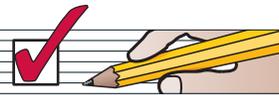


TRADERS' TIPS



Here is this month's selection of Traders' Tips, contributed by article authors from this issue and by various developers of technical analysis software, all to help readers more easily implement some of the strategies presented.

Internet users will also find these and some previous Traders' Tips at our website at <http://www.Traders.com>. To locate the various tips, use our site's search engine or click on the STOCKS & COMMODITIES magazine icon on the left-hand side of our homepage (or go to http://www.traders.com/S&C_homepg.html), then scroll down to the "This month in S&C" section on the left-hand side and look for "Traders' Tips" (or go to http://www.traders.com/Documentation/FEEDbk_docs/TradersTips/TradersTips.html). For Traders' Tips published earlier, click on the "Back issues archive" located under the "This month in S&C" section.

Other code presented in the articles in this magazine can be found at our website in a subscriber-only area at <http://technical.traders.com/sub/sublogin.asp>.

◆ TRADESTATION EASYLANGUAGE

Here is some EasyLanguage code I developed to compute the filters presented in my article in this issue, "Nonlinear Ehlers Filters." First is the code for the nonlinear Ehlers filter:

NONLINEAR EHLERS FILTER EASYLANGUAGE

```
Inputs: Price((H+L)/2), Length(15);
Vars: count(0), SumCoef(0), Num(0), Filt(0);
Array: Coef[25](0);
```

{Coefficients can be computed using any statistic of choice ---- a five-bar momentum is used as an example}

```
For count = 0 to Length - 1 begin
    Coef[count] = AbsValue(Price[count] - Price[Count + 5]);
    {The line above is all that needs to be changed to use other statistics.
    For example: Coef[count]=AbsValue(Price[count]-Filt[count+1]);}
end;
```

```
{Sum across the numerator and across all coefficients}
Num = 0;
SumCoef = 0;
```

```
For count = 0 to Length - 1 begin
    Num = Num + Coef[count]*Price[count];
    SumCoef = SumCoef + Coef[count];
end;
```

```
Filt = Num / SumCoef;
```

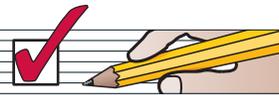
```
Plot1(Filt, "Ehlers");
```

This exemplary filter has 15 coefficients ["Length(15)"], although the array of coefficients is dimensioned to 25 ["Coef[25]"] to allow experimentation using a longer filter. If

	A	B	C	D	E	F	G	H	I
				Price (D2 = (B2+C2) / 2)	Absolute 5-Bar Momentum (E7 = D7 - D2)	Price * Momentum (F7 = D7 * E7)	15 Period Sum of Price * Momentum (Column F)	15 Period Sum of 5-Bar Momentum (Column E)	Ehlers Filter Value (G/H)
1		High	Low						
2	12/11/2000	139.56	136.72	138.14					
3	12/12/2000	138.81	137.38	138.09					
4	12/13/2000	139.41	136.03	137.72					
5	12/14/2000	136.50	134.03	135.27					
6	12/15/2000	133.13	130.56	131.84					
7	12/18/2000	133.47	131.77	132.62	5.52	732.51			
8	12/19/2000	134.97	130.02	132.49	5.60	742.16			
9	12/20/2000	128.94	126.09	127.52	10.20	1300.98			
10	12/21/2000	128.86	125.53	127.20	8.07	1026.53			
11	12/22/2000	131.11	128.84	129.98	1.87	242.73			
12	12/26/2000	132.34	130.28	131.31	1.31	171.36			
13	12/27/2000	133.73	131.25	132.49	0.00	0.07			
14	12/28/2000	133.88	132.59	133.23	5.72	761.90			
15	12/29/2000	134.28	131.19	132.73	5.54	735.28			
16	01/02/2001	132.16	127.56	129.86	0.12	15.19			
17	01/03/2001	136.00	127.66	131.83	0.52	67.96			
18	01/04/2001	135.47	133.00	134.23	1.74	233.90			
19	01/05/2001	133.63	129.19	131.41	1.83	240.21			
20	01/08/2001	130.19	127.69	128.94	3.80	489.51			
21	01/09/2001	131.50	129.42	130.46	0.60	78.47	6838.77	52.43	130.44
22	01/10/2001	132.13	128.81	130.47	1.36	177.31	6283.57	48.27	130.19
23	01/11/2001	133.48	131.09	132.29	1.95	257.37	5798.78	44.61	129.99
24	01/12/2001	133.72	131.28	132.50	1.09	144.89	4642.69	35.50	130.78

FIGURE 1: EXCEL SPREADSHEET. Starting from the prices on the left, here is a way to compute a nonlinear Ehlers filter using a five-day momentum as the embedded filter.

