CONCEPTS FOR USING TC2000/TCNET PCFs

What is a PCF?

PCF stands for Personal Criteria Formula. It is a feature in TC (TC will be used here to refer to both the TC2000 and TCnet software products of Worden Brothers) that lets the user specify 'mathematical' and 'logical' conditions and then select from a watchlist those stocks which meet those conditions. A PCF can range from a very simple one such as C < 50.00 (which means "the closing price today was less than, but not equal to, $50.00) to extremely complex ones limited only by the imagination of the author and the selection of 'variables' in the PCF language.

Why would I want to use a PCF?

By creating your own PCF, you can specify conditions that are not available in the 'packaged' indicators that are built into TC. The PCF is like a 'filter' that let's you sort out the limited number of stocks that are "just what you want" from the whole universe of more than 7000 stocks.

Once you have created a PCF, you can also use it as a 'filter' in an EasyScan, which then automatically creates a watchlist of all the stocks that 'fit through the filter' – not only that, the watchlist is then updated/refreshed every time you download new stock data.

In short, PCF is another tool you can use to find the stocks that match what you are looking for.

What if I'm no good at programming or math?

TC provides 'menu' boxes and 'click to insert' features to help you build the PCF. You are shown a list of all the "operators" that are available for use, and once you select one you are then given choices to select the "parameters" (conditions) you want to use. Most creation of PCFs can be done with nothing more than mouse clicks!

BUT – It is most important that you THINK about what you want the PCF to do.

Setting up a PCF is like writing instructions to a young child who has never done what you want to get done. You must be careful to include every tiny detail. The child (computer) cannot guess or decide what you meant.

If you are no good at thinking about details, you probably will not be good at writing PCFs.

How do I make a PCF in TCnet?

Let's do a very simple pcf first, just to go through the sequences

Suppose we want to find all stocks with a closing price of $50.00 or less

Learning to write a pcf is similar to learning to write a new language --
we must know the words (or symbols) of the new language
we must know how to fit the words/symbols together properly (syntax)

The symbol that is used for the 'last closing price' is   C
The symbol that is used for 'less than' is   <
The symbol that is used for 'equal' is   =

PCF language is very brief and concise; therefore if we write

C <= 50

What we have written above would mean, in English –

"the last closing price was less than or equal to $50.00"

So now we have 'written' the PCF – next we must actually 'make' the PCF in TC

First we have to get TC into the proper 'mode' for writing a PCF

- from the main TCnet screen, at upper left corner, click the **New** button
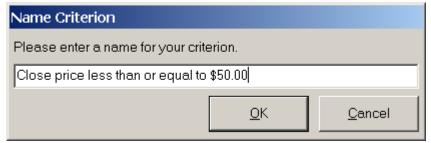
- next click on

- now decide what name you want to call this PCF (one you can easily remember)

Name Criterion

Please enter a name for your criterion.

Close price less than or equal to $50.00

OK   Cancel

when you have typed in the name you want, click on OK

Once in the "PCF editing mode" we have a window for creating and editing the new PCF

Editing formula for Close price less than or equal to $50.00

FUNCTIONS
Open Price
High Price
Low Price
Close/Last Price
Volume
Moving Average
Max Price
Min Price
Stochastics
RSI
BOP
TSV
OBV
MS
MATH OPERATORS
Mulitiply
Divide
Add

Insert

Test   Formula Clipboard   Cancel   Save As   **Save**

- In the editing window we can either just type in the symbols we want to use, or we can pick and choose from the list at the right side … you 'double click' on the Function or Operator you want. Let's do the first symbol (closing price) -

ah … when we double click on Last Price we get another menu from which to choose – do we want today's closing price, yesterday's or some time in the past? For this example, we want today's closing price so we will just click on OK.

the result is simply that the letter C followed by a space show up in the editing window. (Note: Space and Enter characters 'do not count' in the syntax of the PCF language – so you can put lots of 'white space' to make things easier to read, and you can put 'sections' on separate lines for clarity).

