PSEDYS | TECHNICAL REFERENCE MANUAL V3.0

AO — Awesome Oscillator

Technical Reference Manual v1.0

PSEDYS | Complete Edition
Median Price · SMA(5) − SMA(34) · Colored Histogram · Saucer · Twin Peaks · Zero Cross · MTF · Bot vs TradingView

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1. What is AO? Concept and Origin

Awesome Oscillator (AO) was created by **Bill Williams** and introduced in his book Trading Chaos (1995). It is part of the Williams indicator system (Alligator, Fractals, AO, AC).

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AO measures **market momentum through the difference between two SMAs of the Median Price** — a fast SMA (5 bars) versus a slow SMA (34 bars). Unlike MACD (based on Close + EMA), AO uses Median Price and simple SMAs.

Williams' Philosophy: AO represents the "driving force" that moves the market currently compared to its broader average. The green/red histogram indicates whether the force is increasing or decreasing.

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2. Calculation Formula — Complete

2.1 Median Price (MP)

```
MP[i] = (High[i] + Low[i]) / 2
```

Critical Attention: AO uses `(H+L)/2`, **NOT** Typical Price `(H+L+C)/3` (used by CCI). If implementation uses TP instead of MP → AO will diverge from TradingView.

2.2 AO = SMA(MP, 5) − SMA(MP, 34)

```
SMA5[i]  = (MP[i] + MP[i−1] + MP[i−2] + MP[i−3] + MP[i−4]) / 5
SMA34[i] = (MP[i] + MP[i−1] + ... + MP[i−33]) / 34

AO[i] = SMA5[i] − SMA34[i]
```

Fixed Parameters: 5 and 34 are Bill Williams' original parameters. They are not customizable in standard AO (unlike MACD where you can modify periods).

2.3 Histogram Coloring

```
AO GREEN: AO[i] > AO[i−1]   ← AO increases compared to the previous bar
AO RED:   AO[i] < AO[i−1]   ← AO decreases compared to the previous bar
```

Classic Error: Colors do NOT depend on the AO sign (positive/negative). They depend exclusively on the direction compared to the previous bar:

```
AO = +3 → +4: GREEN  (increases, even if both positive)
AO = +4 → +3: RED    (decreases, even if both positive)
AO = −3 → −2: GREEN  (increases, bearish recovering)
AO = −2 → −3: RED    (decreases, bearish deepening)
```

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2.4 Complete Numeric Example — 50 bars

Verification bar 34 (first AO value):

```
MP[30..34] = [105.45, 106.00, 105.94, 105.63, 107.08]  (bars 30-34)
SMA(MP,5)  = sum/5 = 106.0170

MP[1..34]  = [99.00, 99.35, 99.61, ..., 107.08]  (bars 1-34)
SMA(MP,34) = sum/34 = 102.2204

AO[34] = 106.0170 − 102.2204 = 3.7966  ✓  (bullish — SMA5 > SMA34)
```

AO Table bars 34–50:

Bar	MP	SMA5	SMA34	AO	Color
34	107.08	106.017	102.220	**+3.797**	GREEN
35	107.56	106.438	102.472	+3.966	GREEN
36	107.13	106.664	102.701	+3.963	RED
37	106.73	106.823	102.911	+3.912	RED
38	107.22	107.142	103.158	+3.984	GREEN
39	107.01	107.128	103.418	+3.710	RED
40	107.61	107.138	103.702	+3.436	RED
41	107.45	107.202	103.983	**+3.219**	RED
42	106.87	107.229	104.231	+2.998	RED
43	108.14	107.412	104.509	+2.903	RED
50	105.68	106.523	105.827	**+0.696**	RED

Observation: AO remains positive throughout the 34–50 interval (SMA5 > SMA34), but the histogram becomes predominantly RED after bar 38 — momentum weakens although it is still bullish.

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3. AO Range — Unlimited

AO has no limits — it can reach large values in extended trends:

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```
Typical crypto AO: −5 to +5
Strong trend AO: ±10 to ±30
Extreme crash/pump AO: ±50+
```

Zero-line = equilibrium (SMA5 = SMA34). Positive AO = fast SMA > slow SMA → bullish. Negative AO = slow SMA > fast SMA → bearish.

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4. Lag and Warm-up

```
First AO value: bar 34 (index 33)
Warm-up: 34 bars (SMA34 dominates)

Lag SMA34 = (34−1)/2 = 16.5 bars
Lag SMA5  = (5−1)/2  = 2.0 bars
Net AO lag ≈ 16.5 − 2.0 = ~14.5 bars compared to instant price
```

AO has lag similar to MACD(12,26) but based on simple SMAs (not EMA), thus less reactive to recent acute movements.

Lag Comparison:

