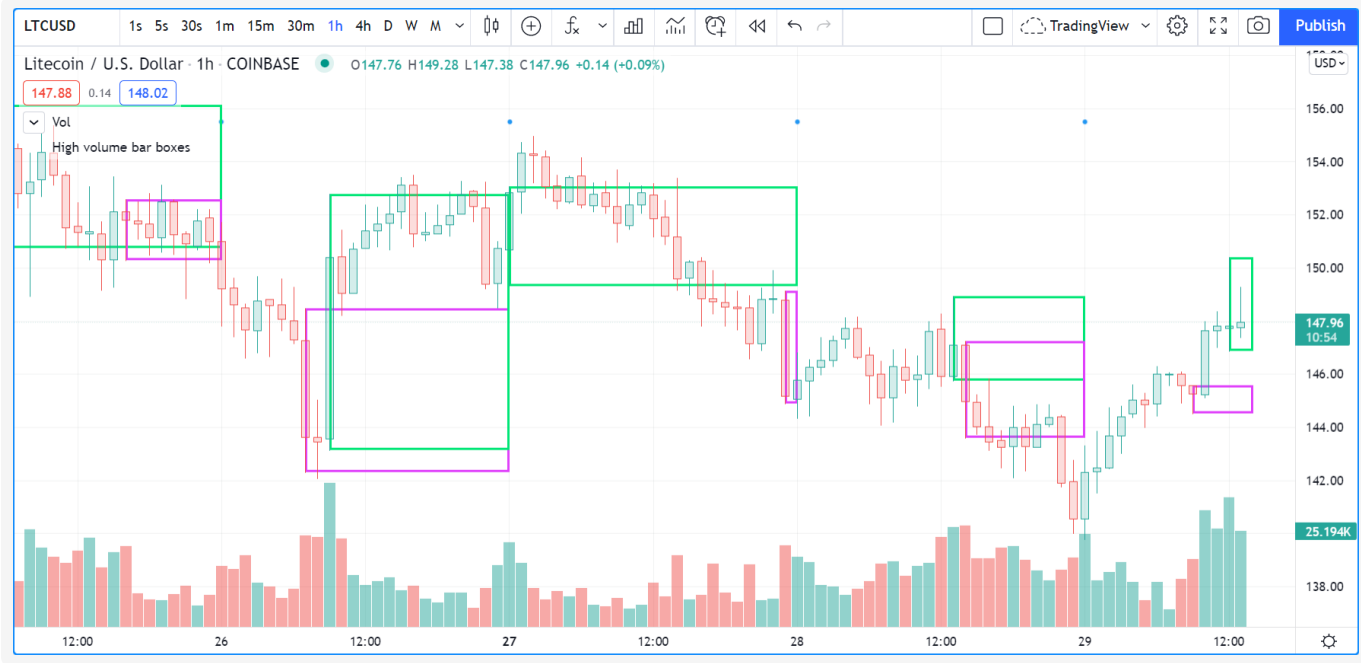
## Modifying boxes

The available *setter* functions for box drawings are:

- `box.set_left()`
- `box.set_top()`
- `box.set_lefttop()`
- `box.set_right()`
- `box.set_bottom()`
- `box.set_rightbottom()`
- `box.set_border_color()`
- `box.set_border_width()`
- `box.set_border_style()`
- `box.set_extend()`
- `box.set_bgcolor()`

Note that contrary to lines, there is no setter function to modify `xloc` for boxes.

