Appendixes

Appendix 1. Technical Indicators Formulae

This appendix contains the specific formulae for the technical indicators shown on the AIQ TradingExpert Pro charts. For additional details on the computation and performance of these indicators, see References, Appendix 2.

Note
In the formulae, the terms day and period are used interchangeably to refer to the time period represented by price and volume data. When the indicators are calculated from weekly data, the terms day and period should be replaced by week in the formulae for the indicators.

Accumulation/Distribution

The Accumulation/Distribution line is the summation of weighted volume. The weights are the same as those computed in the Volume Accumulation Percentage. The weight is given a value between plus 1 and minus 1. If the price closed at the intraday high, the assigned value is plus one. If the price closed at the intraday low, the value is minus one. The value is zero if a price closes at the midpoint between the high and the low. The volume for each day is multiplied by this weight and added to the running total.

$$AD_t = AD_{t-1} + V_t X$$

$$X = \frac{(Pc_t - Pl_t) - (Ph_t - Pc_t)}{(Ph_t - Pl_t)}$$

Where:

AD_t = Accumulation/Distribution, day t
V_t = Volume, day t
Pc_t = Closing Price, day t
Pl_t = Low price, day t
Ph_t = High price, day t

Advance/Decline Line

The line measuring advances and declines on the New York Stock Exchange is a breadth-of-market indicator which measures market status in terms other than dollars. It is the summation, over time, of the net daily difference between the number of advancing issues and the number of declining issues.

$$ADL_t = ADL_{t-1} + ADV_t - DEC_t$$

Where:

ADL_t = Advance/Decline Line, day t
ADL_{t-1} = Advance/Decline Line, day t-1
ADV_t = Number of advancing stocks, day t
DEC_t = Number of declining stocks, day t

Advance/Decline Indicator

$$ADIND_t = s\,(ADV_t - DEC_t) + (1 - s)\,ADIND_{t-1}$$

$$s = \frac{2}{(1+n)}$$

Where:

ADV_t = Number of advancing issues, period t
DEC_t = Number of declining issues, period t
s = Smoothing constant
n = Number of days in time period

Advance/Decline Oscillator

This oscillator is a breadth-of-market indicator using the daily difference between the number of advancing issues and the number of declining issues on the New York Stock Exchange. The difference is weighted and added to a short-term average and to an intermediate-term average. The oscillator is the difference between these two averages.

$$ADOSC_t = ADS_t - ADL_t$$

$$ADS_t = a\,(ADV_t - DEC_t) + (1-a)ADS_{t-1}$$

$$ADL_t = b\,(ADV_t - DEC_t) + (1-b)ADL_{t-1}$$

$$a = \frac{2}{(1+n_1)}$$

$$b = \frac{2}{(1+n_2)}$$

Where:

$ADOSC_t$	=	Advance/Decline Oscillator, day t
ADS_t	=	Short term average difference
ADL_t	=	Intermediate term average difference
ADV_t	=	Advancing issues, day t
DEC_t	=	Declining issues, day t
a	=	Short-term smoothing constant
b	=	Intermediate-term smoothing constant
n	=	Number of days

ADX\ADXR and Directional Movement Index

The Average Directional Movement Index (ADX) is a trend-following indicator based on the concept of directional movement. It is designed to evaluate the trending characteristics of a market.

Directional movement is a measure of the net total price movement over a given period of time. Positive and negative directional movements are first determined by summing the daily up and down moves. These values are then normalized by dividing them by the True Range, the absolute value of the total move for the period. The difference between the normalized values, expressed as a percentage, is defined as the directional movement.

The Average Directional Movement Index (ADX) is obtained from directional movement by use of exponential averages and ratios. The ADX is charted along with a second line, the ADXR indicator, which is a smoothed average of the ADX.

$$ADX = DXa$$

$$ADXR = \frac{ADX_t + ADX_{t-c}}{2}$$

$$DX_n = 100 \quad \frac{(+DI_n) - (-DI_n)}{(+DI_n) + (-DI_n)}$$

$$+DI_n = \frac{+DM_n}{TR_n} \qquad \text{for previous n days}$$

$$-DI_n = \frac{-DM_n}{TR_n} \qquad \text{for previous n days}$$

$$If\ -DM > +DM,\ +DM = 0$$

$$If\ +DM > -DM,\ -DM = 0$$

$$+DM_t = Ph_t - Ph_{t-1}, \quad If\ -DM < 0,\ +DM = 0$$

$$-DM_t = Pl_{t-1} - Pl_t, \quad If\ +DM < 0,\ -DM = 0$$

TR_n = Largest absolute value of:

$Ph_t - Pl_t$, *or*

$Ph_t - Pc_{t-1}$, *or*

$Pl_t - Pc_{t-1}$,

Where:

ADX = Avg. Directional Movement Index
$ADXR$ = Avg. Directional Movement Index Rating
DXa = EMA of DX_n
DX_n = Directional Movement Index, prior n days
$+DI_n$ = Plus Directional Indicator, prior n days
$-DI_n$ = Minus Directional Indicator, prior n days
$+DM_t$ = Plus Directional Movement, day t
$-DM_t$ = Minus Directional Movement, day t
TR_n = True Range, prior n days
Ph_t = Highest price, day t
Pl_t = Lowest price, day t
Pc_t = Closing price, day t
n = Time period

Note:
In the terms *+DM*, *-DM*, *+DI*, and *-DI*, the + and - signs are simply part of the term names and have no mathematical significance.

ADX Rate

ADX Rate is a trend indicator which measures the rate of change of ADX using least squares methodology. The indicator is calculated as the slope of the line that most closely approximates the data over the period of time specified.

$$Slope = \frac{1}{D}\left[\sum X_i Y_i - \sum X_i \sum Y_i \right]$$

summations: i = 1 through n

$$D = n\sum X_i^2 - \left[\sum X_i\right]^2$$

Where:

n = Number of periods

X = date

Y = ADXR

Average Volume

Average Volume is computed by an exponential smoothing formula that smoothes out the random fluctuations that occur from day to day. This Exponentially Smoothed Average dampens out short-term cycles and, depending on the value of the smoothing constant, lets the user view a short, intermediate, or long-term trend in volume.

$$VA_t = s\ V_t + [(1 - s)\ V_{t-1}]$$

$$s = \frac{2}{(1+n)}$$

Where:

VA_t = Average volume, day t
V_t = Volume, day t
n = Number of days in time period
s = Smoothing constant

Bollinger Bands

Bollinger Bands are trading bands that measure price volatility around a simple moving average. Volatility is measured as the statistical standard deviation of price dispersion about the average. The spacing of the bands above and below the average is computed as two standard deviations from the average price.

Upper Band = $\bar{x} + 2\sigma$

Middle Band = $\bar{x}$

Lower Band = $\bar{x} - 2\sigma$

$$\sigma = \sqrt{\frac{(\bar{x}_i - x_i)^2}{n}} \qquad \text{summation: } i = 1, n$$

$$\bar{x}_i = \frac{x_i}{n} \qquad \text{summation: } i = 1, n$$

Where:

$\bar{x}$ = Moving average of price
σ = Standard deviation
x_i = Price, period i
n = Number of periods in moving average

Note
This form of standard deviation is the population standard deviation and not the sample standard deviation.

Commodity Channel Index

Commodity Channel Index (CCI) is a price momentum indicator. It is calculated as an index similar to a statistical standard score that measures price excursions from the mean price as a statistical variation. According to the developer, Donald R. Lambert, normal random fluctuations of the CCI fall within a channel between +100% and -100%.

$$CCI = \frac{(M - \bar{M})}{(.015\ \bar{D})}$$

$$\bar{D} = \frac{1}{n} \sum (M_i - \bar{M}) \qquad \text{summation: i = 1 through n}$$

$\bar{M}$ = simple moving average of M over n periods

$$M = 1/3\ (H + L + C)$$

Where:

H = High price for period
L = Low price for period
C = Closing price for period
M = Mean price
$\bar{D}$ = Mean deviation of the absolute value of difference between mean price and the simple moving average of mean price
n = Number of days in moving average time period

ESA, Exponentially Smoothed Price Average

Average Price is computed by an exponential smoothing formula that smoothes out the random price fluctuations that occur from day to day. This Exponentially Smoothed Average dampens out short-term cycles and, depending on the value of the smoothing constant, lets the user view a short, intermediate, or long-term trend.

$$Pa_t = s\ Pc_t + (1-s)\ Pa_{t-1}$$

$$s = \frac{2}{(1+n)}$$

Where:

Pa_t = Average price, day t
Pc_t = Closing Price, day t
n = Number of days in time period
s = Smoothing constant

High/Low Indicator

This is a breadth indicator which uses the daily number of stocks making new highs for the year and the number making new lows. The net difference is added to an exponentially smoothed average.

$$HILO_t = s\,(NHI_t - NLO_t) + (1-s)\,HILO_{t-1}$$

$$s = \frac{2}{(1+n)}$$

Where:

$HILO_t$ = The High/Low Indicator, day t
NHI_t = Number of stocks reaching new highs
NLO_t = Number of stocks reaching new lows
s = Smoothing constant
n = Number of days

MACDI, Moving Average Convergence-Divergence Index

The is a two-component indicator based on exponential moving price averages. The first component of the MACDI is a line which represents the differential between two moving averages, each computed for a different period of time. The second component, which is called the *signal line*, is an exponential average of the first component.

Differential Line (*DL*):

$$DL = Pa1 - Pa2$$

$$Pa1_t = Pa1_{t-1} + s_1 (Pc_t - Pa1_{t-1})$$

$$Pa2_t = Pa2_{t-1} + s_2 (Pc_t - Pa2_{t-1})$$

Signal Line (*SL*):

$$SL = DLa_t$$

$$DLa_t = DLa_{t-1} + s_3 (DL_t - DLa_{t-1})$$

Where:

DL	=	Differential Line
SL	=	Signal Line
Pa_t	=	Exp. Smoothed Moving Avg. of Pc_t
DLa_t	=	Exp. Smoothed Moving Avg. of DL_t
Pc_t	=	Closing Price, day t
s_1	=	Smoothing constant one
s_2	=	Smoothing constant two
s_3	=	Smoothing constant three

MACDI Oscillator

An oscillator is a difference, expressed in percentage terms, between two exponentially smoothed averages. The MACDI Oscillator is an oscillator derived from the MACDI Index lines (see previous section for a discussion of the MACDI Index). It is computed by first obtaining the difference between the two MACDI exponential averages and then subtracting the signal line of the differential. The signal line is an exponential average of the difference between the two MACDI averages.

In general, an upward trend of this oscillator is bullish and a downward trend is bearish. For the most part, bullish trends remain intact as long as the MACDI Oscillator remains positive, while bearish trends persist only as long as the oscillator is declining within negative territory.

$$OSC = DL - SL$$

Where:

OSC = MACDI Oscillator
DL = Differential line*
SL = Signal line*

* For specific formulae, see Moving Average Convergence-Divergence Index

Money Flow

The Money Flow line is the summation of the average dollars into or out of an equity. The weight is given a value between plus 1 and minus 1. If the price closed at the intraday high, the assigned value is plus one. If the price closed at the intraday low, the value is minus one. The value is zero if a price closes at the midpoint between the high and the low. The product of volume and average price is multiplied by the weight and the result is added to the running total. Average price is computed as the average of the high, low and close prices.

$$MF_t = MF_{t-1} + V_t AP_t X_t$$

$$X_t = \frac{(Pc_t - Pl_t) - (Ph_t - Pc_t)}{(Ph_t - Pl_t)}$$

$$AP_t = \frac{(Ph_t + Pl_t + Pc_t)}{3.0}$$

Where:

MF_t = Money Flow, day t
AP_t = Average Price, day t
V_t = Volume, day t
X_t = Weighting Factor, day t
Pc_t = Closing Price, day t
Pl_t = Low price, day t
Ph_t = High price, day t

Money Flow Oscillator

The Money Flow Oscillator measures the change in money flow over a user defined number of time periods. The oscillator is calculated as the difference between the current value of Money Flow and the value at the start of the time interval.

$$MFOSC_t = MF_t - MF_{t-n}$$

Where:

$MFOSC_t$ = Money Flow Oscillator, day t
MF_t = Money Flow, day t
MF_{t-n} = Money Flow, n days ago
n = number of oscillator time periods

Money Flow RSI

Money Flow RSI is a short-term indicator which attempts to measure the flow of money into or out of an equity. Both price and volume data are included in the calculation and the resulting value is normalized to a scale of 0 to 100 so that it can be used over a variety of situations independent of the equity price.

The price component of Money Flow RSI is the average equity price which is computed each day by averaging the high, low, and closing prices. Money Flow RSI is considered positive on days when the equity closes higher and negative on days when it closes lower.

