# User Guide

Wealth-Lab Developer 4.0

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# Wealth-Lab Developer 4.0 User Guide

***by WL Systems, Inc.***

*Revised: Friday, October 26, 2007*

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*EC Software, whose product HELP & MANUAL printed this document.*

# Table of Contents


Part I How to Purchase Wealth-Lab Developer 6

Part II Introduction 7

1 What is Wealth-Lab Developer 4.0? 7
2 Important Terms & Orientation 8
3 Notes on Trading System Development 8
4 Keyboard Shortcuts by Category 10
5 Keyboard Shortcuts 13
6 Wealth-Lab Developer 4.0 FAQs 14
7 Components 15

Part III Data Access 17

1 Data Access Overview 17
2 New DataSource Wizard 18
Overview 18
Web DataSources 18
Primate Software Integrated Data 19
MetaStock DataSources 21
ASCII DataSources 21
TC2000 DataSources 24
QuotesPlus DataSources 25
Tai-Pan DataSources 25
Intraday Historical DataSources 26
COM Adapter DataSources 27
3 DataSource Manager 28
DataSource Manager Overview 28
DataSource Actions 29
WatchList Actions 32
Primate Data Management 32
4 Data Loading Control 33
5 Futures Mode 36
6 Data Precision Considerations 36
7 Data Access FAQs 39

Part IV ChartScripts 41

1 Overview 41
2 ChartScript Explorer 42
3 ChartScript Windows 45
ChartScript Window Overview 45
Control and Status Panels 46
Chart View 49
Chart View Summary 49
Manipulating the Chart 50
Plotting Indicators 56
Indicator QuickPlot 58
Studies and Custom Indicators 63


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Chart Drawing Tools ... 65
Chart Trading ... 73
**Performance View ... 76**
**Trades View ... 79**
**Profit View ... 80**
**MAE/MFE View ... 81**
**Editor View ... 81**
Summary ... 81
Using the Editor ... 82
Smart Code Editor ... 83
Editor Keyboard Shortcuts ... 85
**Description View ... 86**
**Analysis Series View ... 87**
**4 Creating a New ChartScript ... 88**
**5 New ChartScript Wizard ... 91**
**6 New Indicator Wizard ... 97**
**7 Download ChartScripts ... 98**
**8 Backup and Restore ChartScripts ... 99**
**9 Favorite ChartScripts ... 99**
**10 Preferred ChartScript for Symbol ... 100**
**11 Common ChartScript Errors ... 101**

## Part V ChartScript Integrated Debugger 103

**1 Overview ... 103**
**2 Debugging Quickstart ... 103**
**3 Breakpoints ... 104**
**4 Debugging Tools ... 105**
**5 Variable Inspector ... 107**
**6 Debugging Approach Notes ... 110**

## Part VI ChartScript Optimization 112

**1 Optimization Overview ... 112**
**2 Getting Started with Optimization ... 113**
**3 Optimization Variables ... 114**
**4 Optimization Control ... 117**
**5 Performing the Optimization ... 119**
**6 Results Explorer ... 120**
**7 Preferred #OptVars ... 123**
**8 Optimization FAQs ... 124**

## Part VII Real-Time ChartScript Windows 126

**1 Real-Time ChartScripts Overview ... 126**
**2 Real-time ChartScript Window ... 126**
**3 Features of Real-time ChartScripts ... 128**
**4 Real-time Considerations ... 131**
**5 Real-Time Vendors Supported ... 132**
**Real-Time Vendors Summary ... 132**

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QCharts ... 132
eSignal ... 133
Tai-Pan Real-Time ... 134
Medved QuoteTracker ... 134
Townsend Analytics ... 134
Interactive Brokers ... 135
DTN IQFeed ... 135
Real-Time Data Adapters ... 135

Part VIII Scans 136

1 WatchList Scans Overview ... 136
2 Scans Control ... 136
3 Multi-Scan ... 138
4 List Management ... 140
5 Alerts View ... 141
6 Performance View ... 143
7 Open Positions View ... 144
8 Custom Columns View ... 145
9 Errors View ... 146
10 Applying Scans in Trading ... 146
11 WatchList Scans FAQs ... 147

Part IX Screener 149

1 Screener Overview ... 149
2 Creating and Editing Screens ... 149
3 Running a Screen ... 152
4 Screener Results ... 153

Part X $imulator 155

1 $imulator Overview ... 155
2 $imulator Interface ... 158
3 Performance View ... 163
4 Trades View ... 167
5 Equity Curve View ... 169
6 Profit Distribution View ... 170
7 MAE/MFE View ... 171
8 Drawdown View ... 171
9 By Period View ... 172
10 Analysis Series View ... 173
11 Alerts View ... 173
12 Errors View ... 174
13 $imulation FAQs ... 175

Part XI ChartScript Rankings 177

1 ChartScript Rankings Overview ... 177
2 ChartScript Rankings Control ... 177

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3 Results View ... 178
4 Errors View ... 182
5 ChartScript Ranking FAQs ... 183

Part XII WatchList Rankings 184

1 WatchList Rankings Overview ... 184
2 WatchList Rankings Control ... 184
3 Results View ... 185
4 Errors View ... 189
5 WatchList Rankings FAQs ... 189

Part XIII Quote Manager 190

1 Quote Manager Overview ... 190
2 Quote Manager Window ... 191
3 Alert Management ... 193
4 Quote Manager Options ... 194
5 Alert Lists ... 196
6 Employing the Quote Manager ... 199
7 Quote Data Providers ... 200

Part XIV Real-Time Scans 201

1 Real-Time Scans Overview ... 201
2 Setting up Real-Time Scans ... 201
3 Scan Results View ... 204
4 Errors View ... 206

Part XV Evaluator 207

1 Evaluator Overview ... 207
2 Evaluator Results ... 208

Part XVI Portfolio Manager 212

1 Portfolio Manager Overview ... 212
2 Creating a Portfolio ... 213
3 Paper Portfolio Actions ... 213
4 Positions View ... 217
5 Local Trade History View ... 218
6 Equity Curve View ... 220
7 Portfolio Manager FAQs ... 220

Part XVII Order Manager 222

1 Order Manager Overview ... 222
2 Order Management Concepts ... 223
3 Preparing for Automated Trading ... 229
4 Order Manager Options ... 232

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5 Manual Order Entry ... 234
6 Order List & Management ... 236
7 Status Panel Information ... 240
8 Order Manager FAQs ... 242

Part XVIII Options Dialog 244

1 Options Dialog Overview ... 244
2 Automated Execution Options ... 245
3 Colors/Style Options ... 246
4 Editor Options ... 248
5 EMail Alerts ... 249
6 Preferred Values Options ... 250
7 Sounds Options ... 251
8 Synchronization Options ... 252
9 System Settings Options ... 255
10 Trading Costs/Control Options ... 257
11 Indicator Calculations ... 261

Part XIX Other Tools 263

1 Position Sizing Control ... 263
2 Function QuickRef ... 267
3 Commentary Viewer ... 268
4 Data Window ... 269
5 Debug Window ... 269
6 Include Manager ... 270
7 Futures Symbols Manager ... 271
8 Preferred Values Manager ... 273
9 Series Synchronization Checker ... 275
10 Unload ActiveX Libraries ... 275

Part XX COM Support 277

1 COM Support Overview ... 277
2 COM Support in WealthScript ... 277
3 COM (OLE) Automation ... 279
4 Creating COM Add-Ins ... 282
5 Creating COM Adapters ... 284

Index 285

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# 1 How to Purchase Wealth-Lab Developer

### Phone, Fax, and Secure Web Orders

Please visit the following web page to learn how to place phone or fax orders, or to order online using a secure order form.
https://www.regsoft.net/regsoft/vieworderpage.php3?productid=42936

**Note!** Wealth-Lab Developer 4.0 **is available to customers outside of the US and Canada only.** If you are a U.S. or Canadian resident, please contact Fidelity Investments and inquire about obtaining Wealth-Lab Pro.

### Pricing

Wealth-Lab Developer 4.0 is sold for a **one-time** licensing fee of **$650** USD.

### Registration Process

When you fill out the online order form you'll need to provide a Hardware Fingerprint that identifies the computer that Wealth-Lab Developer 4.0 will run on. Obtain this Fingerprint by clicking the "Enter Key" button in the dialog that appears when Wealth-Lab Developer 4.0 starts up. After your registration is complete, we'll send you an unlock code that you'll enter into the registration dialog to unlock the program. We will provide an additional unlock code for a second computer or laptop if required and upon request.

### Minor Upgrades

Minor upgrades, or builds, are made available frequently (often two or more per month) to add enhancements requested by the user community or to fix potential deficiencies in the Wealth-Lab Developer 4.0 product. Minor upgrades are **absolutely free**.

### Major Upgrades

Each Wealth-Lab Developer 4.0 license entitles the user to 1 free "point" (version) upgrade. For example, a customer purchasing V3.0 may claim a free upgrade to V3.01. If the same customer wishes to upgrade to 3.02, having a 3.0 license he/she will pay a $100 USD upgrade fee for the V3.02 and V3.03 license.

As point upgrades are planned to occur approximately every 6 months, users can always enjoy the latest version of Wealth-Lab Developer 4.0 for a low maintenance fee of only approximately $100 USD per year!

### EMail

info@wealth-lab.com

### Web Site Support

Post messages in the Discussion Forum at the Wealth-Lab.com web site. For individual support subject to Our Support Policy, please use the site's Support Portal (login required).

## Thank You!

We appreciate your support! Let's continue to work together to build the best trading system development platform available!

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# 2 Introduction

## 2.1 What is Wealth-Lab Developer 4.0?

Wealth-Lab Developer 4.0 is a complete platform for developing and back-testing stock and futures trading strategies based on technical analysis. Proven trading strategies can be applied to trading end-of-day as well as real-time data using Wealth-Lab's *automated trading station* (ATS) features.