This script uses setter functions to update boxes. It detects the largest up and down volume bars during a user-defined timeframe and draws boxes with the **high** and **low** levels of those bars. If a higher volume bar comes in, the timeframe's box is redrawn using the new bar's **high** and **low** levels:



```

//@version=5
indicator("High volume bar boxes", "", true)

string tfInput      = input.timeframe("D", "Resetting timeframe")
int   transpInput   = 100 - input.int(100, "Line Brightness", minval = 0, maxval = 100)
int   widthInput    = input.int(2, "Width", minval = 0, maxval = 100, step = 5, inline)
color upColorInput  = input.color(color.lime, "▲▲", inline = "1")
color dnColorInput  = input.color(color.fuchsia, "▼▼", inline = "1")

bool newTF = ta.change(time(tfInput))
bool barUp = close > open

// These keep track of highest up/dn volume found during the TF.
var float hiVolUp = na
var float hiVolDn = na
// These always hold the IDs of the current TFs boxes.
var box boxUp = na
var box boxDn = na

if newTF and not na(volume)
    // New TF begins; create new boxes, one of which will be invisible.
    if barUp
        hiVolUp := volume
        hiVolDn := na
        boxUp := box.new(bar_index, high, bar_index + 1, low, border_color = color.new(
        boxDn := box.new(na, na, na, na, border_color = color.new(dnColorInput, transp
    else
        hiVolDn := volume
        hiVolUp := na
        boxDn := box.new(bar_index, high, bar_index + 1, low, border_color = color.new(
        boxUp := box.new(na, na, na, na, border_color = color.new(upColorInput, transp
    int(na)
else
    // On bars during the HTF, keep tracks of highest up/dn volume bar.
    if barUp
        hiVolUp := math.max(nz(hiVolUp), volume)
    else
        hiVolDn := math.max(nz(hiVolDn), volume)
    // If a new bar has higher volume, reset its box.
    if hiVolUp > nz(hiVolUp[1])
        box.set_lefttop(boxUp, bar_index, high)
        box.set_rightbottom(boxUp, bar_index + 1, low)
    else if hiVolDn > nz(hiVolDn[1])
        box.set_lefttop(boxDn, bar_index, high)
        box.set_rightbottom(boxDn, bar_index + 1, low)
    int(na)

// On all bars, extend right side of both boxes.
box.set_right(boxUp, bar_index + 1)
box.set_right(boxDn, bar_index + 1)
// Plot circle mark on TF changes.
plotchar(newTF, "newTF", "•", location.top, size = size.tiny)

```

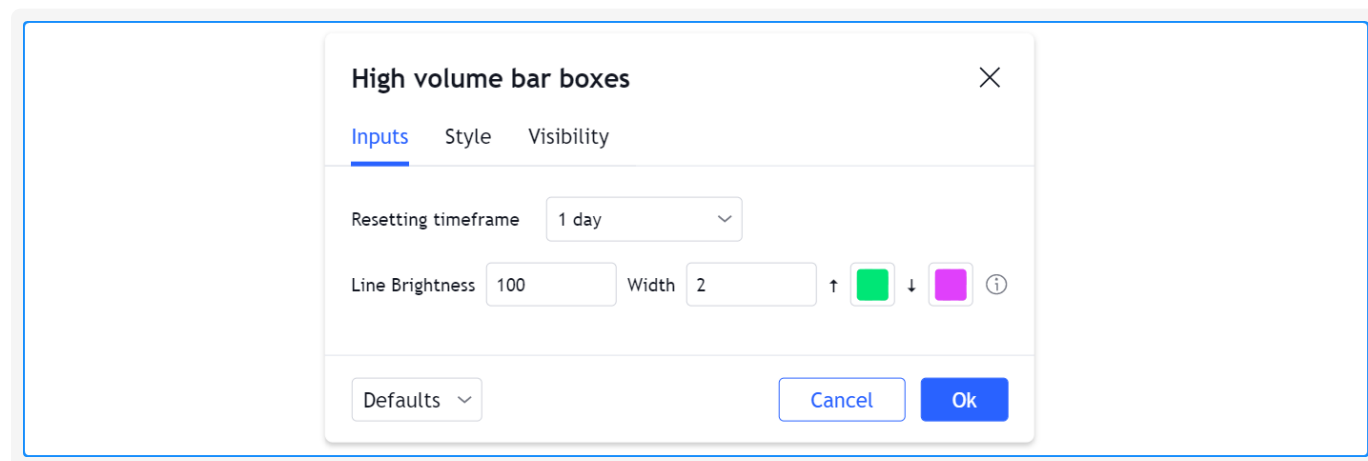
Note that:

- We use the `inline` parameter in the inputs relating to the boxes' visual appearance to place them on the same line.
- We subtract the 0-100 brightness level given by the user from 100 to generate the correct transparency for our box borders. We do this because it is more intuitive for users to specify a brightness level where 100 represents maximum brightness. We provide a tooltip to explain the scale.
- When a new higher timeframe bar comes in and the symbol's feed contains volume data, we reset our information. If the timeframe's first bar is up, we create a new visible `boxUp` box and an invisible `boxDn` box.