The extent of Money Flow RSI is determined by multiplying the average price by the volume for the day. A money flow ratio is then computed from the ratio of positive money flow, averaged over a specified number of days, to negative money flow, averaged over the same period. This ratio is then normalized by means of the RSI formula so that values range between zero and 100. Zero indicates extreme negative money flow, and 100 indicates extreme positive money flow. A value of 50 indicates a balance between positive and negative money.

$$MFI = 100 - \left[\frac{100}{(1 + MR)}\right]$$

$$MR = \frac{PMF}{NMF}$$

$$PMF = \sum MF_t f_t \qquad \text{for n days}$$

$$NMF = \sum MF_t g_t \qquad \text{for n days}$$

$$MF_t = V_t Pa_t$$

$$Pa_t = \frac{(Ph_t + Pl_t + Pc_t)}{3}$$

$f_t = 1.0$ if $Pc_t > Pc_{t-1}$
$f_t = 0.0$ if $Pc_t \leq Pc_{t-1}$

$g_t = 0.0$ if $Pc_t \geq Pc_{t-1}$
$g_t = 1.0$ if $Pc_t < Pc_{t-1}$

Where:

MFI = Money Flow RSI
MR = Money ratio
PMF = Positive Money Flow
NMF = Negative Money Flow
MF_t = Money Flow, day t
Pa_t = Average price, day t
Ph_t = High price, day t
Pl_t = Low price, day t
Pc_t = Closing Price, day t
V_t = Volume, day t
f_t = Positive volume summation factor
g_t = Negative volume summation factor
n = Number of days in summations

Moving Average

Mathematically, the Moving Average is a simple arithmetic mean, with equal weight given to all data values. It smoothes out short-term fluctuations and depicts the underlying trend of a market; the longer the time period used in the calculation, the longer the trend depicted by the average.

Although many different time periods are commonly used, 21 days is considered appropriate for short-term trading. For long-term trend analysis, most analysts prefer a 200-day average.

$$Pa_t = \frac{1}{n} \sum Pc_t \qquad \text{for previous n values}$$

Where:

Pa_t = Simple moving avg. of Pc, day t
Pc_t = Closing Price, day t
n = Number of days in period

Negative Volume Index

The Negative Volume Index is an index of market action during periods of decreasing volume. A cumulative index, on days of decreasing volume, the percentage gain (or loss) of the equity price is added to (or subtracted from) the index.

This indicator is charted as two separate lines—the index line and an exponentially smoothed average of the index.

This indicator is used in conjunction with its counterpart, the Positive Volume Index.

$$NVI_t = NVI_{t-1} + f_t$$

$$NVIa_t = NVIa_{t-1} + s\ (NVI_t - NVIa_{t-1})$$

$$f_t = \frac{(Pc_t - Pc_{t-1})}{Pc_{t-1}} \qquad \text{if } V_t < V_{t-1}$$

$$f_t = 0.0 \qquad \text{if } V_t \geq V_{t-1}$$

Where:

NVI_t = Negative Volume Index for period t
$NVIa_t$ = Exp. Smoothed Avg. of *NVI*, period t
f_t = factor for period t
V_t = Volume for period t
Pc_t = Closing Price for period t
s = Smoothing constant

On-Balance Volume

OBV is a widely used indicator that shows accumulation and distribution action. The indicator is computed as a continuous summation of daily volume. On days when prices advance, the volume for that day is added to the running total. On days when prices decline, the volume for that day is subtracted from the running total. On-Balance Volume is different from the Volume Accumulation Percentage because there is no weighting.

OBV assumes that if the price today is higher than the price yesterday, all of today's volume is accumulation. If the price today is lower than the price yesterday, all of the volume is distribution.

$$OBV = OBV_{t-1} + f_t V_t$$

$$\begin{array}{lll} f_t = 1.0 & \text{if} & Pc_t > Pc_{t-1} \\ f_t = -1.0 & \text{if} & Pc_t < Pc_{t-1} \\ f_t = 0.0 & \text{if} & Pc_t = Pc_{t-1} \end{array}$$

Where:

OBV = On-Balance Volume
f_t = Weighting factor, day t
Pc_t = Closing Price, day t
V_t = Volume, day t