A trading strategy (or, trading system) is a set of explicit rules that tell you when to buy, sell, sell short, and cover. A trading system is meant to exploit opportunities for profit in the markets. Wealth-Lab Developer 4.0 lets you develop and validate trading strategies, and can help you implement them in real-world trading.

### Who Should Use Wealth-Lab Developer 4.0?

Wealth-Lab is a programming environment, and is geared toward programmers. By offering a full-blown programming platform, there is no limit to the strategy ideas that can be transcribed, tested and traded. However, the product contains a number of Wizards and visual tools that allow non-programmers to create their own trading systems. The tools are specially designed so that non-programmers can leverage the expertise of the Wealth-Lab programming community, who provide a constant source of fresh ideas. So, the bottom line is that Wealth-Lab Developer 4.0 is **the** tool for ***anyone*** who is interested in technical analysis-based trading systems.

### Getting a True Sense of a Strategy's Potential

Before committing your money to trading a strategy, it's important to test the strategy on as many markets and time periods as possible. Wealth-Lab Developer 4.0 allows you to test strategies on a single market or on a complete portfolio at once. Thorough back-testing can give you the confidence to employ a trading system on your actual trading account.

### Finding a Strategy for You

Every individual has a distinct personality, risk tolerance, and amount of time that can be dedicated to trading. Wealth-Lab Developer 4.0 comes pre-packaged with hundreds of trading systems developed by the Wealth-Lab community. You can explore these systems to find one that best suits your own trading style. Or, find a system that you can use as the basis for your own unique creation.

### Putting a Strategy into Action

After you find your ideal strategy (or strategies) it's time to trade. Wealth-Lab Developer 4.0 offers tools that help you manage your trading on a day by day, or tick by tick, basis. You can run your scans at the end of every day, or run your systems on live data and get signals in real-time.

### The Wealth-Lab Community

Using Wealth-Lab Developer 4.0, you can Download new ChartScripts directly from the Wealth-Lab.com web site[1]. You'll be amazed when you see some of the ChartScripts that Wealth-Lab users have created (many of which are included in this installation). Some examples include drawing dynamic trendlines, handling multiple positions, and performing walk-forward optimization from within the script. This dynamic community is one of the key advantages that you can tap into.

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## 2.2 Important Terms & Orientation

### WealthScript

The foundation of Wealth-Lab Developer 4.0 is our WealthScript scripting language. WealthScript is based on the standard Pascal programming language, and contains special extensions specific to trading system development. Wealth-Lab Developer 4.0 contains a complete WealthScript programming environment, but also provides a number of Wizards that makes it possible for non-programmers to craft trading strategies visually.

### ChartScript

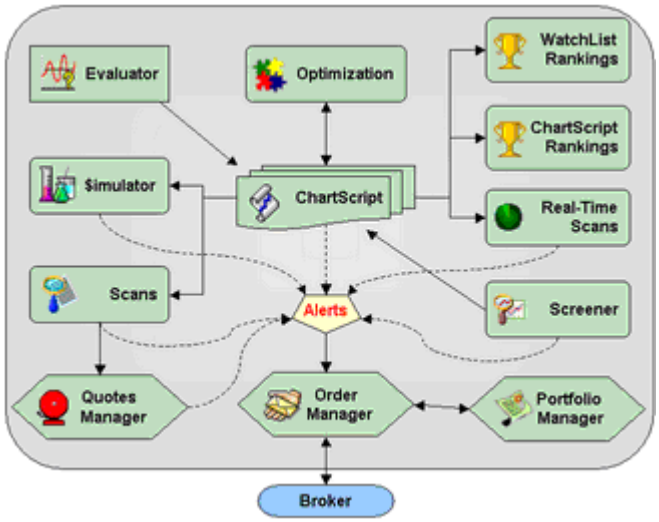
Generally speaking, a script, which is a computer program in itself, is normally used to automate methods and features within an application. A *ChartScript* is a script written in the WealthScript language. It can contain trading strategy rules, but can also contain instructions on which indicators should be plotted on the chart, as well as various other chart annotations. The ChartScript packages the trading system logic with its visual presentation.

### $imulation

A $imulation is a historical simulation of a trading strategy on a portfolio of stocks or futures, with starting capital and position-sizing rules applied. It provides a real-world account of what would have happened if you had applied the strategy over a historical period.

### Orientation

If you're new to the tools and endless capabilities of Wealth-Lab Developer 4.0, at first it may feel like you're drinking from a fire hose. Each of the tools in the diagram below is covered in their own topic in this guide, and we suggest that you take some time to learn each one before moving on to the next.




## 2.3 Notes on Trading System Development

Below are some of our key philosophies concerning trading system development and evaluation. Wealth-Lab Developer 4.0 is a flexible tool, and you can adapt it to your own style. But we feel that the following represent good practices to keep in mind.

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### Position Sizing Notes

When testing your system on a single market, it's important to establish a metric to measure the system's efficiency. For stocks, make sure that each Position has an equal dollar value. By doing this, you'll prevent distortions in the system results that occur when you instead give each position a fixed share size. In futures markets, each point movement translates to the same dollar gain or loss. For this reason, futures Positions are always established using a fixed contract size, rather than a dollar size.

### Measuring the System's Performance

We use the Profit per Bar metric to gauge the efficiency of the trading system compared to Buy & Hold. Profit per Bar is simply the system's total net profit divided by the total number of bars that the system held open Positions. This method lets us fairly compare the system results to Buy & Hold's, even if our system manages multiple open Positions.

The following examples show how Profit per Bar relates to net profit and holding time.

| Strategy | Net Profit | Bars Held | Profit per Bar | Conclusion |
|---|---|---|---|---|
| Buy & Hold | $2000 | 1000 | $2.00 | Baseline |
| Breakout | $200 | 120 | $1.67 | Poor |
| Trend Follower | $670 | 450 | $1.48 | Poor |
| Oscillator | $300 | 60 | $5.00 | Very Good |
| BBand Break | $95 | 13 | $7.30 | Best |
| Average Down | $4500 | 3600 | $1.25 | Poor (even though Profit is higher) |

### Position Sizing

At first glance, the results above don't look very promising. The Buy & Hold strategy resulted in the most net profit. So why use a trading system at all? Note that the Oscillator and BBand Break systems both had a Profit per Bar substantially higher than that of Buy & Hold. This indicates that the systems were more efficient at extracting money from the market.

You can translate this efficiency into profit by applying Position-sizing rules to the system. The idea is to maximize the exposure of the system without taking on too much risk. By increasing the Position size, you can realize more profit. In the example above, we can take the BBand Break system and apply a Position-sizing strategy of 25% of capital per Position. The results would be amazing.

When evaluating the results of a system, we look at total net profit, but also Exposure, Max DrawDown and other metrics. Our own statistic, Wealth-Lab Score, combines profit, exposure and drawdown into a single figure.

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| Strategy | Net Profit | Exposure | Drawdown | WL Score |
|---|---|---|---|---|
| Buy & Hold | 75% | 100% | 34% | 49.5 |
| Breakout | 15% | 23% | 13% | 56.7 |
| Trend Follower | 32% | 47% | 39% | 41.5 |
| Oscillator | 12% | 15% | 29% | 56.8 |
| BBand Break | 10% | 6% | 24% | 126.6 |

We can now re-run BBand Break, but increase the Position-sizing to 25% of capital per Position:

| | | | | |
|---|---|---|---|---|
| BBand Break | 120% | 65% | 37% | 116.3 |

Net profit increased (beating Buy & Hold). Note that Wealth-Lab Score changed only slightly, illustrating that this metric isn't as influenced by Position-sizing as net profit is.

**Optimization**

The process of Optimization involves having the computer try out some or all of the various combinations of parameter values for your trading system, and finding the most profitable values. Wealth-Lab Developer 4.0 provides state of the art Optimization capabilities, but be careful! The danger of Optimization is that you'll find a set of values that worked well in the past, but that don't work at all going forward.

There are a few things you can do to minimize this danger. First, look for profitable **ranges** of optimized parameter values, rather than individual points that stick out. Wealth-Lab Developer 4.0's 2D and 3D graphs will help you visualize the profit ranges. Second, optimize the data from one historical period and then run a $imulation with the optimized values in for a different period. This "walk-forward optimization" technique will help you avoid the perils of curve fitting your systems.

---

## 2.4 Keyboard Shortcuts by Category

Sequences of several keyboard shortcuts have changed from previous versions of Wealth-Lab Developer 4.0 for better commonality with similar functions in other Windows applications. Just about every Wealth-Lab Developer 4.0 tool can be opened without using the mouse, and, you can navigate between open instances of each tool using the **Ctrl+Tab** key sequence.

To activate/deactivate the main menu items from the keyboard, strike (and release) the **Alt** key. When activated, the menu items will contain an underlined letter that you can select on the keyboard to expand the menu item. You can then select the desired function in the menu drop-down list in a similar manner or by clicking the item with the mouse. Alternatively, after activating the menu with the Alt key, you can navigate with the arrow keys and press the Enter key to launch the highlighted item.

To use the shortcuts, press and hold the Ctrl key (and Alt key as applicable) and then strike the desired letter on the keyboard. You may have Caps Lock activated, but do not use the Shift key when choosing a letter.

