PSEDYS | TECHNICAL REFERENCE MANUAL V3.0

DC — Donchian Channel

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Technical Reference Manual v1.0

PSEDYS | Complete Edition
HH/LL on N bars · Breakout System · Turtle Trading · Width · Trend vs Range · MTF · Bot vs TradingView

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1. What is DC? Concept and Origin

The Donchian Channel was created by **Richard Donchian** in 1950 and forms the basis of the **Turtle Trading** system (Richard Dennis, 1983). DC plots the highest High and the lowest Low from the last N bars — the simplest representation of the price range.

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Philosophy: Breakout above the maximum of N bars = strong Long signal (buyer's momentum surpasses all resistance from N bars). Breakout below the minimum of N bars = strong Short signal.

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2. Calculation Formula — Complete

```
Upper[i] = max(High[i-period+1 .. i])   ← highest High from N bars
Lower[i] = min(Low[i-period+1  .. i])   ← lowest Low from N bars
Middle[i] = (Upper[i] + Lower[i]) / 2
Width[i]  = Upper[i] − Lower[i]
```

Standard period: 20 (or 14, 55 — Turtle used 20 and 55)

Note: unlike Williams %R (which uses HH/LL for oscillator calculation), DC displays them directly as price bands.

2.2 Complete Numeric Example — period=20, 50 bars

First DC value: bar 20

```
High[1..20] = max(100.00..108.57 range) = 104.66  (highest High from bars 1-20)
Low[1..20]  = min(97.47..102.52 range)  = 97.47   (lowest Low from bars 1-20)

Upper[20] = 104.66
Lower[20] = 97.47  ← depends on dataset; using calculated values: Upper=104.66, Lower=98.00
Middle[20] = (104.66 + 98.00) / 2 = 101.33
Width[20] = 104.66 − 98.00 = 6.66
```

DC table bars 20–50:

Bar	Upper (HH)	Lower (LL)	Middle	Width
20	104.66	98.00	101.33	6.66
25	106.23	100.55	103.39	5.68
30	106.23	100.55	103.39	5.68
35	106.56	101.31	103.94	5.25
40	108.78	101.73	105.26	7.05
45	110.93	103.13	107.03	7.80
50	111.63	103.13	107.38	8.50

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Observation: DC is an indicator of **rolling extremes** — Upper does not decrease unless the highest High exits the window. Ghost effect: when the HH from N bars ago exits the window, Upper can jump suddenly.

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3. Range and Interpretation

```
Upper = dynamic resistance (highest High from N bars)
Lower = dynamic support (lowest Low from N bars)
Middle = middle of the range → bullish bias if Close > Middle

Small Width: sideways market, compressed range
Large Width: active market with trend or volatility
```

Price position relative to DC:
- Close > Upper → bullish breakout (price surpasses all Highs from N bars)
- Close < Lower → bearish breakout
- Close at Middle → neutral
- Close consistently in the upper half → bullish bias

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4. Lag and Warm-up

```
First DC value: bar period = bar 20
Warm-up: period bars
Lag: 0 structural (reflects current window extremes)
     But extremes can be "fixed" for several bars → variable informational lag

Ghost Effect: when extreme HH/LL exits the window → sudden jump of Upper/Lower
```

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5. Trading Signals

5.1 Breakout System (Turtle Trading)

Turtle System 1 (20 bars):

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```
Long:  Close > Upper[i-1]  (Close surpasses maximum from 20 bars)
       SL: Lower[i] or Low[-2×ATR]
       Exit: Close < Lower from 10 bars (DC 10 on exit)

Short: Close < Lower[i-1]
       SL: Upper[i] or High[+2×ATR]
       Exit: Close > Upper from 10 bars
```

Turtle System 2 (55 bars):

```
Long:  Close > Upper_55[i-1]  (rarer, stronger)
Short: Close < Lower_55[i-1]
```

Filter: Turtle did not enter if the last trade in the same direction was profitable → avoids duplicates.

5.2 Middle Band Cross

```
Close cross Middle bullish (from below to above):
  → Price returns to the upper half of the range → bullish bias
  → Entry Long with EMA stack confirmation

Close cross Middle bearish:
  → Price drops to the lower half → bearish bias
```

5.3 Width as Volatility Filter

```
Decreasing Width = volatility compression → pre-breakout
Increasing Width = expansion → active trend or spike

Width < Width_avg × 0.7: tight range → possible breakout
Width > Width_avg × 1.5: active expansion → riding trend
```

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5.4 Combined Filters

```
# Breakout Long
breakout_long = (
    close > dc_upper_prev and      # surpasses maximum N-1 from N bars
    volume > vol_avg * 1.5 and     # confirmed volume
    adx > 20 and                   # active trend
    ema_stack_bullish              # macro direction
)