TRADERS' TIPS



you want a filter longer than 25, the dimension of the COEF array must be increased accordingly.

In the first calculation, you find each coefficient in the filter as the five-bar momentum. The next computation is to sum the numerator ["NUM"] as the product of each coefficient and the price (the *x*'s in the general equation) at each corresponding sample, and then sum the coefficients alone. Finally, the filter is completed by taking the ratio of the numerator to the coefficient sum. The performance of this filter is shown in Figure 2 in the article.

If you'd rather use a spreadsheet, an example done in Microsoft Excel is shown in Figure 1.

Next is the EasyLanguage code to compute the distance coefficient Ehlers filter also presented in my article in this issue, "Nonlinear Ehlers Filters":

```
Distance2[count] = 0;
For LookBack = 1 to Length begin
    Distance2[count] = Distance2[count] + (Price[count] -
    Price[count + LookBack])*(Price[count] - Price[count +
    LookBack]);
end;
Coef[count] = Distance2[count];
end;
Num = 0;
SumCoef = 0;
For count = 0 to Length -1 begin
    Num = Num + Coef[count]*Price[count];
    SumCoef = SumCoef + Coef[count];
end;
If SumCoef <> 0 then Filt = Num / SumCoef;

Plot1(Filt, "Ehlers");
```

The TradeStation code for a distance coefficient can also be used in the nonlinear Ehlers filter. If you'd rather use a spreadsheet, an example of the TradeStation code for a distance coefficient can be seen in Excel form in Figure 2.

DISTANCE COEFFICIENT EHLERS FILTER

Inputs: Price((H+L)/2),
Length(15);

Vars: count(0),
LookBack(0),
SumCoef(0),
Num(0),
Filt(0);

Array: Coef[25](0),
Distance2[25](0);

For count = 0 to Length - 1 begin

MICROSOFT EXCEL

To compute the filter in Excel, first compute the squared differences from the current price as:

$$E7 = (D7-D6)^2+(D7-D5)^2+(D7-D4)^2+(D7-D3)^2+(D7-D2)^2$$

As soon as you have five values of the squared difference, compute, in F11:

$$F11 = D7 * E7 + D8 * E8 + D9 * E9 + D10 * E10 + D11 * E11$$

	A	B	C	D	E	F	G	H
1	Date	High	Low	(H + L) / 2	Coefficient (Lookback = 5)	Sum Coefficient * Price	Sum of Coefficient	Filter Value
2	12/15/2000	133.13	130.56	131.84				
3	12/18/2000	133.47	131.77	132.62				
4	12/19/2000	134.97	130.02	132.49				
5	12/20/2000	128.94	126.09	127.52				
6	12/21/2000	128.86	125.53	127.20				
7	12/22/2000	131.11	128.84	129.98	30.58			
8	12/26/2000	132.34	130.28	131.31	36.25			
9	12/27/2000	133.73	131.25	132.49	60.54			
10	12/28/2000	133.88	132.59	133.23	84.04			
11	12/29/2000	134.28	131.19	132.73	40.62	33344.39	252.03	132.30
12	01/02/2001	132.16	127.56	129.86	28.71	33097.68	250.16	132.31
13	01/03/2001	136.00	127.66	131.83	7.38	29311.03	221.29	132.45
14	01/04/2001	135.47	133.00	134.23	31.22	25480.82	191.97	132.73
15	01/05/2001	133.63	129.19	131.41	15.67	16343.84	123.61	132.22
16	01/08/2001	130.19	127.69	128.94	57.76	18399.30	140.75	130.73
17	01/09/2001	131.50	129.42	130.46	19.68	17238.78	131.72	130.88
18	01/10/2001	132.13	128.81	130.47	19.25	18777.04	143.58	130.77
19	01/11/2001	133.48	131.09	132.29	22.45	17555.97	134.81	130.22
20	01/12/2001	133.72	131.28	132.50	22.21	18439.26	141.35	130.45

FIGURE 2: DISTANCE COEFFICIENT. This spreadsheet computes the squared difference between the current price and the price five bars back, and then squares it to get a more responsive Ehlers filter value.