```
AO:          ~14.5 bars lag
MACD(12,26): ~13-14 bars lag (EMA, slightly faster at spikes)
RSI(14):     ~14+ bars lag (Wilder RMA)
```

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5. AO Levels — Interpretation

AO	Interpretation
> 0	Bullish — SMA5 > SMA34 (positive momentum)
< 0	Bearish — SMA34 > SMA5 (negative momentum)
= 0	Zero-line — SMA5 = SMA34
Positive + GREEN	Increasing bullish momentum
Positive + RED	Bullish momentum but weakening
Negative + GREEN	Recovering bearish momentum
Negative + RED	Deepening bearish momentum

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6. Trading Signals (Bill Williams Original)

6.1 Zero-line Cross

```
AO cross zero bullish (from negative to positive):
  SMA5 surpasses SMA34 → momentum becomes positive
  → Confirmatory Long Signal (not early entry)

AO cross zero bearish (from positive to negative):
  SMA34 surpasses SMA5 → momentum becomes negative
  → Confirmatory Short Signal
```

Zero cross = **slow** signal — price has already moved significantly. Optimal use: trend confirmation, not exact entry timing.

6.2 Saucer — The Rapid Signal

Saucer Bullish (above zero-line):

```
Condition:
  1. AO > 0 (histogram above zero-line)
  2. Three consecutive bars: RED, RED, GREEN
  (first bar can be positive or not — colors matter)

Shape: histogram forms a concavity ("saucer") above zero-line
→ Momentum temporarily weakened and starts to increase again
→ Long Entry on GREEN bar (bar 3)
```

Saucer Bearish (below zero-line):

```
Condition:
  1. AO < 0 (histogram below zero-line)
  2. Three bars: GREEN, GREEN, RED
→ Short Entry on RED bar (bar 3)
```

Saucer = faster signal than zero cross, but requires AO already on the same side of the zero-line.

6.3 Twin Peaks — The Reversal Signal

Twin Peaks Bearish:

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```
Condition (both conditions simultaneously):
  1. AO > 0 above zero-line
  2. Two peaks (peak1, peak2) — peak2 < peak1 (second peak lower)
  3. Between the two peaks, AO does not cross zero
  4. Last bar (after peak2) is RED
→ Bears take control: weakening bullish momentum at new highs
→ Short Entry or Long Exit on confirmation
```

Twin Peaks Bullish:

```
Condition:
  1. AO < 0 below zero-line
  2. Two valleys (valley1, valley2) — valley2 > valley1 (second valley less negative)
  3. Between the two valleys, AO does not cross zero
  4. Last bar is GREEN
→ Bears exhausted at new lows → Long Entry
```

6.4 Combined Filters

```
# Long entry signal
ao_bullish = (
    ao > 0 and           # above zero-line
    ao_slope > 0         # green histogram (increasing)
)

# Saucer detection
saucer_bull = (
    ao[-3] > 0 and ao[-2] > 0 and ao[-1] > 0 and    # all > 0
    ao[-3] > ao[-4] and ao[-2] < ao[-3] and            # GREEN, RED
    ao[-1] > ao[-2]                                    # GREEN (bar 3)
)

# Combined with EMA/ADX
entry_long = ao_bullish and ema_stack_bullish and adx > 20
```

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7. AO vs MACD — Comparison

Aspect	AO	MACD
Basis	Median Price (H+L)/2	Close
Smoothing	SMA	EMA
Parameters	Fixed (5, 34)	Customizable (12, 26, 9)
Signal line	No (no %D)	Yes (EMA 9 on MACD line)
Histogram	Yes (MACD line − SMA5/34)	Yes (MACD − Signal)
Colors	Green/Red (direction vs previous bar)	Identical
Lag	~14.5 bars	~13-14 bars
Spike sensitivity	Partial (MP includes H/L)	Reduced (Close + EMA)
Divergences	Yes (more visible)	Yes (standard)

When to use AO vs MACD:
- AO: Bill Williams systems, spike sensitivity, no signal line
- MACD: versatility, signal line crossover, period customization

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8. AO in Sideways and Trending Markets

Sideways: AO frequently oscillates through zero. Frequent false Saucer signals. ADX < 20 = AO filtering.

Active bullish trend: AO remains positive, predominantly GREEN histogram with RED corrections. Persistent RED = trend weakening (possible trailing SL tighten). Cross zero bearish = serious change signal.

Active bearish trend: AO remains negative. Persistent GREEN = possible bottom/reversal. Cross zero bullish = reversal confirmation.