On-Balance Volume Percentage

OBV Percentage is another technical indicator of accumulation/ distribution action. In the computation of this indicator, On-Balance Volume (see previous indicator) is summed over a specified period of time and computed as a percentage of total volume for the same period of time.

$$OBVP = \frac{TOBV}{TV} \quad 100$$

$$TV = \sum V_t \qquad \text{for prior 21 days}$$

$$TOBV = \sum V_t f_t \qquad \text{for prior 21 days}$$

$$f_t = 1.0 \qquad \text{if } Pc_t > Pc_{t-1}$$
$$f_t = -1.0 \qquad \text{if } Pc_t < Pc_{t-1}$$
$$f_t = 0.0 \qquad \text{if } Pc_t = Pc_{t-1}$$

Where:

$OBVP$ = On-Balance Volume Percentage
TV = Total volume, 21 day period
$TOBV$ = Total on-balance volume, 21 day period
f_t = Summation factor, day t
Pc_t = Closing Price, day t
V_t = Volume, day t

Positive Volume Index

The Positive Volume Index is an index of market action during periods of increasing volume. A cumulative index, on days of increasing volume the percentage gain (or loss) of the equity price is added to (or subtracted from) the cumulative total.

This indicator is charted as two separate lines—the index line and an exponentially smoothed average of the index.

This indicator is used in conjunction with its counterpart, the Negative Volume Index.

$$PVI_t = PVI_{t-1} + f_t$$

$$PVIa_t = PVIa_{t-1} + s\ (PVI_t - PVIa_{t-1})$$

$$f_t = \frac{(Pc_t - Pc_{t-1})}{Pc_{t-1}} \qquad \text{if} \quad V_t > V_{t-1}$$

$$f_t = 0.0 \qquad \text{if} \quad V_t \leq V_{t-1}$$

Where:

PVI_t = Positive Volume Index for period t
$PVIa_t$ = Exp. Smoothed Avg. of *PVI*
f_t = factor
V_t = Volume for period t
Pc_t = Closing Price for period t
s = Smoothing constant

Price Phase Indicator

The Price Phase Indicator is an oscillator that shows the difference between short- and intermediate-term price averages. This indicator shows the direction, or phase, of a ticker's movement. When the Price Phase Indicator changes direction, it is telling you to review the ticker for possible action.

$$PPI = PA1_t - PA2_t$$

$$PA1_t = a\ Pc_t + (1 - a)\ PA1_{t-1}$$

$$PA2_t = b\ Pc_t + (1 - b)\ PA2_{t-1}$$

Where:

PPI	=	Price Phase Indicator
$PA1_t$	=	Price Average one
$PA2_t$	=	Price Average two
Pc_t	=	Closing Price in period t
a	=	Smoothing constant one
b	=	Smoothing constant two

RS (RS Indx & RS Tkr)

RS is a one line indicator computed as the exponential moving average of the Relative Strength of a ticker vs. an index. For the computation of the Relative Strength of a ticker vs. a second ticker (RS Tkr), the second ticker is substituted for the index in the formula shown below.

$$RS_t = s\,RSR_t + (1 - s)\,RS_{t-1}$$

$$RSR_t = \frac{\left(\frac{Pc_t}{Ic_t}\right)}{RSF}$$

$$RSF = \left(\frac{Pc_0}{Ic_0}\right) 100$$

$$s = \frac{2}{(1+n)}$$

Where:

RS = Exponential Moving Average of Relative Strength

RSF = Relative Strength Factor

RSR = Relative Strength Ratio

t_0 = First date in database with data for both ticker and index

Pc_0 = Close price of ticker at time t_0

Ic_0 = Close price of index at time t_0

Pc_t = Close price of ticker at time t

Ic_t = Close price of index at time t

s = Smoothing constant

n = Number of periods in average (constant set by the user)

RSMD (RSMD Indx & RSMD Tkr)

RSMD is a two-component indicator based on exponential moving averages of Relative Strength. The computation is identical to MACDI except that daily Relative Strength is the basic variable instead of daily price. The first component is the *difference line*. This line represents the difference between two moving averages of Relative Strength, each computed for a different time period. The second component, which is called the *signal line*, is an exponential average of the first component, the *difference line.*