We do the inverse if the first bar’s polarity is down. We take care to reassign the IDs of the newly created boxes to `boxUp` and `boxUp` so we will be able to update those boxes later in the script. This is possible because we have declared those variables with `var`. See the section on the [var declaration mode](#) for more information.




- On all other chart bars belonging to the same higher timeframe bar, we monitor volume values to keep track of the highest. If a new higher volume bar is encountered, we reset the corresponding box’s coordinates on that new bar using `box.set_lefttop()` and `box.set_rightbottom()`.
- On all bars, we extend the right side of the timeframe’s two boxes using `box.set_right()`.
- Approximately the last 50 boxes will be visible on the chart because we do not use `max_boxes_count` in our `indicator()` call to change its default value.

This is our script’s “Settings/Inputs” tab:



## Box styles

Various styles can be applied to boxes with either the `box.new()` or `box.set_border_style()` functions:

Argument	Box	
<code>line.style_solid</code>		
<code>line.style_dotted</code>		
<code>line.style_dashed</code>		

## Getting box properties

The following *getter* functions are available for boxes:

- `box.get_bottom()`
- `box.get_left()`
- `box.get_right()`
- `box.get_top()`

The signature for `box.get_top()` is:

```
box.get_top(id) → series float
```

where `id` is the ID of the box whose `top` value is to be retrieved.

## Cloning boxes

The `box.copy()` function is used to clone boxes. Its syntax is:

```
box.copy(id) → void
```

## Deleting boxes

The `box.delete()` function is used to delete boxes. Its signature is:

```
box.delete(id) → void
```

## Realtime behavior

Lines and boxes are subject to both *commit* and *rollback* actions, which affect the behavior of a script when it executes in the realtime bar. See the page on Pine Script™'s [Execution model](#).

This script demonstrates the effect of rollback when running in the realtime bar:

```
//@version=5
indicator("My Script", overlay = true)
line.new(bar_index, high, bar_index, low, width = 6)
```

While `line.new()` creates a new line on every iteration of the script when price changes in the realtime bar, the most recent line created in the script's previous iteration is also automatically deleted because of the rollback before the next iteration. Only the last line created before the realtime bar's close will be committed, and will thus persist.

## Limitations

### Total number of objects

Lines and boxes consume server resources, which is why there is a limit to the total number of drawings per indicator or strategy. When too many are created, old ones are automatically deleted by the Pine Script™ runtime, in a process referred to as *garbage collection*.

This code creates a line on every bar:

```
//@version=5
indicator("", "", true)
line.new(bar_index, high, bar_index, low, width = 6)
```

Scrolling the chart left, one will see there are no lines after approximately 50 bars:





You can change the drawing limit to a value in range from 1 to 500 using the `max_lines_count` and `max_boxes_count` parameters in the `indicator()` or `strategy()` functions:

```
//@version=5
indicator("", "", true, max_lines_count = 100)
line.new(bar_index, high, bar_index, low, width = 6)
```

## Future references with `xloc.bar\_index`

Objects positioned using `xloc.bar_index` cannot be drawn further than 500 bars into the future.

## Additional securities

Lines and boxes cannot be managed in functions sent with `request.security()` calls. While they can use values fetched through `request.security()`, they must be drawn in the main symbol's context.

This is also the reason why line and box drawing code will not work in scripts using the `timeframe` parameter in `indicator()`.