- The next 'section' of our PCF needs to say "less than or equal to" – this is not a function, it is a 'Logical Operator' so we slide down on the right side and double click on "Less Than or Equal To" --

which, of course, inserts the symbols <= in the edit window.

- Finally, we need to insert the value $50.00 to complete our PCF. To do this, simply click once to the right of the <= symbols and type in 50 (do not type the $ symbol, and if the price you want is exactly 50 you do not need to type in the decimal value .00 – although you can if you prefer to make it clearer).

The example PCF is now completed. Click the 'Save' button to save it. However, there is a handy 'tool' built into the pcf editor – we can 'test'

our code to see if it really does what we wanted it to do. In our example, this is rather basic – but when you grow to more complex PCFs it can be very useful to be able to see exactly how the code we wrote is being used and calculated in the PCF. If we click on the 'Test' button at the lower left corner of the editing window, all the 'variable' values and 'operators' are activated and we can see the result of our PCF.

As you can see above, our test result is 'True' -- hmmm … that's interesting. Our PCF sets up a condition that is either True (last price IS less than or equal to 50.00) or False (last price IS NOT less than or equal to 50).

If we had written a PCF that just did some numerical calculations and gave a number for the result (no Logical Operators used) then the Test Result would show the number result and the window would show all the values used to calculate the result.

More importantly, in the test window we can see the actual value that was used for C (our last price). And we can clearly see that it is not equal to 50, but it IS less than 50. You can also see the ticker symbol for which the test was calculated (top of window, in blue strip) – VCO. If you want to test the calculation for a different ticker, just click on the 'Change Test Symbol' button at the lower left.

Just to impress on you the importance of being able to see exactly what values and calculations are used when the PCF is much more complex, here is the Test result for a much more complicated PCF --
Here is the actual 'formula' for the pcf …

and here is the Test result, with values shown for every piece of the PCF.

In this case, the condition of the PCF for this stock at this time is False. More importantly, you can view each section to see just how it is working.

So, back to our example. We now have created a PCF and when the 'Save' button is clicked, it will be saved with the name we typed in the beginning of this procedure.

How do we use it, and where do we find it?

Using the newly created PCF

- Before the PCF can be used in the TCnet system, it must be 'calculated.'
  This means that all the values for all the dates used must be fetched from
  the TCnet historical price database and linked to the new PCF.

  The simplest way I have found to do this is to Databank button.

  Then click on the 'Personal Criteria Formulas' selection.
  You will see another window --

  With the latest revision of TCnet, this update feature will spend time only
  updating those PCFs that have not been updated/calculated since the last
  data update.

  The FIRST time you calculate a new PCF, I suggest that you click in the
  small white box at lower left – "When updating, include criteria which
  require data from CD-ROM"

  It is easier and 'safer' to do this rather than have to decide each time if your
  new PCF uses data older than what is in the 'local storage' on your computer.

  However, be sure to un-check this box the next time you update all your PCFs,
  or the update will last forever and ever and ever !!

(Note: I find it is much faster and more reliable to run the data Update *without* the little box checked in that menu – and then run the PCF update (as above) later… this also seems to avoid a lot of crashes during the data updates.

To update/calculate the new PCF, use the Databank sequence described above and click on the "Update All Criteria" button – as noted, this will **not** update *all* the criteria if they have been previously updated!! Just the new one.

When the updating is finished, click the "Close" button and you will be able to use your new PCF for sorting watchlists and as criteria in EzScans.

Suppose we want to find ALL the stocks on the market that closed today at or below $50.00

We just created a simple PCF that is 'true' for those stocks and 'false' for all other stocks.

If we start with a watchlist containing "all stocks" and then 'sort by' our new PCF, we will be able to see those stocks that are 'true' quite easily.

- On the main TCnet page, click on the Watchlist button to create the pull-down menu of all available watchlists …

For our example, click on the "All Stocks" line in the menu.