TRADERS' TIPS



Then,

```
G11 =SUM(E7:E11)
H11 =F11/G11
```

Copy all the row 11 values downward and check the values against those in Figure 2.

— John Ehlers

◆ TRADESTATION EASYLANGUAGE

Here is a generic EasyLanguage version of the nonlinear Ehlers filter, based on John Ehlers's article in this issue, "Nonlinear Ehlers Filters." This EasyLanguage filter accepts the coefficients statistic as an input.

In the following EasyLanguage indicator code, the Coef input is set to AbsValue(MedianPrice - MedianPrice[5]), and the price input is set to MedianPrice. MedianPrice is a built-in function in EasyLanguage that returns (H + L) / 2. With these values for the inputs, the indicator is equivalent to the momentum-based Ehlers filter, for which a specific EasyLanguage version has been developed by John Ehlers and is given at the top of this Traders' Tips section.

To derive the distance coefficient Ehlers filter, which is also described in Ehlers's article, the Coef input value in the following EasyLanguage can be replaced with DistanceSqr(MedianPrice, 15). DistanceSqr is a custom function, and the code for that follows the indicator code.

INDICATOR: Ehlers Filter

Inputs:

```
Coef( AbsValue( MedianPrice - MedianPrice[5] ) ),
Price( MedianPrice ),
Length( 15 );
```

Variables:

```
Num( 0 ),
SumCoef( 0 ),
Count( 0 ),
Filt( 0 );
```

```
Num = 0 ;
SumCoef = 0 ;
```

```
for Count = 0 to Length - 1
begin
Num = Num + Coef[Count] * Price[Count] ;
SumCoef = SumCoef + Coef[Count] ;
end ;
```

```
if SumCoef <> 0 then
Filt = Num / SumCoef ;
```

```
Plot1( Filt, "Ehlers" ) ;
```

FUNCTION: DistanceSqr

Inputs:

```
Price( numericseries ),
Length( numericseries );
```

Variables:

```
DSqrd( 0 ),
LookBack( 0 );
```

```
DSqrd = 0 ;
for LookBack = 1 to Length
begin
DSqrd = DSqrd + Square( Price - Price[LookBack] ) ;
end ;
DistanceSqr = DSqrd ;
```

The EasyLanguage for both the function and indicator will be available for download at www.tradestation.com. Look for the file "EhlersFilter.ELS."

— Ramesh Dhingra, Product Manager, EasyLanguage TradeStation Technologies, Inc. (formerly Omega Research, Inc.)
A wholly owned subsidiary of TradeStation Group, Inc.
www.TradeStation.com

◆ METASTOCK FOR WINDOWS

The formulas discussed by John Ehlers in his article in this issue, "Nonlinear Ehlers Filters," can be recreated in MetaStock 6.52 or higher. To set up these indicators, select the Indicator Builder from the Tools menu. Then click "New" and enter the formulas as listed here:

Name: Ehlers Filters

Formula:

```
ti:= 15;
pr:= MP();
coef:= Abs(pr - Ref(pr,-5));
```

```
Sum(coef*pr,ti)/Sum(coef,ti)
```

Name: Distant Coefficient Ehlers Filter

Formula:

```
ti:= 15;
pr:= MP();
coef:=Sum(Power(Ref>LastValue(pr+PREV-PREV)-pr,-1),2),ti);
```

```
Sum(coef*pr,ti)/Sum(coef,ti)
```

— Cheryl C. Abram, Equis International, Inc.
www.equis.com

◆ NEUROSHLL TRADER

The Ehlers filter can be easily implemented in NeuroShell Trader by combining a few of the built-in indicators (of which there are more than 800). We've done this for you already and have created custom indicators that you can download from the NeuroShell Trader free technical support website.

However, we wanted to show you how easy it is to implement the Ehlers filter in NeuroShell Trader. To do so, select "New Indicator ..." from the Insert menu and follow these steps:

- 1 Select the volume-weighted moving average from the Volume Weighted Moving Average category.
- 2 Change the time series and the volume variables to the values you wish to use.