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**See Also:** Editor Keyboard Shortcuts 85

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### File menu

| | |
|---|---|
| **Ctrl + N** | New ChartScript |
| **Ctrl + W** | New ChartScript Wizard |
| **Ctrl + I** | New Indicator Wizard |
| **Ctrl + O** | Open ChartScript |
| **Ctrl + T** | Open ChartScript for Optimization |
| **Ctrl + G** | Open ChartScript for Debugging |
| **Ctrl + S** | Save ChartScript |
| **Ctrl + E** | Save ChartScript As... |
| **Ctrl + P** | Print |
| **Ctrl + Alt + X** | Exit |

---

### Edit menu (for use in the ChartScript Editor view).

| | |
|---|---|
| **Ctrl + X** | Cut |
| **Ctrl + C** | Copy |
| **Ctrl + V** | Paste |
| **Ctrl + Z** | Undo |
| **Ctrl + A** | Select All |
| **Ctrl + F** | Find |
| **Ctrl + H** | Find & Replace |

---

### DataSources menu

| | |
|---|---|
| **Ctrl + D** | New DataSource |
| **Ctrl + M** | DataSource Manager |
| **Ctrl + Alt + L** | Enable On-demand Updates |
| **Ctrl + Alt + Z** | Enable Streaming (for next ChartScript Window opened) |

---

### Chart menu

| | |
|---|---|
| **F5** | Execute [ChartScript] |
| **Esc** | Stop [ChartScript] Execution |
| **F4** | Fix ChartScript |
| **+/- keys** | Increase/decrease bar spacing (chart window) |

---

### Tools menu

| | |
|---|---|
| **F2** | Scans |
| **Ctrl + Alt + S** | Screener |
| **F3** | $imulator |
| **Ctrl + Alt + R** | ChartScript Rankings |
| **Ctrl + Alt + W** | WatchList Rankings |
| **Ctrl + Alt + A** | Quote Manager |
| **Ctrl + Alt + M** | Real-Time Scans |
| **Ctrl + Alt + E** | Evaluator |
| **Ctrl + R** | Order Manager |

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| | |
|---|---|
| **Ctrl + Alt + T** | Portfolio Manager |
| **F6** | Include Manager |
| **Ctrl + Alt + F** | Futures Symbol Manager |
| **Ctrl + Alt + P** | Preferred Values Manager |
| **Ctrl + Alt + K** | Series Synchronization Checker |
| **F12** | Options |
| **Ctrl + Alt + O** | Proxy Server Settings |
| **Ctrl + U** | Unload ActiveX Libraries |

---

### **View menu** (toggles view of the item described)

| | |
|---|---|
| **Ctrl + Alt + C** | Commentary Window |
| **Ctrl + Alt + V** | Data Values Window |
| **Ctrl + Alt + D** | Debug Window |
| **Ctrl + Alt + N** | Chart Notes |

---

### Help menu

| | |
|---|---|
| **F1** | Wealth-Lab Help, QuickRef from ChartScript Window |
| **Ctrl + K** | Function QuickRef |

---

### Order Manager

| | |
|---|---|
| **F11** | Panic button (Cancels all open orders) |

---

### Chart Window

| | |
|---|---|
| **+/- keys** | Increase/decrease bar spacing |
| **. key** | Toggle cursor mode pointer/cross hairs |
| **Arrow keys** | Scroll chart horizontally |
| **Begin/End keys** | Fast Scroll chart horizontally to first/last bar |

---

### ChartScript Window Editor View

| | |
|---|---|
| **Ctrl + Space** | WealthScript Function List |
| **Ctrl + Shft + Space** | Force Smart Code Parameter List pop-up |

*Shortcuts applicable to a ChartScript Window opened for debugging:*

| | |
|---|---|
| **Ctrl + Alt + I** | View Variable Inspector |
| **Ctrl + F5** | Add to Variable Inspector |
| **F7** | Step Into |
| **F8** | Step Over |
| **F9** | Run to Breakpoint |
| **F10** | Stop Debugging / Reset Script |

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## 2.5 Keyboard Shortcuts

| | |
|---|---|
| **Ctrl + A** | Select All (ChartScript Editor) |
| **Ctrl + C** | Copy (ChartScript Editor) |
| **Ctrl + D** | New DataSource |
| **Ctrl + E** | Save ChartScript As... |
| **Ctrl + F** | Find (ChartScript Editor) |
| **Ctrl + G** | Open ChartScript for Debugging |
| **Ctrl + H** | Find & Replace (ChartScript Editor) |
| **Ctrl + I** | New Indicator Wizard |
| **Ctrl + K** | Function QuickRef |
| **Ctrl + L** | Options Dialog \| Color/Style tab |
| **Ctrl + M** | DataSource Manager |
| **Ctrl + N** | New ChartScript |
| **Ctrl + O** | Open ChartScript |
| **Ctrl + P** | Print |
| **Ctrl + R** | Order Manager |
| **Ctrl + S** | Save ChartScript |
| **Ctrl + T** | Open ChartScript for Optimization |
| **Ctrl + U** | Unload ActiveX Libraries |
| **Ctrl + V** | Paste (ChartScript Editor) |
| **Ctrl + W** | New ChartScript Wizard |
| **Ctrl + X** | Cut (ChartScript Editor) |
| **Ctrl + Z** | Undo (ChartScript Editor), Clear Alerts (Quote Manager) |
| **Ctrl + Tab** | Changes focus to next open tool window |
| **Ctrl + F5** | Add to Variable Inspector (ChartScript opened for debugging, only) |
| **Ctrl + Space** | WealthScript Function List (Editor View) |
| **Ctrl + Shft + Space** | Force Smart Code Parameter List pop-up (Editor View, within parameter list) |
| **Ctrl + Alt + A** | Quote Manager |
| **Ctrl + Alt + C** | Commentary Window |
| **Ctrl + Alt + D** | Debug Window |
| **Ctrl + Alt + I** | View Variable Inspector (ChartScript opened for debugging, only) |
| **Ctrl + Alt + E** | Evaluator |
| **Ctrl + Alt + K** | Series Synchronization Checker |
| **Ctrl + Alt + T** | Portfolio Manager |
| **Ctrl + Alt + F** | Futures Symbol Manager |
| **Ctrl + Alt + L** | Enable On-demand Updates |
| **Ctrl + Alt + M** | Real-Time Scans |
| **Ctrl + Alt + N** | Chart Notes |
| **Ctrl + Alt + O** | Proxy Server Settings |
| **Ctrl + Alt + P** | Preferred Values Manager |
| **Ctrl + Alt + R** | ChartScript Rankings |
| **Ctrl + Alt + S** | Screener |
| **Ctrl + Alt + X** | Exit |

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| | |
|---|---|
| **Ctrl + Alt + V** | Data Values Window |
| **Ctrl + Alt + W** | WatchList Rankings |
| **Ctrl + Alt + Z** | Enable Streaming (for next ChartScript Window opened) |
| | |
| **Esc** | Stop [ChartScript] Execution |
| **F1** | Wealth-Lab Developer 4.0 Help, QuickRef from ChartScript Window |
| **F2** | Scans |
| **F3** | $imulator |
| **F4** | Fix ChartScript |
| **F5** | Execute [ChartScript] |
| **F6** | Include Manager |
| **F7** | Step Into (ChartScript opened for debugging, only) |
| **F8** | Step Over (ChartScript opened for debugging, only) |
| **F9** | Run to Breakpoint (ChartScript opened for debugging, only) |
| **F10** | Stop Debugging / Reset Script (ChartScript opened for debugging, only) |
| **F11** | Panic (Cancel all open orders) |
| **F12** | Options |
| | |
| **+/- keys** | Increase/decrease bar spacing (Chart window) |
| **. key** | Toggle cursor mode pointer/cross hairs (Chart window) |
| **Arrow keys** | Scroll chart horizontally (Chart window) |
| **Begin/End keys** | Fast Scroll chart horizontally to first/last bar (Chart window) |

---

## 2.6 Wealth-Lab Developer 4.0 FAQs

### *How do I save the results that Wealth-Lab Developer 4.0 tools generate?*

Almost anywhere Wealth-Lab Developer 4.0 presents data, you're just two clicks away from copying it to the Windows clipboard for export to another program. Tabular data will be pasted, for example, directly into Microsoft Excel in a delimited format. Charts and graphs are copied exactly as the images appear in Wealth-Lab. Just right click on tabular data or on a chart/graph and select your copy option from the pop-up menu.

The $imulator and Optimizer have the additional ability to save their data in special formats for later review in Wealth-Lab Developer 4.0. Click their links to jump to the respective documentation.

Saving/Exporting $imulation Results 158
Saving Optimization Results 120

---

### *How do I save my Wealth-Lab Developer 4.0 Workspace?*

When you have a configuration of windows and tools that you would like to recall in a future Wealth-Lab session, select **File | Save Workspace (Ctrl+Alt+H)** from the main menu. Reload a saved Workspace by clicking **File | Open Workspace (Ctrl+Alt+G)**

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### *How can I open multiple workspaces simultaneously?*

Since a workspace is global, it applies to the entire Wealth-Lab Developer 4.0 environment. You can, however, start more than one instance of Wealth-Lab

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Developer 4.0 and then load a different workspace into each one. Simply switch between your Wealth-Labs using the Windows Task bar.

---

***What do I do when I receive the message, "Class not registered"?***

Computer applications are dependent on other components and servers (programs) to function properly. Wealth-Lab has many such "open interfaces" so that you can connect via COM 277 to a multitude of static and real-time data providers, brokers, objects, etc. The message means that you have attempted to connect to one of these external components, but the operating system was unable to find it's Class Identifier (CLSID) in the system's registry. This is almost always caused because the component has not been installed properly. An example is attempting to use eSignal for real-time data without first installing its support library.

---

***How do I keep a ChartScript from executing immediately after it is opened?***

Select the ChartScript Execution option in System Settings 255 to prevent Wealth-Lab from automatically loading a symbol when a new ChartScript Window is launched.

Also, on a per-ChartScript basis, you can place `{$NO_AUTO_EXECUTE}` anywhere in your ChartScript; the first line is a convenient place. After opening a ChartScript that contains this directive, you must manually select a symbol from a WatchList in order to execute the ChartScript for the first time. Note that this has no effect for a Real-Time ChartScript Window 126 for which you are always required to click or enter a symbol.

**Tip:** By adding this directive (or any other code) to your ChartScript Template 88, you won't have to remember to add it each time that you create a new ChartScript.