This will result in a watchlist with EVERY stock that TCnet has in the database (today that is 6762 stocks!)

If you have not made changes to it, Tab 1 of the watchlist area
will look like the screen shown above. This tab is particularly useful
for sorting by PCFs.

As shown above, the stocks are listed alphabetically by their ticker symbol.
We can change that by clicking on the 'Sorted by:' button and picking
a different sorting criteria.

For this example, we want to Sort By the new PCF that is 'true' for all
stocks that closed at or below $50.00

When we click on the 'Sorted by:' button, we will get a pull-down
menu showing not only the PCFs available but also all the EzScans, and
all the 'system criteria' supplied by Worden as part of TCnet.

You can see some of the choices for sorting in the screen above.

To make it easier to find things, and with shorter lists, there are five buttons at the top of this menu list – All, System, PCFs, Real Time, and Indicator. If we click on the PCFs button, then only our PCFs will show in the list.

You can see in this list our new PCF called "Close price less than or equal to $50.00" – note also that for each pcf the date of the data used for the last 'calculation' is shown. If a PCF has not been initially calculated, this date will be blank (or the pcf might now show at all).

If we click on the line for our new PCF, the watchlist of "all stocks" will be sorted so that all the 'true' ones will be together --

TCNet ... Updated through 11:09:00 PM ET -

File   WatchList   Chart Template   Reports   Tools   Databar

⬜New   🔖Jump   ◀ Back ▾   ▷ ▾   🔲 ƒₓ   👤Profile

All Stocks ▾

Sorted by: Close price less than or equal to $50.00 (02/25/04) ▾

1 ⟩ 2 ⟩ 3 ⟩ 4 ⟩ 5 ⟩ 6 ⟩ 7 ⟩ 8 ⟩ 9 ⟩ 10 ⟩

Symbol	Sort Va...	# Users Viewing Chart
ADRU		
ADRE		
ADRD		
ADRA		
ADI		1
ACL		
ACH		
ABK		
ABC		
AAA		
ZVXI	True	5
ZTR	True	1
ZTEL	True	
ZRAN	True	8
ZQK	True	1
ZOOM	True	
ZONS	True	
ZONA	True	
ZOMX	True	
ZOLT	True	1
ZOLL	True	
ZNT	True	
ZNH	True	
ZNDT	True	

As you can imagine, *most* of the stocks are at or under $50.00 so I have adjusted the watchlist so that we see only the end of the 'true' list and the start of the 'not true' (false) list.

At this point, you can create a new watchlist containing only those stocks that closed today at or below $50.00 by right clicking in the grey area at the left of ZVXI (the last 'true' in the list) and selecting "Flag All Below This Item"

Then copy all the flagged items to a new watchlist --

by scrolling to the bottom of the Destination Chart list
and selecting '[New WatchList]' – then click OK.

Type in the name you want to use for the new Watchlist
(in this case, let's use the same name we used for the PCF)

then click on OK again …

The new watchlist has been created, but we are still viewing the original
'All Stocks' with the 'true' conditions shown – click the watchlist
selection button and locate the 'Close price less than or equal to $50.00'
watchlist. (Note: again, there are buttons available at the top of the menu
so that we can show only certain types of watchlists – All, System, Personal,
Scans, Component, Industry, and Shared – if we click on 'Personal' then only
those watchlists that **we** have created will be listed.)

Click on the desired watchlist name and the new watchlist will display.

It is always a good practice to CLEAR all the flags as soon as you
are finished using them – right click on any check mark at left of list
and select 'Unflag All' …

Notice now that ALL the stocks in this list are 'True' …
after all, that was the criteria for the list !!

By the way, if the PCF we wrote had been the type that resulted in
a number value instead of True/False, we could have sorted in Tab 1
by that value and then flagged/selected only the number range we wanted.

Now you can use the watchlist to browse the charts, or select any
of the other Tabs to show other information about the stocks in the list.

Note that now I have changed the 'Sorted by:' back to Ticker Symbol.