Signal Line (*SL*):

$$SL = s_3\ DL + (1 - s_3)\ SL_{t-1}$$

Differential Line *(DL):*

$$DL = Ra1 - Ra2$$

$$Ra1_t = s_1\ R_t + (1 - s_1)\ Ra1_{t-1}$$

$$Ra2_t = s_2\ R_t + (1 - s_2)\ Ra2_{t-1}$$

Relative Strength (*R*):

$$R_t = \frac{\left(\frac{Pc_t}{Ic_t}\right)}{RSF}$$

$$RSF = \left(\frac{Pc_0}{Ic_0}\right) \times 100$$

Where:

SL	=	Signal Line
DL	=	Differential Line
$Ra1$	=	Short-term Average Relative Strength
$Ra2$	=	Long-term Average Relative Strength
R_t	=	Relative Strength, day t
Pc_t	=	Closing Price, day t
Ic_t	=	Index closing price, day t
RSF	=	Relative Strength Factor
R	=	Relative Strength
Pc_0	=	Closing Price, day t_0
Ic_0	=	Index closing price, day t_0
s_1	=	Smoothing constant one
s_2	=	Smoothing constant two
s_3	=	Smoothing constant three
t_0	=	First date with data for ticker and index

Relative Strength Index (RSI AIQ)

The Relative Strength Index measures overbought/oversold conditions. The indicator is a measure of the relative strength of the average upward price movement against the average downward price movement. For this version of the indicator, the averages are computed as exponentially smoothed averages.

Relative strength is computed on a vertical scale of 0 to 100. A value over 70 indicates an overbought situation. A value under 30 indicates an oversold situation.

$$RSI = 100 - \left[\frac{100}{(1+r)}\right]$$

$$r = \frac{U_t}{D_t}$$

When $Pc_t > Pc_{t-1}$,

$$U_t = s\,(Pc_t - Pc_{t-1}) + (1-s)\,U_{t-1}$$

When $Pc_t \leq Pc_{t-1}$,

$$D_t = s\,(Pc_{t-1} - Pc_t) + (1-s)\,D_{t-1}$$

Where:

RSI = Relative Strength Index
r = Relative strength factor
U_t = Average Upside movement, day t
D_t = Average Downside movement, day t
Pc_t = Closing Price, day t
s = Smoothing constant

Relative Strength Index (RSI Wilder)

The Relative Strength Index indicator measures overbought/oversold conditions. The indicator is a measure of the relative strength of the average upward price movement against the average downward price movement. For Wilder's original version of the RSI indicator, the averages are computed as weighted moving averages.

Relative strength is computed on a vertical scale of 0 to 100. A value over 70 indicates an overbought situation. A value under 30 indicates an oversold situation.

$$RSI = 100 - \left[\frac{100}{(1+r)}\right]$$

$$r = \frac{U_t}{D_t}$$

When $Pc_t > Pc_{t-1}$,

and $t < n$, $U_t = 0$

or if $t = n$, $U_t = (\Delta Pc_t + U_{t-1}) \div n$

or if $t > n$, $U_t = \left[\Delta Pc_t + ((n-1)U_{t-1})\right] \div n$

sum for period $t = 1$ to $t = n$

When $Pc_t < Pc_{t-1}$,

and $t < n$, $D_t = 0$

or if $t = n$, $D_t = (D_{t-1} - \Delta Pc_t) \div n$

or if $t > n$, $D_t = \left[((n-1)D_{t-1}) - \Delta Pc_t\right] \div n$

sum for period $t = 1$ to $t = n$

Where:

RSI = Relative Strength Index
r = Relative strength factor
ΔPc_t = Price difference time t-1 to time t
U_t = Average Upside movement, time t
D_t = Average Downside movement, time t
Pc_t = Closing Price, time t
n = Number of periods in average (user constant)

This version of Lane's formulation of stochastics involves two components. The SK component is typically a 3-day moving average of the stochastic ratio as defined by Lane's basic stochastic formula (see Stochastic). SK is again averaged over the same number of days to obtain a double smoothed average ratio called SD.

$$SK_t = \sum \frac{STOC_t}{n} \qquad \text{for period } t = 1 \text{ to } t = n$$

$$SD_t = \sum \frac{SK_t}{n} \qquad \text{for period } t = 1 \text{ to } t = n$$

Where:

SK = *n* day moving average of *STOC*
SD = *n* day moving average of *SK*
STOC = *n* day stochastic
n = number of days in period

Split Volume

Split Volume is simply daily Volume displayed above and below a center line on the chart: above the line when the price advances from the previous day, and below the line when the price declines from the previous day.