---

***How do I display... ?***

Wealth-Lab Developer 4.0 provides a number of general-purpose and specific functions for chart annotation. The answer to the rest of this question is likely to be found in Cosmetic Chart category of the WealthScript Function Reference or, if you prefer, the QuickRef in the main icon toolbar, **Ctrl + K**.

---

***How can I work with data in multiple time frames?***

Review the Time Frame category of WealthScript functions.

---

***How do I hide the Volume pane?***

Use the function HideVolume anywhere in your ChartScript.

---

## 2.7 Components

Wealth-Lab Developer 4.0 uses the following third party components that are covered under the Mozilla Public License 1.1:

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**SynEdit**
http://synedit.sourceforge.net/

*Modifications:*
- Modified the Pascal syntax highlighter to highlight WealthScript keywords and constants
- Modified format of completion proposal tool tip

**FastMM**
http://sourceforge.net/projects/fastmm/

*Modifications:*
- None

**DWSII 2.0**
http://sourceforge.net/projects/dws

*Modifications:*
- Disabled internal validation of compiler directives
- Disabled internal Print and PrintLn functions
- Modified timeout processing
- Moved cleanup routines into new procedure
- Modified comparison evaluator to allow for comparing COM objects
- Added message processing breaks during script processing
- Changed parameter types for trigonometric functions from radians to degrees
- Modified debugger to use DWS 2.0 Evaluate function
- Changed IntToStr to support Int64
- Modified open array type to support synched array

Modifications to source code files are available upon email request to info@wealth-lab.com.

Use of the open source components above is governed by the Mozilla Public License 1.1:
http://www.mozilla.org/MPL/MPL-1.1.html

Portions of Wealth-Lab Developer 4.0 include software licensed from third parties, including but without limitation, software licensed subject to the following copyright notice:

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All Rights Reserved Worldwide

# 3 Data Access

## 3.1 Data Access Overview

Wealth-Lab Developer 4.0 isn't very useful for back testing without a good set of historical market data to use as the basis of your system development. The product supports a number of different data formats. You can download end of day data for free, or interface to an end of day database provided by a commercial data vendor. You can even connect to a live data feed and have your charts update in real-time during the trading day.

### Static Data

Static data is historical price/volume data that resides on your local computer. Wealth-Lab Developer 4.0 can interface to static data in a variety of different formats.

### DataSources

You interface to static data by creating a DataSource using the New DataSource Wizard 18. You can create as many DataSources as you need, each one connecting to a different source of static data on your computer.

### Real-time Data

Wealth-Lab Developer 4.0 can also use real-time data supplied by a commercial data provider. Real-time data updates during the trading day. You'll see new bars appear on your charts as the data streams in, and your trading system can generate signals throughout the trading session. These signals, or alerts, can be routed directly to the Order Manager 222 for manual or automatic trade submission.

### DataSource Adapter APIs

Wealth-Lab Developer 4.0 supports APIs for integration of alternate static and real-time data sources. This means that Wealth-Lab can be extended to interface with data formats that are not supported directly or "natively". See the collection of API Documentation on the Wealth-Lab.com web site for details.

The following topics describe how to obtain access to market data in Wealth-Lab Developer 4.0. Be assured that if you have market data, Wealth-Lab has a solution or can create one to utilize it.

New DataSource Wizard 18

Regardless of the format or type of static DataSource, you'll use the New DataSource Wizard to "connect" them to Wealth-Lab Developer 4.0.

DataSource Manager 28

Once your static DataSources have been set up, use the tools in the DataSource Manager (DSM) to add, delete, update, view, edit, and otherwise manipulate the properties of the DataSources. With the DSM you can generate random WatchLists or create them manually using the symbols from defined DataSources.

Data Loading Control 33

In Wealth-Lab Developer 4.0 access to data is always at your virtual fingertips. With a common control used to load data for all Wealth-Lab Tools, you'll always be working with a familiar data-access interface.

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Futures Mode 36

Work with stocks and futures simultaneously, Wealth-Lab makes it easy!

---

## 3.2 New DataSource Wizard

### 3.2.1 Overview

The **New DataSource Wizard** guides you through the process of connecting a source of static historical price/volume data with Wealth-Lab Developer 4.0. The Wizard creates a new DataSources that connects to a specific set of historical data.

To open the New DataSource Wizard, perform one of the following actions:

- Select **New DataSource (Ctrl+D)** from the **DataSources** menu item, or,
- Click the **Create a New DataSource** button from the DataSource Manager 28

---

#### DataSource Type

The New DataSource Wizard opens with a list of the different DataSource types that are available. Select the type that corresponds to the data you want to use in Wealth-Lab Developer 4.0. Based on the DataSource type that you select, the New DataSource Wizard takes you through different paths (detailed in the following topics).

Web DataSources 18
Primate DataSources 19
MetaStock DataSources 21
ASCII DataSources 21
TC2000 DataSources 24
QuotesPlus DataSources 25
Tai-Pan DataSources 25
Intraday Historical DataSources 26
COM Static Adapter DataSources 27

---

#### DataSource Name

After you complete the Wizard, you must enter a name for the new DataSource. The new DataSource will appear in the DataSource tree the next time you open a ChartScript Window. You can refresh the DataSource tree for open ChartScript windows at any time by right clicking the tree and selecting **Refresh** from the pop-up menu.

---

### 3.2.2 Web DataSources

Web DataSources are used to collect data from various financial web sites. At the time of this writing, Yahoo! Finance and MSN Money are natively supported. Wealth-Lab Developer 4.0 acts as a web browser and reads the free historical quotes published by these providers. It includes special functions to update and maintain the data.

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Prior to using data from either of the web data providers for testing, please review *The Effect of Dividends and Distributions on DataSources* in the Wealth-Lab Knowledge Base.

**Step 1. Select a Web DataSource Provider**

*Prior to starting the New DataSource Wizard*, you should select your preferred provider. Providers may use different symbols (especially for indices) and can back-adjust data in different manners. For example, some providers may adjust volume for splits and price data for both stock and cash dividends, whereas other providers may not adjust split volume nor include cash dividends. Check with your preferred web provider for their individual policies.

**Step 2. Symbols and History**

After selecting **Web Download** for the DataSource Type, enter the symbols that you want to collect in the edit field. Separate individual symbols with spaces or commas. If a symbol contains the space character, enclose the symbol in double quotes ("SYM A"). You can also paste in symbols copied from an external source, such as the symbols lists provided with the Wealth-Lab.com WatchLists. Specify the number of **Years** of data that you wish to collect in the entry field below.

***New!*** An additional option allows you to choose whether or not to use adjusted closing prices when downloading from Yah*oo Finance!*

**Step 3. Data Collection**

Click the **Next** to begin the data collection process (you must be connected to the internet). The New DataSource Wizard reports on your progress as new symbols are collected. If any symbols encounter errors in the download, they are reported in the error list.

**Step 4. Name the DataSource**

Finally, you will be prompted to provide a name for the new DataSource. Aborting the process before naming the DataSource will result in the elimination of all data downloaded.

---

### Updating Web DataSources

To update the data in a Web DataSource you can use the **Web Update**, **Daily Update**, **Web Refresh** or **SmartUpdate** actions in the DataSource Actions 29 tab of the DataSource Manager 28. Choose your preferred Web DataSource Provider prior to the update. If you should experience an error collecting some of the symbols, you can try to add the symbols using the **Modify Symbols** action.

---

## 3.2.3 Primate Software Integrated Data

Wealth-Lab Developer 4.0 offers special integration with end-of-day historical data served by Primate Software. Primate offers US & Canadian stock plus mutual fund data, as well as futures, for one low monthly subscription.

**Note!** Until further notice, it's not possible for us to support Primate data, consequently we highly recommend testing this option on a trial basis

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before buying.

### Advantages

Primate Software's data service is seamlessly integrated into Wealth-Lab Developer 4.0. Data is downloaded on-demand, there's no need for you to perform a manual data update. Additionally, the Primate service includes automatic error-correction and stock split-adjustment.

### Setting up the Primate Account Information

Click the **Primate Software** tab on the DataSource Manager 28 to set up your Primate Software account information. After establishing an account with Primate (visit their web site for details) you enter your User Name and Password. A single Primate account can be configured to operate on up to two computers. If you switch machines after that point you'll have to contact Primate Software to reset your account.

### Primate DataSources

Primate DataSources consist of a list of symbols only. Data is retrieved from a local database that is updated from the Primate servers as needed. You can freely create DataSources that have overlapping symbols without having to worry about data duplication. Because of this, it's never necessary to create WatchLists based on Primate data, you can simply create different DataSources that contain the symbols desired.

### On-Demand Updating

Primate DataSources are updated on-demand. Thus, the first time you access a symbol the entire history will be downloaded from the Primate servers and stored locally. Subsequent updates of the symbol will be much quicker than the initial download.

### Disabling the On-Demand Updates

Wealth-Lab Developer 4.0 will try and update Primate data as needed. If you're not on-line, you can disable this behavior by unchecking the "Enable On-Demand Updates" item under the "DataSources" main menu item.

### Bulk Update

Although the Primate data updates on-demand, you can also perform a Bulk Update to bring all of your local symbols up to date in one shot. The Bulk Update can be faster than updating the symbols individually, because it only has to make a single request to the Primate servers to update all of the symbols. This option is handy if you want to update the data on your notebook before going off-line, for example.

### Industry Group DataSources

This action creates a set of Primate DataSources that correspond to industry groupings for the US stock market. The definition of the Industry Groupings must be downloaded from the Internet, so you must be on-line in order to create the Industry Grouping DataSources. You can perform this action at any time to refresh the DataSources.

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### 3.2.4 MetaStock DataSources

The MetaStock format is a common data format for historical financial data. It is the format used by the Reuter's DataLink data subscription service.

**Step 1. Data Location**

The one and only step involved in setting up a MetaStock DataSource is specifying the **Folder** of the MetaStock files on your local system. Navigate to the desired folder and double click on it in the folder tree. Once you set the location, you will see a list of symbols that are contained in the selected MetaStock folder.