## Historical buffer and `max\_bars\_back`

Use of `barstate.isrealtime` in combination with drawings may sometimes produce unexpected results. This code's intention, for example, is to ignore all historical bars and create a label drawing on the *realtime* bar:

```
//@version=5
indicator("My Script", overlay = true)

if barstate.isrealtime
    label.new(bar_index[300], na, text = "Label", yloc = yloc.abovebar)
```

It will, however, fail at runtime. The reason for the error is that Pine Script™ cannot determine the buffer size for historical values of the `time` plot, even though the `time` built-in variable isn't mentioned in the code. This is due to the fact that the built-in variable `bar_index` uses the `time` series in its inner workings. Accessing the value of the bar index 300 bars back requires that the history buffer size of the `time` series be of size 300 or more.

In Pine Script™, there is a mechanism that automatically detects the required historical buffer size for most cases. Autodetection works by letting Pine Script™ code access historical values any number of bars back for a limited duration. In this script's case, the `if barstate.isrealtime` condition prevents any such accesses to occur, so

the required historical buffer size cannot be inferred and the code fails.

The solution to this conundrum is to use the `max_bars_back` function to explicitly set the historical buffer size for the `time` series:

```
//@version=5
indicator("My Script", overlay = true)

max_bars_back(time, 300)

if barstate.isrealtime
    label.new(bar_index[300], na, text = "Label", yloc = yloc.abovebar)
```

Such occurrences are confusing, but rare. In time, the Pine Script™ team hopes to eliminate them.

## Examples

### Pivot Points Standard



```

//@version=5
indicator("Pivot Points Standard", overlay = true)
higherTFInput = input.timeframe("D")
prevCloseHTF = request.security(syminfo.tickerid, higherTFInput, close[1], lookahead = 1)
prevOpenHTF = request.security(syminfo.tickerid, higherTFInput, open[1], lookahead = 1)
prevHighHTF = request.security(syminfo.tickerid, higherTFInput, high[1], lookahead = 1)
prevLowHTF = request.security(syminfo.tickerid, higherTFInput, low[1], lookahead = 1)

pLevel = (prevHighHTF + prevLowHTF + prevCloseHTF) / 3
r1Level = pLevel * 2 - prevLowHTF
s1Level = pLevel * 2 - prevHighHTF

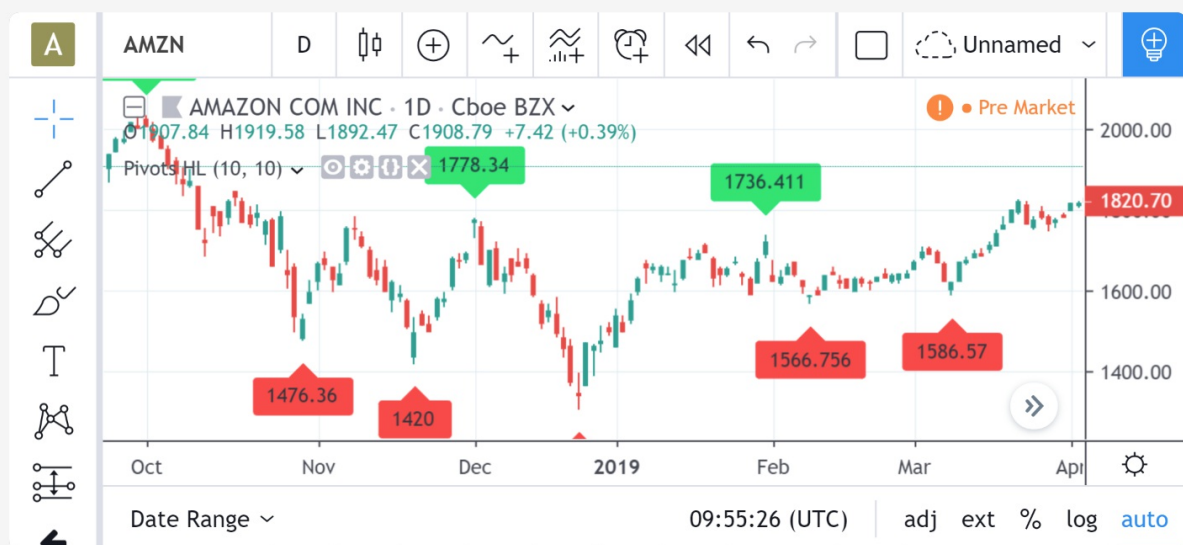
var line r1Line = na
var line pLine = na
var line s1Line = na

if pLevel[1] != pLevel
    line.set_x2(r1Line, bar_index)
    line.set_x2(pLine, bar_index)
    line.set_x2(s1Line, bar_index)
    line.set_extend(r1Line, extend.none)
    line.set_extend(pLine, extend.none)
    line.set_extend(s1Line, extend.none)
    r1Line := line.new(bar_index, r1Level, bar_index, r1Level, extend = extend.right)
    pLine := line.new(bar_index, pLevel, bar_index, pLevel, width=3, extend = extend.right)
    s1Line := line.new(bar_index, s1Level, bar_index, s1Level, extend = extend.right)
    label.new(bar_index, r1Level, "R1", style = label.style_none)
    label.new(bar_index, pLevel, "P", style = label.style_none)
    label.new(bar_index, s1Level, "S1", style = label.style_none)

if not na(pLine) and line.get_x2(pLine) != bar_index
    line.set_x2(r1Line, bar_index)
    line.set_x2(pLine, bar_index)
    line.set_x2(s1Line, bar_index)