# Range trading
range_long = (
    close <= dc_lower * 1.005 and  # at or near Lower
    adx < 20 and                   # sideways market
    rsi < 35                       # oversold
)
```

6. DC vs BB vs KC — Comparison

Aspect	DC	BB	KC
Upper	max(High, N)	SMA + 2×StdDev	EMA + 2×ATR
Lower	min(Low, N)	SMA − 2×StdDev	EMA − 2×ATR
Middle	(HH+LL)/2	SMA	EMA
Basis	Absolute extremes	Statistical deviation Close	Absolute range (ATR)
Smoothing	None	SMA	EMA + Wilder ATR
Ghost effect	Yes (extreme exits window)	No	No
Breakout trading	Excellent (Turtle)	Not recommended	Moderate
Range trading	Good	Excellent	Good

7. DC in Sideways and Trend Markets

Sideways: Upper and Lower flat or slightly shifted. Middle = middle of the range. Reversal trading at DC extremes.

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Bullish trend: Upper consistently rising (price makes new highs). Lower also rising (high LL = valid trend). Width can remain constant or slightly increase.

Bearish trend: Lower consistently falling. Upper descending. Breakout below Lower = trend confirmation.

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8. MTF

Level	Timeframe	DC Usage
Macro	4H/1D	DC(55) for major context (Turtle S2)
Meso	4H	DC(20) for main trend and breakout
Entry	1H/5M	DC(10) for exit timing or dynamic SL

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9. PSEDYS — DC as Range and Breakout Filter

```
# Range context
price_in_upper_half = close > dc_mid    # bullish bias
price_in_lower_half = close < dc_mid    # bearish bias

# Breakout detection
new_high_n = close > dc_upper_prev      # breakout above N-bar High
new_low_n  = close < dc_lower_prev      # breakdown below N-bar Low

# Width filter
compressed = dc_width < dc_width_avg * 0.7  # compressed range
expanded   = dc_width > dc_width_avg * 1.5  # expanded range
```

---

10. Bot vs TradingView Validation

```
□ Upper[i] = max(High[i-period+1:i+1])   ← including current bar
□ Lower[i] = min(Low[i-period+1:i+1])    ← including current bar
□ Middle = (Upper + Lower) / 2
□ First value: bar period (index period-1, 0-indexed)
□ Off-by-one: some implementations exclude current bar → Upper = max(High[i-period:i])
  → 1 bar divergence
□ Tolerance: 0 (exact formula, no smoothing)
```

Python Script:

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```
def donchian_channel(highs, lows, period=20):
    n = len(highs)
    upper = [None]*n; lower = [None]*n; mid = [None]*n
    for i in range(period-1, n):
        upper[i] = max(highs[i-period+1:i+1])
        lower[i] = min(lows[i-period+1:i+1])
        mid[i]   = (upper[i] + lower[i]) / 2
    return upper, lower, mid
```

---

11. Practical Exercises

Exercise 1: Close surpasses DC Upper — immediate Long entry?

Situation: On 4H, Close[current] > Upper_DC(20)[previous]. ADX = 24. The last short trade in the same direction was profitable on DC (active Turtle filter).

Answer: Entry Long — valid breakout. Close > Upper = price surpasses all resistance from 20 bars. ADX > 20 confirms active trend. Turtle filter (last trade in the same direction profitable = skip) does not apply — standard Turtle system skips only if the last LONG was profitable, not Short. SL = Lower_DC(10) or 2×ATR below Close.

Exercise 2: DC Width at 50-bar minimum — what do you do?

Situation: DC(20) Width at minimum from the last 50 bars. Price sideways for 12 days. ADX = 11.

Answer: Prepare for breakout, no anticipatory entry. Minimum Width = extreme compression → imminent explosion, unknown direction. ADX = 11 = no trend market. Set alert at Close > Upper or Close < Lower with volume. Do not enter in the speculated direction without breakout confirmation.

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12. Cheat Sheet — Quick Summary

Concept	Value / Rule
Upper	`max(High[i-period+1:i+1])`
Lower	`min(Low[i-period+1:i+1])`
Middle	`(Upper + Lower) / 2`
Width	`Upper − Lower`
Standard period	20 (Turtle S1); 55 (Turtle S2)
Warm-up	period bars
Lag	0 structural (rolling extremes live)
Ghost effect	Yes — extreme exiting window
Breakout Long	Close > previous Upper → entry
Breakout Short	Close < previous Lower → entry
Middle cross bull	Price in upper half → bullish bias
SL Turtle	Lower DC (10 bars) for Long
Compressed Width	Pre-breakout; do not enter anticipatorily
DC vs BB	DC: absolute extremes; BB: statistical Close
DC vs KC	DC: no smoothing; KC: EMA+ATR smooth
Cause #1 divergence	Off-by-one (include/exclude current bar)

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