**Multiply Volume by 100:**

Be sure to properly specify if your data's volume field should be multiplied by 100 using the check box.

**Note!** Wealth-Lab's native MetaStock price loader is compatible with MetaStock Version 6 only. If your MetaStock DataSource has more than 2000 symbols per folder, then you must install and use the MetaStock Static Adapter, which you can obtain at wealth-lab.com's Upgrade page, or by clicking here. Generally speaking, the adapter exhibits better performance (faster) than the native price loader.

---

### 3.2.5 ASCII DataSources

ASCII is a universal text document format, and many data vendors use ASCII format to store their data. ASCII data can come in a wide variety of formats, and Wealth-Lab Developer 4.0 is very flexible in its ASCII support.

**Note:** ASCII data must be in chronological order, starting with the earliest date at the beginning of the file and ending with the most recent date.

**Step 1. Location and File Extension**

The first step in creating an ASCII DataSource is to navigate to the **Folder** of the ASCII files on your local system. Next, supply the **File Extension** of your data files. The New DataSource Wizard makes its best guess about file extension as you navigate through the folders on your system by selecting the extension of the first file in the folder. Change the extension if required. As you change the file extension, the list of files is updated to show only the files that match the extension that you specified.

**Important!** Any file having the chosen extension in the selected folder will be treated as an ASCII DataSource file, and, they must all conform to the same data specification.

**Step 2. ASCII Format**

The next step is to specify the format of the data in your ASCII files. At this stage, it may be useful to view one of the data files to get an idea of how the data within is arranged. You can do this easily by clicking the **View Data File in Notepad** button.

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### Field Order

Use the **Arrow** buttons to move data fields up or down. If your ASCII file doesn't contain a data element, such as Volume, select the item and delete it by clicking the **Delete** button. Or, simply leave unused fields at the bottom of the list.

### Security Name

If your ASCII file contains a field that holds the name of the security or market you can add this field to the list by pressing the **Custom Field** button. Give the field the name "Security Name".

### Filler Items

If your data file contains elements that aren't in the field list, you can add "Filler" items to act as place holders so that your file is imported properly. Click the **Add Filler** button to add a filler item. Then, position the Filler item in the list with the **Arrow** buttons. You can remove a filler item with the Delete button.

### Time Field

If your security file contains a field for time, add the time field to the field list using the **Time** button, then position the field in the list normally.

### Open Interest

If your file contains Open Interest data, you can add this field by clicking the **Open Interest** button. Be sure to properly position the Open Interest field using the **Arrow** keys.

### Custom Fields

Press the **Custom Field** button to add a custom field to the ASCII format definition. You must provide a unique name for each custom field that you enter. Data in custom fields are available in your scripts via the **FindNamedSeries** WealthScript function (see Price Series Functions).

Custom Fields currently only work in the chart data's native time frame. For example, if you have a daily ASCII DataSource, the Custom Field data is not available if you switch to Weekly scale from the toolbar.

### Date Format

Specifies the description of how dates are formatted in the file.

### Time Format

Specifies the description of how time values (if present) are formatted in the file.

### Field Separator

Specifies which character is used to separate the different fields in a single row of data. If your file uses a field separator that doesn't appear in the list, just type in the value.

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### Decimal Separator

Specifies which character is used as the decimal separator for price fields. The selection is either period (.) or comma (,).

### Header Lines

If your data file contains one or more header lines, specify this value in the Ignore First Lines in File entry field. These lines will subsequently be ignored when the file data is imported.

### Volume Multiple

Some files store volume information that must be multiplied by 10, 100, or some other amount to result in correct volume data. If this is the case, specify this value in the Volume Multiple entry field.

### Common Formats

Click the **Common Formats** button to see a list of ASCII File format for some common data providers. You can select one of these items to load the settings into the ASCII Format fields. You can even add your own ASCII Formats to the Common Formats list for formats that you frequently use.

## Step 3. Data Preview

The next step is to validate that the ASCII Format was correctly specified. You should see a *sample* of your file's data in the preview window. If you don't see any rows of data, chances are that the specified ASCII Format is incorrect. In this case, go back and try to correct the problem.

**Important!** Be sure to set the DataSource's **Scale** and **Interval** (if intraday) properties correctly in the drop down controls below the Data Preview. For example, if your DataSource consists of 5-minute intraday bars, set the Scale to "Minute" and the Interval to "5".

**Notes:**

- Custom Fields do not appear in the Data Preview window.
- The currency symbol is that which you have specified in the System Settings Options255.
- If no data appears and you are certain that the ASCII Format is specified correctly, ensure that all data in each file corresponds to the same ASCII Format.

## Step 4. DataSource Name

Provide a name for the DataSource that reminds you of its components, such as "Dow 30" or "CME Agri Futures". Click **Next** to complete the operation.

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### 3.2.6 TC2000 DataSources

TC2000 is a commercial data subscription service which also comes with a charting and stock screening software. The complete TC2000 database can be updated each day through the TC2000 software.

#### Step 1. Select Symbols/Lists

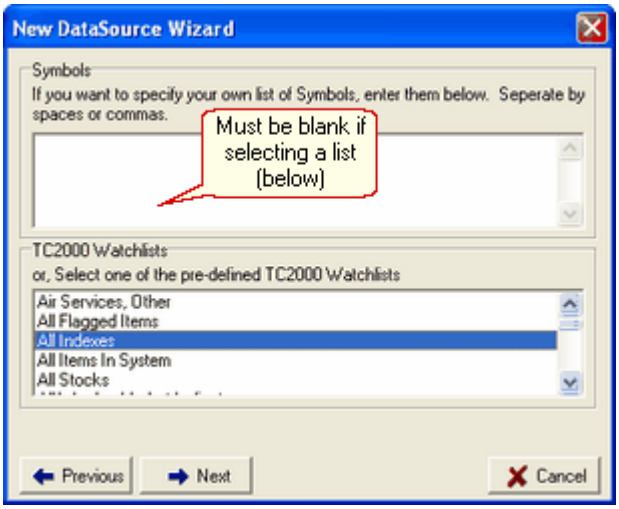
The only step involved in setting up a TC2000 DataSource is specifying the symbols or the TC2000 list to use for the DataSource. If you don't have TC2000 installed on your system you'll receive an error if you try to create a TC2000 DataSource.

**Symbols**

Specify the symbols that you want the DataSource to contain. If a symbol that you want to collect contains spaces, enclose the symbol in double quotes ("SYM A").

**TC2000 List**

Instead of specifying the symbols, you can have the DataSource use the symbols that were pre-defined in a TC2000 List. TC2000 comes with numerous Lists built into the system, and you can create your own lists within the TC2000 program. The advantage of using a TC2000 List is that if you change the content of the List in TC2000 (as a result of an EasyScan, for example), these changes will automatically be reflected the next time you start up Wealth-Lab Developer 4.0.




**Notes:**

- When selecting a TC2000 WatchList, ensure that the Symbols box is clear (blank).
- After a TC2000 Update, creating DataSources from TC2000 Lists, or making other TC2000 data-related changes, restart Wealth-Lab for the changes to be recognized.

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### 3.2.7 QuotesPlus DataSources

QuotesPlus offers an end-of-day stock and mutual fund database that can be updated daily from the QuotesPlus software.

**Step 1. Select Symbols/List**

The only step involved in setting up a QuotesPlus DataSource is specifying the symbols or the QuotesPlus list file to use for the DataSource. You must have QuotesPlus installed on your system, otherwise you'll receive an error if you try to create a QuotesPlus DataSource.

**Symbols**

Provide the symbols that you want the DataSource to contain. If a symbol that you want to collect contains spaces, enclose the symbol in double quotes ("SYM A").

**QuotesPlus List File**

Instead of specifying the individual symbols, you can use a QuotesPlus List File. This is a file type created by QuotesPlus that contains a list of symbols that were the result of a QuotesPlus scan. When you use a QuotesPlus List File, Wealth-Lab Developer 4.0 reads the symbols from the list and uses these symbols as the source of the DataSource.

**Note:** To keep your local QuotesPlus DataSources synchronized with a QP List File it is necessary to recreate the DataSource. As above, Wealth-Lab will populate the DataSource with the symbols from the QP List File, which includes the changes.

---

### 3.2.8 Tai-Pan DataSources

Tai-Pan is a historical data service provided by Lenz & Partner, a German firm. Tai-Pan comes with a complete historical database that includes major European and US stock markets. It can be updated daily from the Tai-Pan software.

**Step 1. Select Symbols/Katalog**

The only step involved in setting up a Tai-Pan DataSource is specifying the symbols or the Tai-Pan WatchList to use for the DataSource. Note that if you don't have Tai-Pan End of Day installed on your system then you'll receive an error if you try to create a Tai-Pan DataSource.

**Symbols**

Specify the symbols that you want the DataSource to contain. If a symbol that you want to collect contains spaces, enclose the symbol in double quotes ("SYM A").

**Tai-Pan Katalog**

Instead of specifying the symbols, you can have the DataSource use the symbols that are pre-defined in a Tai-Pan Katalog. Tai-Pan comes with numerous Katalogs built into the system, and you can create your own Katalogs within the Tai-Pan End of Day program. The advantage of using a Tai-Pan Katalog is that if you change the content of the Katalog in Tai-

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Pan, these changes will automatically be reflected the next time you start up Wealth-Lab Developer 4.0.

### 3.2.9 Intraday Historical DataSources

Intraday Historical DataSources collect data from one of the Real-Time providers 126 supported by Wealth-Lab Developer 4.0. The data for the requested period and interval (which can be Daily, Weekly, or Monthly as well as Intraday) is collected and stored on your local computer. You can then use this data for system development and back-testing.