Split Volume Moving Average

The SVMA is an exponentially smoothed average of the Split Volume and is equivalent to an average of On-Balance Volume.

$$SV_t = s\ V_t f + (1 - s)\ SV_{t-1}$$

$$f = 1.0 \quad \text{if} \quad Pc_t > Pc_{t-1}$$
$$f = -1.0 \quad \text{if} \quad Pc_t \leq Pc_{t-1}$$

Where:

SV_t = Split Volume average, day t
V_t = Volume, day t
Pc_t = Closing Price, day t
s = Smoothing constant

Stochastic

This indicator measures the closing price relative to the range of prices over the stochastic period. The stochastic price range is the difference between the highest value in the period and the lowest value. Stochastic is expressed as a percentage and presented on a scale of 0 to 100.

Above 80% indicates an overbought condition, and below 20% indicates an oversold condition.

$$STOC_t = \frac{(Pc_t - Pmin)}{(Pmax - Pmin)} \quad 100$$

Where:

$STOC_t$ = n-Day Stochastic, day t
Pc_t = Closing Price, day t
$Pmin$ = Lowest Low price, last n days
$Pmax$ = Highest High price, last n days
n = Number of days, stochastic period

Summation Index

The Summation Index is a running total or summation of the Advance/Decline Oscillator.

$$SI_t = SI_{t-1} + ADOSC_t$$

Where:

SI_t = Summation Index, day t
$ADOSC_t$ = Advance/Decline Oscillator, day t

Traders Index (TRIN)

This indicator measures the distribution of the up and down volume to advancing and declining issues. It thus measures the balance of the market and indicates when market action is overly distributed to a few stocks, which calls for a market correction.

$$TRIN_t = s\,(X_t) + (1 - s)\,TRIN_{t-1}$$

$$X_t = \frac{(ADV_t / DEC_t)}{(UPV_t / DNV_t)}$$

Where:

$TRIN_t$ = Traders index, day t
ADV_t = Number of advancing issues, day t
DEC_t = Number of declining issues, day t
UPV_t = Volume on advancing issues, day t
DNV_t = Volume on declining issues, day t
s = Smoothing factor

Trading Channel Index

The Trading Channel Index measures the location of average daily price relative to a smoothed average of average daily price. It is derived from the average difference between these two values.

$$TCI_t = s_2\ CI_t + (1 - s_2)\ TCI_{t-1}$$

$$CI_t = \frac{(AP_t - ESA_t)}{0.015\ D_t}$$

$$D_t = s_1\ (Ap_t - ESA_t) + (1-s_1)\ D_{t-1}$$

$$ESA_t = s_1\ Ap_t + (1-s_1)\ ESA_{t-1}$$

$$AP_t = \frac{(Ph_t + Pl_t + Pc_t)}{3.0}$$

$$s_1 = \frac{2}{(1+n_1)}$$

$$s_2 = \frac{2}{(1+n_2)}$$

Where:

TCI_t = Trading Channel Index, day t
CI_t = Channel Index, day t
D_t = Price range estimate, day t
ESA_t = Smoothed price average, day t
AP_t = Average price, day t
s_1 = Smoothing constant one
s_2 = Smoothing constant two
n_1 = Channel days
n_2 = Number of days in average

Up/Down Volume Oscillator

This indicator measures the momentum of volume. It is computed as the difference between two moving averages, a short- and a long-term average, each being a moving average of the net difference between up volume and down volume.

When the Up/Down Volume Oscillator is greater than zero, or when it moves from negative to positive, it is showing that net volume is up and that the strength of short-term volume exceeds long-term volume. This indicates market strength and is supportive of a market rally. When the indicator drops below zero, it is showing increasing down volume and is supporting a market decline.

$$UDVOSC_t = UDS_t - UDL_t$$

$$UDS_t = a\,(UVOL_t - DVOL_t) + (1-a)\,UDS_{t-1}$$

$$UDL_t = b\,(UVOL_t - DVOL_t) + (1-b)\,UDL_{t-1}$$

$$a = \frac{2}{(1+n_1)}$$

$$b = \frac{2}{(1+n_2)}$$

Where:

$UDVOSC_t$	= Up/Down Volume Oscillator, day t
UDS_t	= Short-term average difference, day t
UDL_t	= Intermediate-term avg. diff., day t
$UVOL_t$	= Up volume, dat t
$DVOL_t$	= Down volume, dat t
a	= Short-term smoothing constant
b	= Intermediate-term smoothing constant
n_1	= Number of days, long ESA
n_2	= Number of days, intermediate ESA

Velocity

Velocity is a momentum indicator which measures the rate of change of price using least squares methodology. The indicator is calculated as the slope of the line that most closely approximates the data over the period of time specified.

$$Slope = \frac{1}{D}\left[\sum X_i Y_i - \sum X_i \sum Y_i\right]$$

summations: i = 1 through n

$$D = n\sum X_i^2 - \left[\sum X_i\right]^2$$

Where:

n = Number of periods

X = date

Y = Closing price

Volatility

This indicator is a measure of the fluctuation in price over a specified period of time. The calculation is similar to the Standard Deviation formula which measures dispersion around the mean for a series of values. In the Volatility formula, deviation from the mean is replaced by an exponential function of the change in price from the prior day's (or week's) value. To allow relative comparisons, the Volatility coefficient is expressed as an annualized percentage change.

$$V = 100 \left[\frac{Af}{(n-1)} \left[\sum dp^2 - \frac{\left[\sum dp \right]^2}{n} \right] \right]$$

summations for prior periods n through 1

$$dp = \ln \left[\frac{p_t}{p_{t-1}} \right]$$

Where:

V = Volatility
Af = Annualization factor (52 for weekly, 250 for daily)
dp = Log of change in price from prior period
P_t = Closing Price on day t
n = Number of periods

Volume Accumulation Percentage

This indicator is a measure of buying pressure as opposed to selling pressure. Volume Accumulation Percentage is a percentage of total volume resulting from buying, or accumulation, averaged over a specified number of days. Accumulation pressure is determined by the relationship of the day's closing price to the intraday high (the highest price during the day) and the intraday low (the lowest price during the day).

$$VA_t = \left[\frac{TVA}{TV}\right] 100$$

$$TV = \sum V_t \qquad \text{previous n days}$$

$$TVA = \sum V_t X_t \qquad \text{previous n days}$$

$$X_t = \frac{(Pc_t - PL_t) - (Ph_t - Pc_t)}{(Ph_t - Pl_t)}$$

Where:

VA_t = Volume Accumulation Percentage
TVA = Total Volume accumulation for n days
TV = Total Volume for n days
X_t = Accumulation factor day t
V_t = Volume for day t
Pc_t = Closing Price for the day
Pl_t = Low price for the day
Ph_t = High price for the day
n = Number of days

Volume Oscillator

An oscillator is the difference, in percentage, between two exponentially smoothed averages.

The Volume Oscillator is a percentage difference between short-term volume and long-term volume. As volume tends to precede price, TradingExpert provides an indicator that shows the relationship between short-term volume and long-term volume. A positive value for Volume Oscillator indicates that short-term volume is greater than long-term volume. A negative value shows that long-term volume is greater than short-term volume.

$$VS = \left(\frac{AX_t}{AY_t} - 1\right) 100$$

$$AX_t = a\ X + (1 - a)\ AX_{t-1}$$

$$AY_t = b\ X + (1 - b)\ AY_{t-1}$$

$$X = \frac{V_t}{Va_t}$$

$$Va_t = s\ V_t + (1 - s)\ Va_{t-1}$$

Where:

VS	=	Volume Oscillator
X	=	Volume factor
V_t	=	Volume, day t
Va_t	=	Average Volume, day t
AX_t	=	Volume-factor average one
AY_t	=	Volume-factor average two
a	=	Smoothing constant one
b	=	Smoothing constant two
s	=	Smoothing constant one or two

Volume/Price Trend

Volume/Price Trend is a confirmation indicator that is an exponentially smoothed average of the product of volume and price change. By comparing changes in price with changes in V/P Trend, price moves that coincide with increasing volume are easily distinguished.

$$VPT_t = s \left[(PC_t - PC_{t-1}) \, V_t \right] + (1-s) \, VPT_{t-1}$$

$$s = \frac{2}{(1+n)}$$

Where:

VPT = Volume Price Trend, period t
PC_t = Closing Price, period t
s = Smoothing constant

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