Using a PCF in an EzScan

EzScans are a powerful tool in the TCnet system. And they are easy to set up. This is not the place for a full tutorial on using EzScan, but I will show a quick example of how to include a PCF.

Keep in mind that EzScans are a form of FILTER – that is, they select certain conditions and eliminate the rest. So we can not use a PCF that just calculates a number for the result – we can only use PCFs based on Logical Operators.

A big advantage of using EzScan is that it can create a watchlist 'automatically' instead of having to sort a watchlist manually like we did in the previous example.

Our example PCF used in this paper is not a very good example to use in an EzScan because the condition it selects could more easily be set using the slider feature of EzScan. But for this example I will continue to use it.

- To create anything 'new' in TCnet, we first click the 'New' button --

and select 'New EasyScan'

which presents the EasyScan editing window --

- The first condition to be selected is "what large group do we want to start selecting from?"

  Let's select "All Stocks" like we did before --

click on "All Stocks"

and again we can see that there are 6762 stocks in this list (today).

Next we will add our new PCF, which will 'filter' and leave only those stocks that closed today at or below $50.00

Click on "Add New Condition" and a menu of what is available will appear – since we want to find our PCF, next click on the 'PCFs' button and then select the name of our new PCF …

Only those stocks which the PCF sees as 'True' will pass through the filter.

You can see that there are only 6272 stocks left that closed today
at or under $50.00

With EasyScan, it is very easy to add additional 'filters' to reduce the
number of stocks we have to look at, and increase the likelihood that we
will find stocks that are the kind we are looking for.

Let's add one more selection criteria just for example. Volume is a very important criteria – if we buy a stock that trades very low volume, it might be next to impossible to find someone who wants to buy our shares when we decide to sell. So let's look for very 'liquid' stocks that had more than one million shares traded *today*. First we need to add this New Condition --

When we select "Volume 1-Day – H" we'll next have to make a selection about the actual value of the volume …

The screen above is what we see after selecting the criteria
"Volume 1-Day – H" … the slider at the right side can be adjusted
to select a 'Value' close to one million and above.

CAUTION: the current version of TCnet has a flaw in this screen so
that if you try to actually slide the blue area inside the 'thermometer'
the cursor (mouse) will be trapped inside the blue/white area and you
will not be able to continue unless you crash TCnet and restart it, and
then restart building the EzScan. Solution – use the arrow buttons on
the far right side (the cursor appears over one in the screen above).

Now you can see that by selecting only stocks with more than 9975oo
shares of volume today, our selected stocks have dropped from 6272
to 584 – a significant reduction.
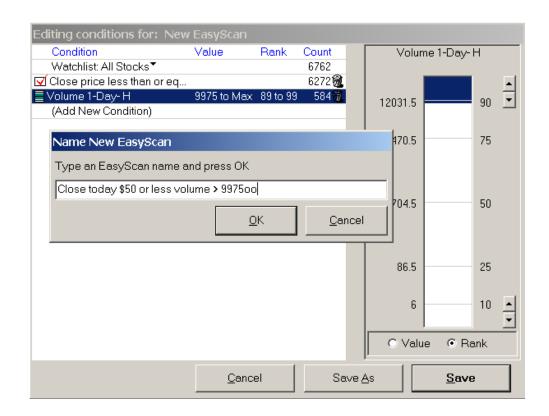
NOTE: remember that the values for volume are always shown without
the last two zeros. That is why I always write the volume as done above,
as 9975oo – the last two zeros are small and remind you they 'don't count'
in TCnet.

When you have selected all your filter conditions and set the values for
them, click the 'Save' button.

Since we have not yet selected a name for this EasyScan, now is the time to do that – type in the desired name in the text window and click OK.

When you have saved the EasyScan, it will be available as a **Watchlist** !!

To locate the new EzScan watchlist, click on the EzScan icon at top of the page, then click the 'Scans' button in the watchlist menu, scroll to find the name of the new watchlist, and click once on the watchlist name.