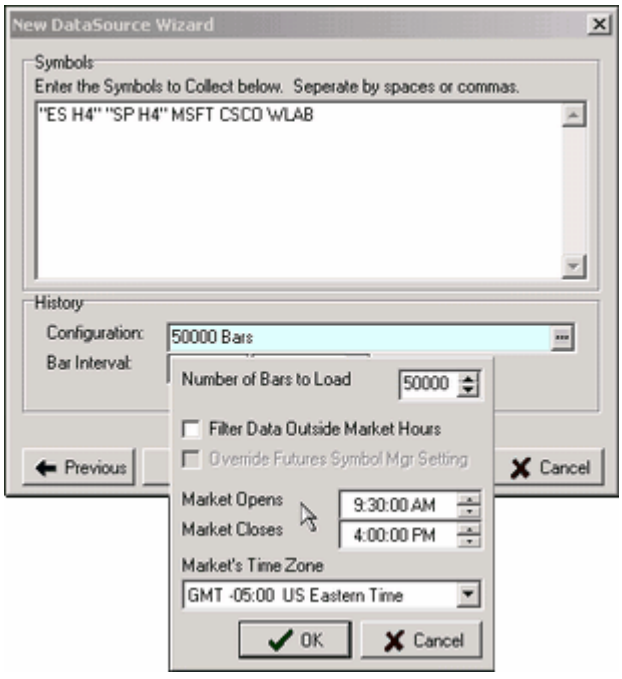
#### Step 1. Select Provider

First, select a real-time provider to use to collect the intraday historical data. See the topic Real-Time ChartScript Windows 126 for a description of real-time providers supported.

#### Step 2. Symbols/History Selection

Specify the symbols that you want to collect in the DataSource. If a symbol contains spaces, enclose it in double quotes. Using the common Data Loading control 33, specify the maximum number of historical bars that your DataSource will hold per symbol, the market open and closing times, and if you want the data to be filtered. Finally, set the bar interval and period desired.

**Note:** Even if not filtering data, you should specify the market open time for the DataSource. This time will be used as a reference when compressing intraday bars to higher scales (e.g., 3 minute bars compressed to 12 minutes). For more information see the Intraday Bar Compression 252 option.




***Creating an Intraday Historical DataSource. Use "quotes" for symbols containing spaces. Market Open time serves as a reference for compressed bars even if "Filter Outside" is not selected.***

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**Tip:** Enter a large number of bars (e.g. 1,000,000) so that data is added, not replaced, each time you update your DataSource. For example, if you can retrieve 60 days of 1-min data from your data provider, you'll want to specify at least 60 days x 390 1-min bars/day = 23,400 bars. Specifying only 23,400 bars will limit the DataSource to only the latest 23,400 bars following each update. Using a much larger number allows additional data to be appended.

**Note for eSignal Users:**

If you enter too many bars for the initial request, eSignal will not return any data. For the Daily time frame, the limit appears to be approximately 7,750 bars.

**Step 3. Data Collection**

The next step actually collects the historical data from the provider. Errors encountered in the collection process are reported in the error window.

**Step 4. Name the DataSource**

Finally, you will be prompted to provide a name for the new DataSource. Aborting the process before naming the DataSource will result in the elimination of all data downloaded.

---

### Updating Intraday Historical Data

To update the data in an Intraday Historical DataSource you can use the **Web Refresh** or **Web Update** actions, in the DataSource Actions 29 tab of the DataSource Manager 28.

---

## 3.2.10 COM Adapter DataSources

COM (Component Object Model) is Windows component technology that allows software objects to communicate over pre-defined interfaces. Using COM, third-party developers can build interfaces to static data in any format. These DataSource types appear in the New DataSource Wizard 18 along with the other types. You can identify COM Adapter DataSources because their COM "class name" will appear in the list next to the DataSource name. The other DataSource types will contain the word "Native" instead of the COM class name.

### Building a COM Static Data Adapter

Consult the Static Adapter API article on the Wealth-Lab.com web site for details on how to create your own COM Adapter. The article contains a sample Adapter that reads Wealth-Lab's native data format, as well as complete source code for building the Adapter in Borland Delphi. Adapters can be built using Visual Basic or C++ as well.

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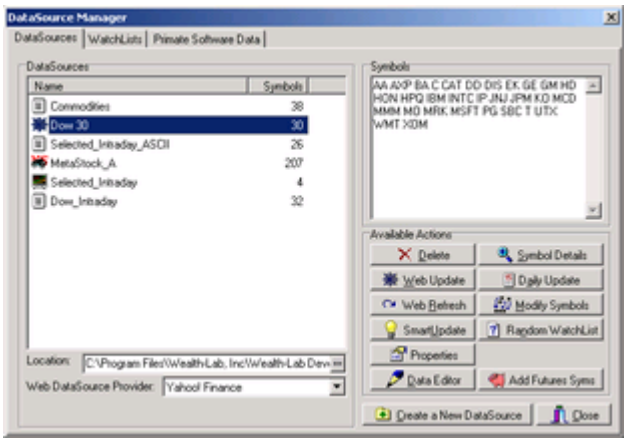
## 3.3 DataSource Manager

### 3.3.1 DataSource Manager Overview

The **DataSource Manager** lists all of your defined DataSources and WatchLists. It provides a number of actions that let you manage, edit, and update your data. It also contains the account information for Primate Software 19 integrated data.

To open the DataSource Manager do one of the following actions:

- Select **DataSource Manager (Ctrl+M)** from the **DataSources** menu
- Click the **DataSources** icon on the main icon toolbar




***The DataSource Manager***

DataSource Actions 29

A DataSource represents a link to a source of static historical market data. For example, if you have MetaStock format data in three different folders, you'd create three DataSources, one for each MetaStock folder, using the New DataSource Wizard 18. When you open a ChartScript Window 45, the DataSources appear in a tree view control along the left side of the window. Contained in each node of the tree are the symbols that make up the DataSource.

WatchList Actions 32

A WatchList is a collection of symbols from one or several DataSources. You can create WatchLists to group different symbols in any manner that you wish. For example, you may collect 500 symbols from a Web DataSource 18 every day, but you may want to group these by industry. Instead of creating different DataSources for each group, you can keep the single Yahoo! DataSource. Then, create WatchLists that contain the symbols for each industry group. In this way you can even have the same symbols appear in several different WatchLists.

Primate Data Management 32

Wealth-Lab Developer 4.0 offers special integration with data supplied by Primate Software.

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## 3.3.2 DataSource Actions

### DataSources List

In the *DataSources* frame a list of named Static DataSources are shown with the number of symbols therein contained. As you select a different DataSource, its symbols are shown in the *Symbols* list, each symbol separated by a space. If necessary, you can change the name of a DataSource by selective it from the list, and then clicking it once more. To add or remove symbols, see the Modify Symbols 29 action.

#### Location

Displays the full path of the DataSource's location. You can modify the location of a DataSource by clicking the '•••' button. This can be useful to reconnect a backed-up DataSource, for example.

#### Web DataSource Provider

Free Web DataSources are updated/refreshed from the **Web DataSource Provider** currently selected. Although you can choose the source when updating free web data, symbols may differ between providers for the same issue - especially for indices. For example, notice the differences for retrieving the Dow Jones 30 Industrials:

| | |
|---|---|
| Yahoo! Finance | **^DJI** |
| MSN Money | **$INDU** |

---

### Available Actions

The following actions are available for managing DataSources. Some actions are applicable to specific DataSource types as indicated, and, only those actions applicable to a specific type of DataSource will appear. For example, ASCII DataSources or DataSources connected by the means of a Static DataSource Adapter (e.g., MetaStock, Bloomberg, etc.) do not apply to the *Web Update*, *Daily Update*, *Web Refresh*, *Modify Symbols*, or *Data Editor* actions, and therefore, these actions will not be available. Functions such as these should be supported by the connecting adapter or external downloading program.

**Note:** Update and Refresh actions will use the same data provider employed to create the DataSource. If, for example, eSignal 133 was used to make an Intraday Historical DataSource, then eSignal will be the web source when choosing Web Update or Web Refresh for that DataSource.

**Delete** *Applies to:* All types

Deletes the selected DataSource. The files and folders of DataSources that were actually created and downloaded using the New DataSource Wizard 18 will be completely removed. As this action is not reversible, you will be prompted to confirm the deletion. Data files and directories from other DataSource types created from a separate downloading application (MetaStock, ASCII, etc.) are not harmed. In the latter case, these DataSources are simply *disconnected* from the DataSource Manager.

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**Symbol Details** *Applies to:* All types

Displays a list containing the end date and number of bars available for each symbol within the selected DataSource.

**Web Update / Data Update** *Applies to:* Web DataSources 18 / Intraday Historical 26

Downloads the required historical data to update the selected DataSource from the internet. Use this option to extend the historical period available in the DataSource. Be sure that you're connected to the internet before performing an update.

**Reload Symbols** *Applies to:* ASCII DataSources 21, MetaStock 21

Causes the DataSource Manager to recognize new symbols added to a static DataSource during a Wealth-Lab session.

**Exclude Current Day** *Applies to:* Intraday Historical DataSources

Use this option so that the current day's data is ignored when updating an Intraday Historical DataSource. This is useful, for example, to update the previous day's data without including partially-complete data from the current day.

**Daily Update** *Applies to:* Web DataSources 18

Downloads the latest daily prices for the selected Web DataSource from the selected financial web site, i.e., Yahoo! Finance or MSN Money. You should only use this option if your DataSource is already updated to the previous trading day. Performing a Daily Update is considerably faster than doing a Web Update, since for example, daily price data is made available much sooner from Yahoo! than its corresponding historical data.

**Tip:** **Daily Update** will overwrite the last bar's value if it has the same date, which can be useful if you prematurely updated a Web DataSource (prior to the market close).

**Web Refresh** *Applies to:* Web DataSources 18, Intraday Historical 26

Completely refreshes the selected DataSource after deleting any existing data and downloading fresh data from the web. You will be prompted for the number of years of historical data that you would like to download.