```

## Pivot Points High/Low



```

//@version=5
indicator("Pivot Points High Low", "Pivots HL", true)

int lenHInput = input.int(10, "Length High", minval = 1)
int lenLInput = input.int(10, "Length Low", minval = 1)

float pivotHigh = ta.pivohigh(high, lenHInput, lenHInput)
float pivotLow = ta.pivotlow(low, lenLInput, lenLInput)

float pivot = 0.0
if not na(pivotHigh)
    pivot := nz(high[lenHInput])
    label.new(nz(bar_index[lenHInput]), pivot, str.tostring(pivot, format.mintick), sty
if not na(pivotLow)
    pivot := nz(low[lenLInput])
    label.new(nz(bar_index[lenLInput]), pivot, str.tostring(pivot, format.mintick), sty

```

## Linear Regression



```

//@version=5
indicator('Linear Regression', shorttitle='LinReg', overlay=true)

upperMult = input(title='Upper Deviation', defval=2)
lowerMult = input(title='Lower Deviation', defval=-2)

useUpperDev = input(title='Use Upper Deviation', defval=true)
useLowerDev = input(title='Use Lower Deviation', defval=true)
showPearson = input(title='Show Pearson\'s R', defval=true)
extendLines = input(title='Extend Lines', defval=false)

len = input(title='Count', defval=100)
src = input(title='Source', defval=close)

extend = extendLines ? extend.right : extend.none

calcSlope(src, len) =>
    if not barstate.islast or len <= 1

```

```

    [float(na), float(na), float(na)]
else
    sumX = 0.0
    sumY = 0.0
    sumXSqr = 0.0
    sumXY = 0.0
    for i = 0 to len - 1 by 1
        val = src[i]
        per = i + 1.0
        sumX := sumX + per
        sumY := sumY + val
        sumXSqr := sumXSqr + per * per
        sumXY := sumXY + val * per
    sumXY
    slope = (len * sumXY - sumX * sumY) / (len * sumXSqr - sumX * sumX)
    average = sumY / len
    intercept = average - slope * sumX / len + slope
    [slope, average, intercept]

[s, a, intercpt] = calcSlope(src, len)

startPrice = intercpt + s * (len - 1)
endPrice = intercpt
var line baseLine = na

if na(baseLine) and not na(startPrice)
    baseLine := line.new(bar_index - len + 1, startPrice, bar_index, endPrice, width =
    baseLine
else
    line.set_xy1(baseLine, bar_index - len + 1, startPrice)
    line.set_xy2(baseLine, bar_index, endPrice)
na

calcDev(src, len, slope, average, intercept) =>
    upDev = 0.0
    dnDev = 0.0
    stdDevAcc = 0.0
    dsxx = 0.0
    dsyy = 0.0
    dsxy = 0.0

    periods = len - 1

    daY = intercept + slope * periods / 2
    val = intercept

    for i = 0 to periods by 1
        price = high[i] - val
        if price > upDev
            upDev := price
            upDev

        price := val - low[i]
        if price > dnDev
            dnDev := price
            dnDev

        price := src[i]
        dxt = price - average
        dyt = val - daY

        price := price - val
        stdDevAcc := stdDevAcc + price * price
        dsxx := dsxx + dxt * dxt
        dsyy := dsyy + dyt * dyt
        dsxy := dsxy + dxt * dyt