You should end up with something that looks like this:

```
VolWgtMovAvg(X, Y, 5)
```

TRADERS' TIPS



where:

X = The time series you wish to filter [Ehlers uses (High+Low)/2 or the Average2(High, Low)]

Y = The coefficients you wish to use (as Ehlers points out, coefficients can be computed using any statistic of choice).

In Ehlers's first example, he sets:

X = Average2(High, Low)

Y = Absolute Value(Momentum(Average2(High,Low), 5)

Users of NeuroShell Trader can go to the STOCKS & COMMODITIES section of the NeuroShell Trader free technical support website to download a copy of the Ehlers filter (Figure 3), as well as an example chart (Figure 4).

For more information on NeuroShell Trader, visit www.NeuroShell.com.

— Marge Sherald, Ward Systems Group, Inc.
301 662-7950, sales@wardsystems.com
www.neuroshell.com

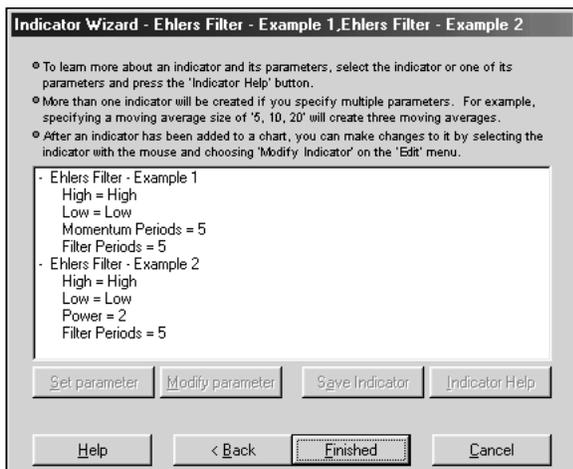


FIGURE 3: NEUROSHELL TRADER. Here's how to add the Ehlers filter custom indicators using NeuroShell Trader's Indicator Wizard. The custom indicators can be downloaded from NeuroShell Trader's free technical support website.

◆ TRADINGSOLUTIONS

In "Nonlinear Ehlers Filters," John Ehlers presents a general filter that can be used with any coefficient statistic to produce a value that can be used like a simple moving average, but with less lag during sharp transitions. The general formula for this filter can be entered in TradingSolutions as follows:

Ehlers Filter (General)

Short Name: Ehlers

Inputs: Price, Coefficient, Length

Div (Sum (Mult (Coefficient , Price) , Length) , Sum (Coefficient , Length))

Using this general function, the sample five-bar momentum version of the Ehlers filter can be entered like this:

Ehlers Filter (Momentum)

Short Name: EhlersMom

Inputs: Price, Length

Ehlers (Price , Abs (Change (Price , 5)) , Length)

Implementing the distance coefficient is slightly more complex, since it subtracts multiple previous prices from the current price. This can be accomplished in TradingSolutions with the following formula:

Ehlers Filter (Distance)

Short Name : EhlersDist

Inputs: Price, Length

Ehlers (Price , Sum (Pow (Sub (Current: Ident (Price) , Lag (Price , 1)) , 2) , Length) , Length)

To produce the value "Current: Ident (Price)," insert the Price input into the formula. Then select it and view the Special Processing page. Press the Add Level button to add the surrounding Identity function and then select "Use the current value of the selected function for all values in the surrounding array function." This tells TradingSolutions to use the current price value for each iteration of the surrounding summation. (See sample chart in Figure 5.)

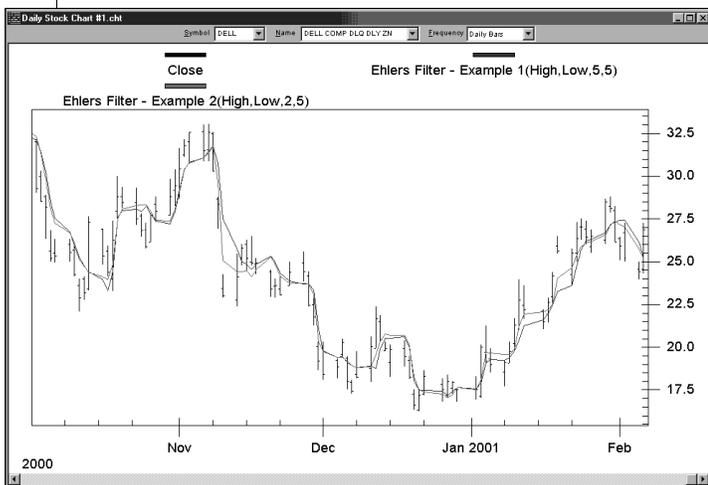


FIGURE 4: NEUROSHHELL TRADER. Here's a sample NeuroShell Trader chart that graphically depicts the Ehlers filters.