The new watchlist will appear and you can sort it or do anything with it that you can do with any other watchlist – BUT it has one very important and useful feature, because it is an EzScan watchlist …

EzScan watchlists are 'dynamic' – that is, they will change by themselves.

The next time you update closing price data, the number of stocks and which ones they are will change to meet the criteria set up in the EzScan -- that is, $50 or less and volume more than 9975oo.

Symbol Company Name	Last-RT Net-RT	% Chang... Bid-RT	Ask-RT Bid V...	Ask V...	Bid Ti... Vol-RT	High-... Low-RT
A Agilent Technologie...	**34.20** 0.00	0% 33.30	35.20 4	2	20208	34.20 34.20
AA Alcoa Inc	**37.17** 0.00	0% 36.72	37.25 12	10	36317	37.17 37.17
AAC Ableauctions.Com Inc	**0.78** 0.00	0% 0.74	0.82 10	20	5727	0.78 0.78
AAII Aai Pharma	**15.49** 0.00	0% 0.01	9000.00 1	1	↓ 15449	15.49 15.49
AAPL Apple Computer Inc	**23.11** 0.00	0% 13.48	32.74 1	1	↑ 35429	23.11 23.11
ABGX Abgenix Inc	**15.02** 0.00	0% 5.05	25.11 1	1	↓ 15123	15.02 15.02
ABS Albertson's Inc	**24.86** 0.00	0% 24.00	24.86 1	1	21120	24.86 24.86
ABT Abbott Laboratories	**43.05** 0.00	0% 42.95	43.95 1	2	38189	43.05 43.05
ABX Barrick Gold Corp	**20.32** 0.00	0% 20.20	20.48 3	2	29409	20.32 20.32
ACG Acm Income Fund	**8.56** 0.00	0% 0.01	25.98 1	1	7806	8.56 8.56
ACN Accenture Ltd	**23.09** 0.00	0% 22.86	23.49 8	8	21367	23.09 23.09
ACS Affiliated Computer ...	**48.89** 0.00	0% 0.00	49.68	2	14865	48.89 48.89
ADBE Adobe Systems Inc	**37.71** 0.00	0% 19.24	56.10 1	1	↑ 45928	37.71 37.71
ADCT Adc Telecommunic...	**2.99** 0.00	0% 0.01	9000.00 1	1	↓ 155845	2.99 2.99

A: 1 of 584 Items in WatchList

Brainpower and Concepts for Creating a PCF

Important Steps to creating a PCF

- Know what you are trying to find.

- Sketch the chart pattern you want to find or work with.

- Label all the important points on the sketch.

- Label any calculations you will need to make.

- Build your PCF step-by-step, in little pieces, like building blocks.

Know what you are trying to find
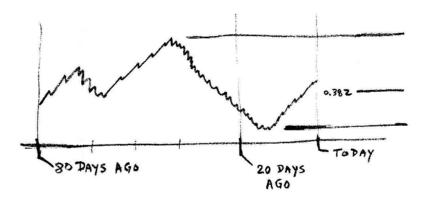
You cannot find your way to Santa's Workshop unless you know that you are going to the North Pole. Likewise, you cannot write a PCF unless you know what you want it to do.

For the purpose of this paper, let's decide that we want to find all stocks that have –

- dipped to a minimum price within the last 20 days
- had a previous peak price within the last 100 days, but not in the last 20 days
- recovered, after the dip, by 0.382 of the distance between the peak and dip
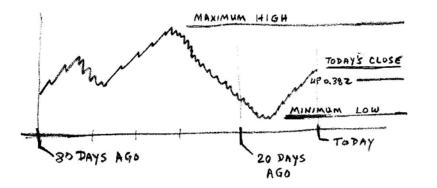
Sketch the chart pattern you want to work with