**Modify Symbols** *Applies to:* Web DataSources 18, Intraday Historical 26, QuotesPlus 25, TC2000 24, Tai-Pan 25, Primate 19

Lets you add or remove symbols from the selected DataSource. For Web and Intraday Historical DataSources, data for new symbols will be downloaded from the web. If a symbol that you want to collect contains spaces, enclose the symbol in double quotes.

**Tip:** To modify symbols in an ASCII DataSource, simply use Windows Explorer to rename or delete the ASCII data files. It may be necessary to restart Wealth-Lab Developer 4.0 for the changes to be recognized.

**SmartUpdate** *Applies to:* Updates all Web DataSources 18

The SmartUpdate feature allows you to update ***all*** of your Web DataSources 18 in one action. SmartUpdate knows whether a particular symbol needs a historical update, or if a daily update is sufficient. You should perform a SmartUpdate only after the day's trading session is closed.

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### Random WatchList

*Applies to:* All types

Lets you create a WatchList that contains random symbols from the selected DataSource. You specify the name of the new WatchList and how many symbols should be contained in the new WatchList. When finished, click to the WatchLists view to see the new random WatchList.

### Properties

*Applies to:* All types

Click the Properties button to see the internal properties of the DataSource. Properties are a series a name-value pairs. Each DataSource type has a different set of properties. You should only modify a DataSource's properties upon instruction from Wealth-Lab tech support. One exception is the Bars and Interval properties of Intraday Historical DataSources. You can modify the Bars property to change the amount of historical data that will be stored for the DataSource. Change the Interval property to control the bar interval of downloaded data. If you change the Interval property, you should immediately perform a **Web Refresh** to download new history.

### Change Symbol

*Applies to:* Primate 19

Use the **Change Symbol** action if a security undergoes a symbol change and you want to append the new data to the history for the old symbol. For example, Hewlett-Packard merged with Compaq and the symbol was changed from HWP to HPQ. You could use Change Symbol to change the HWP symbol to HPQ. Subsequent updates would append data for the new symbol to the old history.

Changing a symbol for an Intraday Historical DataSource must currently be done manually. Click on the DataSource to select it and make note of its "...Data\Folder#" in the Location window below. Using Windows Explorer, simply navigate to this directory, find the symbol name, and change it. Following this operation, you'll need to restart Wealth-Lab for the changes to take effect.

### Data Editor

*Applies to:* Web DataSources 18, Intraday Historical 26, Primate 19

Launches a Data Editor Window where you can modify individual entries in the DataSource. After selecting the symbol at the top, you can change dates, open, high, low, close and volume values, and delete or insert new records into the static DataSource. You can also process stock splits on the data. To save your data edits, be sure to click "Write Changes to Data File" when finished.

**Note:** Editing static DataSources does *not* change or affect data in any way for Real-Time ChartScript Windows 126 or Real-Time Scans 201.

### Add Futures Syms

*Applies to:* All types

Use this action to quickly populate the Futures Symbols Manager 271 with a list of symbols from the selected DataSource. Following this action, it will be necessary to enter the appropriate properties (tick value, margin, etc.) for each symbol.

**See Also:**

**Create a New DataSource** and **Web DataSource Provider** in the New DataSource Wizard 18 topic.

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### 3.3.3 WatchList Actions

The following actions are available for managing WatchLists:

**New WatchList**

Creates a new WatchList. You can select the symbols to be included in the new WatchList. Symbols can be included from one or several DataSources.

**Delete WatchList**

Deletes the selected WatchList. Alternatively, you may right click a WatchList and select **Delete** from the pop-up menu.

**Add/Remove Symbols**

Lets you add new symbols or remove existing symbols from the selected DataSource in the top frame. Select individual or multiple issues from the Available Symbols list and add them using the right arrow button. Use the Ctrl or Shift key in combination with the left mouse button to select multiple symbols.

Add all symbols at once from the selected DataSource using the right double-arrow button. Conversely, you may quickly remove all Selected Symbols from the DataSource using the left double-arrow button.

You can enter symbols manually by typing or pasting them in Selected Symbols frame. Separate a list of symbols by spaces, commas, or line feeds. If a symbol that you want to collect contains spaces, enclose the symbol in double quotes. Duplicate symbols and those not appearing in the Available Symbols list will *not* be added after clicking **OK**.

**Symbol Check**

The Symbol Check tool verifies that the symbols in the WatchList still exist in the DataSource. If the symbol is not found, you are notified of this condition via a message in the Symbols text box, and, the symbol is automatically removed from the WatchList. Note that if the DataSource in which the symbol exists (or existed) supports on-demand data requests and you are connected to the internet, then the symbol will be found to exist in the DataSource even if it is not physically located on the local machine.

---

### 3.3.4 Primate Data Management

Wealth-Lab Developer 4.0 offers special integration with data supplied by Primate Software. Primate offers historical stock and futures data for US and Canadian markets for a low monthly fee. Wealth-Lab Developer 4.0 downloads data directly from Primate servers as you request it, resulting in a seamless integration.

**Primate Software Account Information**

After you open an account with Primate Software you will receive a User ID composed of your first and last names, and a password. Enter this information into the entry fields. The **Server** field contains the IP address of the Primate server that will initially be queried when the first request is made. The default value is 64.3.108.7, but Primate support may ask you to modify this value if you experience connection problems.

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### Industry Group Creation

If you select this option, a set of Industry Groups for the US stock markets will be created. Each group will be added as a new Primate DataSource [19], with the stock symbols that comprise the group. You must be connected to the Internet to perform this operation.

### Bulk (on-demand) Update

Unless you disable this feature from the **DataSources** menu, data is downloaded from Primate servers whenever a symbol requires updating. You can use the Bulk Update feature to update all of your local symbols in one shot. This can be considerable faster than updating symbols one at a time as they are accessed.

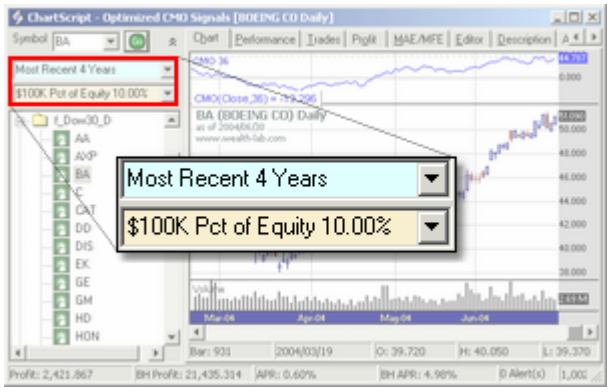
### Where Primate Data is Stored

Wealth-Lab Developer 4.0 stores the downloaded Primate data in a folder called **Integrated** directly under the **Data** folder, under the main Wealth-Lab Developer 4.0 install folder. Sub-folders are created under Integrated that correspond to the first letter in a symbol's name. For example, the symbol BORL would be stored in the **{Install Folder}\Data\Integrated\B** folder.

---

## 3.4 Data Loading Control

In Wealth-Lab Developer 4.0, data control is at your virtual fingertips in ChartScripts, Rankings, Scans, and the $imulator. In each of these tools, you'll find a light-blue colored control that lets you specify the amount of data to consider.




***Detail of Common Controls. Data Loading (light blue, top) and Position Sizing (bottom)***

The location of the control varies with the tool as follows:

| Tool | Location of Common Data Loading Control |
|---|---|
| ChartScript | DataSource tree (must be showing) |
| $imulator | Period tab |
| Rankings | Selection tab |
| Scans | Selection tab |
| RT Scans | Data Range/Position Sizing frame |

The Data Loading control is independent between Wealth-Lab tools and for each *instance* of each tool. For example, you can have 6 ChartScripts open each with their own data-loading configuration. The control will remember its last-selected state, independently for each Wealth-Lab tool, to aid in its next use.

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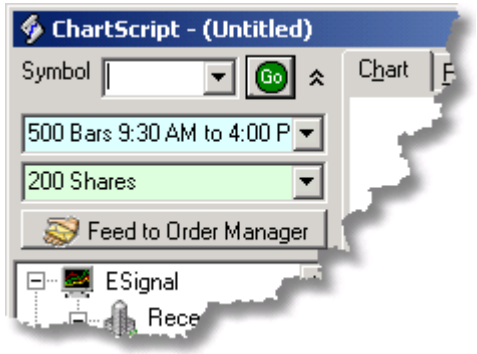
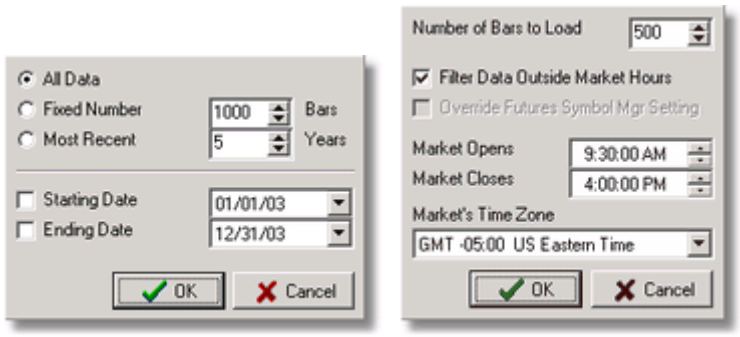
The Data Loading control always displays the current state of the selected options so that you won't be in doubt of the range of data selected or in use. In the image below, we illustrate the configuration of the Data Loading control with a real-time ChartScript. The 500 most-recent bars are selected, and the data is filtered for the market hours shown.




***The Common Data Loading Control (light blue)***

Depending if the DataSource that is connected to the tool is real-time or static, the Data Loading interface will change to offer you the appropriate selections, as the following images illustrate.




***Static (left) and real-time (right) Data Loading options.***

### No Data Available / Insufficient Data

As easy as it is to use the Data Loading control, it's possible to mistakenly select a range of data that does not exist in your DataSource. When this condition occurs, you'll see the message "No Data Available". For a ChartScript, this message will be boldly displayed in the chart window. For the other tools, the message will be written to the respective Errors View, which you should inspect any time that a Wealth-Lab tool does not produce a result.