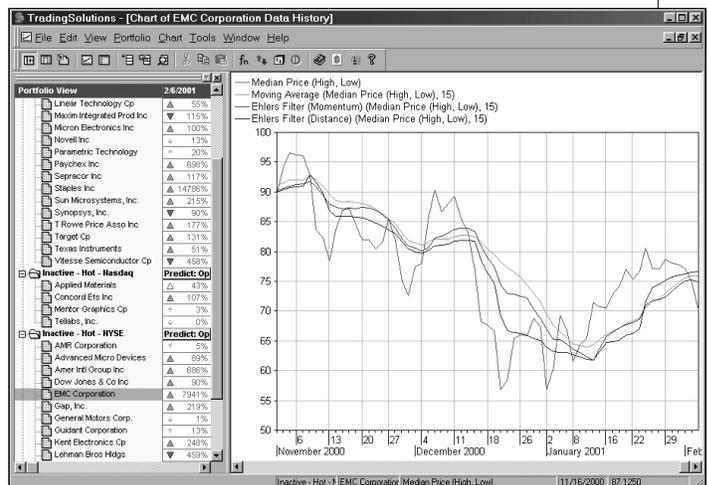
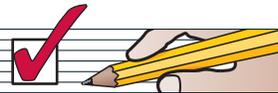


FIGURE 5: TRADINGSOLUTIONS. Here's a sample TradingSolutions chart of the median price of EMC with the 15-period moving average, Ehlers's momentum filter, and Ehlers's distance filter.

TRADERS' TIPS



These functions are available in a function file that can be downloaded from our website in the Solution Library section. It can then be imported into TradingSolutions using "Import Functions..." from the File menu.

To apply one of these imported functions to a stock or group of stocks, select "Add New Field..." from the context menu for the stock or group, select "Calculate a value...", then select the desired function from the "Traders Tips Functions" group.

— Gary Geniesse, TradingSolutions Project Lead
 NeuroDimension, Inc., 800 634-3327, 352 377-5144
 info@tradingsolutions.com, www.tradingsolutions.com

```

Coef = Absolute ( Median - Ago Of Median ) ;
      Value Of Price 5 Of Price ;

Price_x_Coef = Median Price x Coef ;

SumPrice_x_Coef = Summation Of Price_x_Coef ;
                  15

SumCoef = Summation Of Coef ;
           15

SumPrice_x_Coef ÷ SumCoef
    
```

FIGURE 6: BYTE INTO THE MARKET. The Byte Into The Market formula to compute the Ehlers filter is shown.

```

DistCoef = Momentum x Momentum + Momentum x Momentum + Momentum x
            1_of (MPRC) 1_of (MPRC) 2_of (MPRC) 2_of (MPRC) 3_of (MPRC) 3_of (MPRC)
            + Momentum x Momentum + Momentum x Momentum + Momentum x
            4_of (MPRC) 4_of (MPRC) 5_of (MPRC) 5_of (MPRC) ;

SumCoef_x_Price = Summation Of ( DistCoef x Median Price ) ;
                  5

SumCoef = Summation Of DistCoef ;
           5

SumCoef_x_Price ÷ SumCoef
    
```

FIGURE 7: BYTE INTO THE MARKET. Here's the formula to calculate the distance coefficient Ehlers filter.

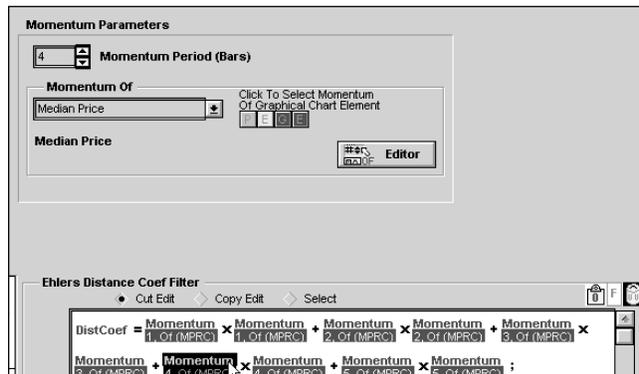


FIGURE 8: BYTE INTO THE MARKET. Clicking a momentum icon in the formula editor displays the icon parameter graphical controls.