```

```

    val := val + slope
    val

stdDev = math.sqrt(stdDevAcc / (periods == 0 ? 1 : periods))
pearsonR = dsxx == 0 or dsyy == 0 ? 0 : dsxy / math.sqrt(dsxx * dsyy)
[stdDev, pearsonR, upDev, dnDev]

[stdDev, pearsonR, upDev, dnDev] = calcDev(src, len, s, a, intercpt)

upperStartPrice = startPrice + (useUpperDev ? upperMult * stdDev : upDev)
upperEndPrice = endPrice + (useUpperDev ? upperMult * stdDev : upDev)
var line upper = na

lowerStartPrice = startPrice + (useLowerDev ? lowerMult * stdDev : -dnDev)
lowerEndPrice = endPrice + (useLowerDev ? lowerMult * stdDev : -dnDev)
var line lower = na

if na(upper) and not na(upperStartPrice)
    upper := line.new(bar_index - len + 1, upperStartPrice, bar_index, upperEndPrice, v
    upper
else
    line.set_xy1(upper, bar_index - len + 1, upperStartPrice)
    line.set_xy2(upper, bar_index, upperEndPrice)
    na

if na(lower) and not na(lowerStartPrice)
    lower := line.new(bar_index - len + 1, lowerStartPrice, bar_index, lowerEndPrice, v
    lower
else
    line.set_xy1(lower, bar_index - len + 1, lowerStartPrice)
    line.set_xy2(lower, bar_index, lowerEndPrice)
    na

// Pearson's R
var label r = na
transparent = color.new(color.white, 100)
label.delete(r[1])
if showPearson and not na(pearsonR)
    r := label.new(bar_index - len + 1, lowerStartPrice, str.tostring(pearsonR, '#.###')
    r

```

## Zig Zag



```

//@version=5
indicator('Zig Zag', overlay = true)

float dev_threshold = input.float(title = 'Deviation (%)', defval = 5, minval = 1, max
int depth          = input.int(title = 'Depth', defval = 10, minval = 1)

type Point
    int     index
    float    price

type Pivot
    line     ln
    bool     isHigh
    Point    point

var pivotArray = array.new<Pivot>()
int length     = math.floor(depth / 2)
float pH       = ta.pivohigh(high, length, length)
float pL       = ta.pivotlow(low, length, length)

calcDeviation(base_price, price) =>
    100 * math.abs(price - base_price) / base_price

newPivot(Point lastPoint, bool isHigh, int index, float price) =>
    line ln = line.new(lastPoint.index, lastPoint.price, index, price, color =
    Pivot pivot = Pivot.new(ln, isHigh, Point.new(index, price))
    array.push(pivotArray, pivot)
    pivot

updatePivot(Pivot pivot, int index, float price) =>
    line ln = pivot.ln
    line.set_xy2(ln, index, price)
    pivot.point.index := index
    pivot.point.price := price
    pivot

isPivotFound(bool isHigh, float price) =>
    bool result = false
    int index = bar_index[length]
    int size = array.size(pivotArray)
    Pivot prevPivot = size >= 1 ? array.get(pivotArray, size - 1) : newPivot(Point.new

    if prevPivot.isHigh and not na(prevPivot.ln)
        m = isHigh ? 1 : -1
        if price * m > prevPivot.point.price * m
            updatePivot(prevPivot, index, price)
            result := true
    else if na(prevPivot.ln) or math.abs(calcDeviation(prevPivot.point.price, price)) >
        newPivot(prevPivot.point, isHigh, index, price)
        result := true
    result

isPivotFound(true, pH)
isPivotFound(false, pL)

```





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[Libraries](#)

[Non-standard charts data](#)

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