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9. MTF

Level	Timeframe	Long Condition
Macro	4H	AO > 0 and GREEN histogram
Meso	1H	AO > 0 or near zero and recovering
Entry	5M	Saucer bullish or zero cross bullish

Combined MTF:

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```
4H: AO > 0 + GREEN histogram          → macro bullish trend
1H: AO > 0 or recovering from negative  → meso momentum ok
5M: Saucer bullish                      → precise entry timing
→ Long with all TFs aligned
```

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10. PSEDYS — AO as a Momentum Filter

In PSEDYS, AO complements the EMA stack with Bill Williams' momentum perspective:

```
# PSEDYS momentum filter
ao_momentum_ok = ao > 0 and ao > ao_prev    # positive and increasing

# Rapid screener
bullish_momentum = ao > 0                   # SMA5 > SMA34
bearish_momentum = ao < 0                   # SMA34 > SMA5
```

Limitation: AO with fixed SMAs (5, 34) can be slow for very short timeframes (1M, 5M). On 4H and 1H, it works well as a macro filter.

Indicator manual: AO — Awesome Oscillator Part 2 of 2.

11. Bot vs TradingView Validation

Main sources of divergence:

```
□ MP = (H+L)/2, NOT (H+L+C)/3 (Typical Price) → cause #1
□ Simple SMA (not EMA) → cause #2
□ Colors: AO[i] > AO[i-1] = GREEN (not AO > 0 = GREEN)
□ Periods 5 and 34 are fixed (not customizable in standard)
□ Off-by-one in SMA window: [i-period+1:i+1] inclusive
```

Checklist:

```
□ MP = (High + Low) / 2
□ SMA5 = SMA(MP, 5) — simple, no EMA
□ SMA34 = SMA(MP, 34) — simple
□ AO = SMA5 - SMA34
□ Green: AO[i] > AO[i-1]; Red: AO[i] < AO[i-1]
□ Tolerance: < 0.001 AO points
```

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Python Script:

```
def ao(highs, lows):
    n = len(highs)
    mp = [(highs[i] + lows[i]) / 2 for i in range(n)]
    ao_v = [None] * n
    for i in range(33, n):
        sma5  = sum(mp[i-4:i+1]) / 5
        sma34 = sum(mp[i-33:i+1]) / 34
        ao_v[i] = sma5 - sma34
    return ao_v

def ao_color(ao_values):
    colors = [None] * len(ao_values)
    for i in range(1, len(ao_values)):
        if ao_values[i] is not None and ao_values[i-1] is not None:
            colors[i] = 'green' if ao_values[i] > ao_values[i-1] else 'red'
    return colors
```

12. Practical Exercises

Exercise 1: Positive AO but RED for 10 consecutive bars — exit Long?

Situation: On 4H, AO = +2.5 (positive but decreasing from +5.8). EMA stack bullish. ADX = 28.

Answer: Do not exit, but tighten trailing SL. Positive AO = SMA5 > SMA34 → bullish momentum still present. RED histogram = weakening momentum. With ADX = 28 and EMA stack bullish, the trend is active. Exit at: (1) AO cross zero bearish or (2) ADX below 20 or (3) EMA stack breakdown. Trailing SL at −1.5–2× ATR below current High.

Exercise 2: Bearish saucer — entry Short or not?

Situation: On 1H, AO = −1.5, histogram: GREEN, GREEN, RED (last 3 bars). EMA 200 4H below price. ADX = 22.

Answer: Skip Short. Bearish saucer requires AO < 0 — condition met. But EMA 200 4H **below** price = macro bullish bias. Shorting in a macro bullish context on 1H with AO = −1.5 = high risk. Wait for either EMA 200 4H to confirm bearish, or a pullback to major resistance for clearer context.

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13. Cheat Sheet — Quick Summary

Concept	Value / Rule
MP	`(High + Low) / 2` — NOT Typical Price!
SMA5	`SMA(MP, 5)` — simple
SMA34	`SMA(MP, 34)` — simple
AO	`SMA5 − SMA34`
Green	`AO[i] > AO[i−1]` (increasing, NOT AO > 0)
Red	`AO[i] < AO[i−1]` (decreasing, NOT AO < 0)
Period	Fixed: 5 and 34 (not customizable in standard)
Range	Unlimited
Zero-line	SMA5 = SMA34 (momentum equilibrium)
> 0	Bullish (SMA5 > SMA34)
< 0	Bearish (SMA34 > SMA5)
Zero cross bull	AO from negative to positive → Long confirmation
Zero cross bear	AO from positive to negative → Short confirmation
Saucer bull	AO > 0 + RED, RED, GREEN → Long entry
Saucer bear	AO < 0 + GREEN, GREEN, RED → Short entry
Twin Peaks bear	2 positive peaks, peak2 < peak1 → Short
Twin Peaks bull	2 negative valleys, valley2 > valley1 → Long
Warm-up	34 bars
Lag	~14.5 bars (SMA34 dominant)
Cause #1 divergence	MP = (H+L)/2 ≠ TP = (H+L+C)/3
Cause #2 divergence	Colors based on direction, not sign
AO vs MACD	AO: Median Price + SMA; MACD: Close + EMA

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