◆ BYTE INTO THE MARKET

The Byte Into The Market (BITM) formula to compute the Ehlers filter from John Ehlers's article, "Nonlinear Ehlers Filters," is shown in Figure 6. Figure 7 shows the formula to calculate the distance coefficient Ehlers filter. In the distance filter formula, we used the momentum icon (same as a simple difference over a specified period). The momentum is of the median price ((high+low)/2). Clicking a momentum icon in the formula editor displays the icon parameter graphical controls (Figure 8).

These filter formulas are also available in a downloadable zip file from Tarn Software's website at <http://www.tarnsoft.com/filter.zip>.

— Tom Kohl, Tarn Software
 303 794-4184, bitm@tarnsoft.com
 www.tarnsoft.com

◆ WEALTH-LAB.COM

In "Nonlinear Ehlers Filters," John Ehlers presented the code for creating a nonlinear, finite impulse response filter (FIR). The resulting indicator is similar to a moving average but provides better smoothing in sideways markets and less lag in trending markets.

We've programmed this as a Wealth-Lab.com ChartScript that you can try out against any stock that you wish. Just point your browser to www.wealth-lab.com and click the "Public ChartScripts" link. There, you'll find a ChartScript named "Ehlers Filter." This particular script is a good example of how to create a custom indicator in Wealth-Lab's scripting language, WealthScript, and how to work with functions that manipulate entire price series.

Here is the code for the Ehlers Filter ChartScript.

```

{ Create a Price Series to hold Absolute 5 day momentum }
AbsMom5 := CreateSeries();

{ Populate the Price Series }
for Bar := 6 to BarCount() - 1 do
    SetSeriesValue( Bar, AbsMom5, Abs( PriceAverage(
    Bar ) - PriceAverage(
    Bar - 5 ) ) );

{ Obtain 5 day Abs Momentum multiplied by Average Price }
PriceTimesMomentum5 := MultiplySeries( PriceAverage(),
AbsMom5 );

{ Create Price Series to hold Ehlers Filter }
EhlersFilter := CreateSeries();

{ Populate Ehlers Filter Price Series }
for Bar := 25 to BarCount() - 1 do
begin
    xSumPM := Sum( Bar, PriceTimesMomentum5, 15 );
    xSumM := Sum( Bar, AbsMom5, 15 );
    SetSeriesValue( Bar, EhlersFilter, xSumPM / xSumM );
end;

{ Plot it }
PlotSeries( EhlersFilter, 0, #Teal, 2 );
DrawText( 'Ehlers Filter', 0, 4, 34, #Teal, 8 );
    
```

TRADERS' TIPS



— Dion Kurczek, *Wealth-Lab.com*
 773 883-9047, *dionkk@ix.netcom.com*
www.wealth-lab.com

[3]: [2]F&1 { SumCoef }
 [4]: ([1] * [2])F&1 { Num }
 [5]: [4] / [3] { Filt }

◆ TECHNIFILTER PLUS

Here are the two filtered average formulas from John Ehlers's article in this issue, "Nonlinear Ehlers Filters." In each formula, line 2 calculates the coefficients used in the calculation. The calculation on line 2 in the second formula is algebraically equivalent to the one given by Ehlers; this different form of the formula better fits TechniFilter Plus's algebra.

Formula for Ehlers' filter

NAME: Ehlers_Filter
 SWITCHES: multiline
 PARAMETERS: 15
 FORMULA:

[1]: (H+L)/2 { Price }
 [2]: ([1]-[1]Y5)U0 { Coefficient }

Formula for Ehlers Filter using distance coefficients

NAME: Ehlers_Filter_Dist_Coef

SWITCHES: multiline

FORMULA:

[1]: (H+L)/2 { Price }
 [2]: 5*[1]*[1] - 2*[1]*[1]Y1F5 + ([1]Y1*[1]Y1)F5
 [3]: [2]F5 { SumCoef }
 [4]: ([1] * [2])F5 { Num }
 [5]: [4] / [3] { Filt }

Visit RTR's website at <http://www.rtrsoftware.com> to download this formula as well as program updates.

— Clay Burch, *RTR Software*
 919 510-0608, *rtrsoft@aol.com*
www.rtrsoftware.com

S&C