Here is what a sketch of these conditions would look like –
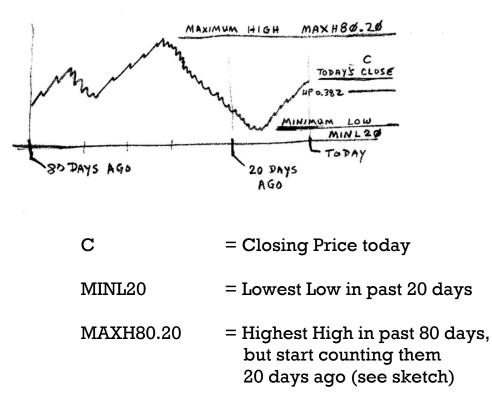
Label all important points on the sketch

The first stage of labeling the sketch would show in words the important points –

But then we should also label these points with the PCF language 'code' we will use –

C	= Closing Price today
MINL20	= Lowest Low in past 20 days
MAXH80.20	= Highest High in past 80 days, but start counting them 20 days ago (see sketch)

Label any calculations you will need to make

At this point, all this may seem like a lot of work.
It is!! But it is the best way to keep track of what you are doing,
to clearly see how things relate to each other, and to see what you
need to calculate and how.

Since we want to know if today's closing price is close to the
0.382 Fib line up from the bottom of the dip to the top of the peak,
we will need to calculate the total distance from dip to peak, and
then calculate 0.382 of that distance, and then add the 0.382 distance
to the value at the bottom of the dip.

We can show these calculations on the sketch like this –

Ⓐ "peak minus dip"   MAXH80.20 - MINL20
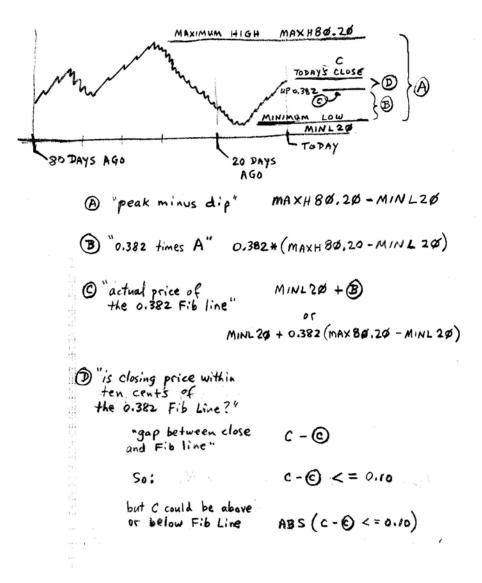
Ⓑ "0.382 times A"   0.382 * (MAXH80.20 - MINL20)

Ⓒ "actual price of   MINL20 + Ⓑ
    the 0.382 Fib line"

                                    or

              MINL20 + 0.382 (MAX80.20 - MINL20)

Ⓓ "is closing price within
    ten cents of
    the 0.382 Fib Line?"

        "gap between close   C - Ⓒ
        and Fib line"

        So: C - Ⓒ <= 0.10

        but C could be above
        or below Fib Line   ABS (C - Ⓒ <= 0.10)

For simplicity above, I used the symbol © instead of the pcf language symbols on the sketch. To put together the final PCF, let's put the "building blocks" together –

$$C - (MINL20 + 0.382 * (MAX80.20 - MINL20)) < = 0.10$$

However, as mentioned on the sketch page, the closing price C might be above OR below the Fib. line, so the left part above could be positive or negative – but the 0.10 is always positive. We can solve this problem by using the "absolute value" (which simply removes the minus sign) –

ABS (C – (MINL20 + 0.382 * (MAX80.20 – MINL20))) < = 0.10

Because we used some "logical operators" in this PCF (the < and =), the result of the PCF won't give us a number answer – it will give us either a TRUE or FALSE answer.

If a watchlist is sorted using this PCF, we'll be able to see all the stocks that meet all the conditions we set up.

Now for some "homework"

Now see if you can reverse the conditions and create another PCF to detect stocks where there was a peak in the last 20 days and a dip in the 80 days before that, and the closing price is within ten cents of the Fib line 0.382 <u>down</u> from the peak value.