---

## Static Data Loading Options

The following options give you the control and flexibility necessary to select specific data with which you wish to work. Each of the Wealth-Lab tools (ChartScript, $imulator, etc.) will remember the last options chosen for the next use of the Data Loading control.

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### All Data

**All Data** is subject to the **Starting Date** and **Ending Date** selections at the bottom of the control dialog. If neither date option is checked, all data available in the connected DataSource(s) will be loaded. You can filter the DataSource by date by checking one or both date options. If, for example, Starting Date is unchecked and Ending Date is checked, the Data Control will load all data up to and including the selected Ending Date and display **'All Data; until [Ending Date]'**.

**Tip:** When selecting the date using the drop-down feature, quickly choose a month and year by clicking them at the top of the calendar. Note that date is displayed according to your computer's short date format.

### Fixed Number of Bars

Like the **All Data** option, loading a fixed number of bars is also influenced by the date selections. If neither date option is checked and the number of fixed bars selected is 1000, then the most recent 1000 bars in the DataSource will be loaded. By using the **Starting Date** or **Ending Date**, you can influence the start or end date of the data loaded. If the dates define a period in the DataSource that contains *fewer* bars than those selected, then the reduced number of bars will be loaded. Note that **All Data** is the only option when ***both*** Starting and Ending Date are selected.

### Most Recent (X Years)

Choose the **Most Recent** option to load data for the most recent number of years selected. The number of years is with respect the computer's system date. Consequently, if 2 years are selected and the system date is 15 June 2003, then the control will load all data in the DataSource between 16 June 2001 and 15 June 2003, inclusive. If the DataSource does not contain data after 15 June 2001, then no data would be loaded.

**Note:** If you require repeatable $imulation results, the **Most Recent** option is generally not the best choice. Since the first bar loaded is based on the computer's system date, your results can change from one day to the next even if the DataSource itself remains unchanged.

---

## Real-time Data Loading Options

When using a real-time DataSource for ChartScripts or Scans, you will be presented with the real-time data loading options shown in the image above. Select the number of *historical bars* to load (100 minimum) and whether or not to filter the data between the selected market hours. As real-time bars become available, they are appended to the historical bars that were initially loaded.

### Filter Data Outside Market Hours

If this option is selected, data will not be displayed outside of the market hours indicated. The open and close times should be specified in the time zone of the market being traded. For example, if you're charting the US stock market, specify the open and close times in Eastern Standard Time.

Market hours are determined by first looking up the symbol in the Futures Symbols Manager 271. If the symbol does not exist in the FSM, the market hours specified in this control are used. This functionality is *not* affected by the Enabling/Disabling Futures Mode 36 from the DataSource main menu.

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### Override Futures Symbol Mgr Setting

For futures symbols, filtering data will automatically use the symbol's market times that are entered in Future Symbol Manager. This is indicated in the data control by the cue '*FSM Mkt Settings*' and additionally by disabling control of the Market Open/Close/Time Zone. By placing a check mark in the override option you can override the symbol's FSM settings with the time configuration displayed in the real-time data loading control.

### Market's Time Zone

This setting should be set to market's time zone. The only time this value is important is when requesting intraday bars from eSignal 133. Wealth-Lab determines the difference between your computer's time zone and the market's time zone so that eSignal can set the correct starting time for the intraday bars.

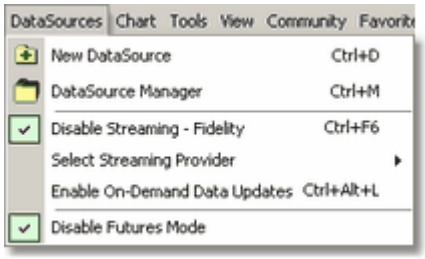
---

## 3.5 Futures Mode

When working with futures data, be sure that the **Futures Mode** menu item is enabled under the **DataSources** menu. When Futures Mode is enabled Wealth-Lab will use the Point Value, Margin, and Tick values that you establish in the Futures Symbols Manager. To learn how Wealth-Lab Developer 4.0 works with futures data, read the section on the Futures Symbols Manager 271.

**Important!**

To avoid confusion, you can leave **Futures Mode** enabled always, even when working with stocks. **Futures Mode** simply instructs Wealth-Lab to treat all symbols that you have entered in the Futures Symbols Manager 271 as futures symbols. *All other symbols are treated as stocks*.




***The image indicates that Futures Mode is enabled.***

### Disabling Futures Processing

You can disable the special processing of futures symbols described above by clicking "Disable Futures Mode". This may be necessary only in rare cases in which a futures symbol is identical to a stock symbol, or for some other investigative purpose.

---

## 3.6 Data Precision Considerations

Wealth-Lab stores price values in Price Series using *single precision numbers*. Although a floating point "extended" (double-precision) type would allow us to store values *almost* exactly, systems would take a much longer time to execute and consume approximately twice the memory. Floating point *single* types store values use 32 bits (4 bytes) and have a precision of 7 to 8 significant digits. We feel that the

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trade off is a good one and worth the miniscule round-off errors. Nonetheless, precision errors can be a source of consternation if you're not aware of them, so this topic focuses on proper programming techniques when dealing with floating point numbers.

**Note:** Every *Price Series value* is a single-precision floating point number, however, *variables and arrays declared as floats* are in fact double precision. See Data Types in the WealthScript Language Guide.

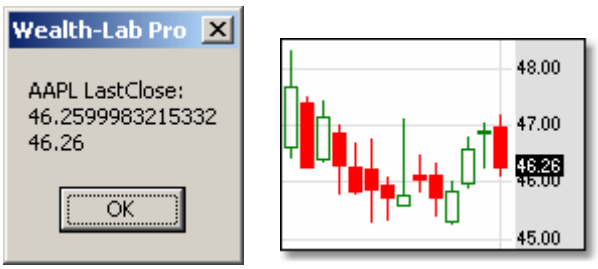
### Display Rounding

Prices or indicators that you see on a chart and/or in the **Data Window** (Ctrl+Alt+V) are rounded to the decimal precision that you specify in **Tools|Options|System Settings**. Consequently, the actual price/indicators values are almost never *precisely* the displayed value. Let's clarify this with an example.

### Example

```
var C: float = PriceClose( BarCount - 1 );
ShowMessage( GetSymbol + ' LastClose: ' + #13
             + FloatToStr( C ) + #13
             + FormatFloat( '0.00', C ) );
```

The first **FloatToStr** statement converts the closing price to a string and shows the *full numeric representation* of the value, whereas **FormatFloat** *rounds* the value according to the specified format, which in this case is 2 decimal places.




***Single-precision and rounded representations of AAPL's last closing price.***

The dialog shows that AAPL's closing price is represented in the #Close Series as 46.259998, ignoring the numbers after 8 significant digits. When we look on the chart, however, the closing price matches the second, *rounded version* of the number, 46.26. Although we can be pretty sure that AAPL actually traded at precisely 46.26, this like most numbers cannot be represented precisely in a computer using 4-bytes. The point is that ChartScript processing works with the *first, non-rounded* number during processing. What effect does that have?

### Trade Processing

Wealth-Lab executes trades at the full precision of the underlying series. In other words, if we had used a BuyAtClose order on the last bar in the previous example, the purchase price would be 46.259998... even though the price displayed in the Trades list would be 46.26 due to display rounding. Executing trades using the "non-rounded" price during back test is necessary for two reasons:

1. Back-adjusted prices due to stock splits actually have more than the apparent 2-decimal significance so that prices retain their percentage relationships allowing you to duplicate backtesting results even after splits. Example: Ignoring single-precision errors for a moment, if we had purchased stock 'ABCD' at $50.25 prior to a 2:1 in a back test, later we would expect to purchase twice as many shares at $25.125 in a back test after the split to obtain equivalent results.

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2. Other markets (futures) trade at varying decimal precision.

### Stop and Limit Prices (Stocks)

In some cases, single precision floating point representation of the underlying Price Series values may cause a Stop/Limit purchase or sale to not trigger as you may expect. Here's a contrived example.

**Example**

```
{ Example for symbol 'AIG' }
var Bar: integer = DateToBar( 20050721 );
if ShortAtLimit( Bar + 1, 60.82, '' ) then
  Print( 'Trade success' )
else
  Print( 'No trade' );
Print( FloatToStr( PriceHigh( Bar ) ) );
```

The high of 'AIG' on 7/21/2005 and 7/22/2005 was 60.82. Consequently, by passing precisely 60.82 to a **ShortAtLimit** order (or **BuyAtStop**), you would expect a trade to be executed, but instead nothing occurs. After running the example, the Debug window shows:

```
No trade
60.8199996948242
```

What happened? The number 60.82 cannot be represented *precisely* in a computer using single precision, and since the value of the #High series did not achieve the specified limit price, the trade is not executed. Note however, that it is unrealistic to *hard code* a specific price value in a trading system so this is rarely a problem. The proper and common coding practice is to generate trigger prices using data from Standard Price Series (#Close, #High, etc.), moving averages, and other indicators. Compare the result with following version of the script:

**Example**

```
{ Example for symbol 'AIG' }
var Bar: integer = DateToBar( 20050721 );
if ShortAtLimit( Bar + 1, PriceHigh( Bar ), '' ) then
  Print( 'Trade success' )
else
  Print( 'No trade' );
Print( FloatToStr( PriceHigh( Bar ) ) );

Trade success
60.8199996948242
```

The trade executes as we would expect because we pass the PriceHigh value of the current *Bar* directly from the #High series as the specified limit price. Since the limit matches the value in the #High series on the next bar, the trade can execute. Using indicator values such as moving averages in stop and limit signals follow the same type of logic when comparing the prices in their single-precision representation.

### Stop and Limit Prices (Futures Symbols)

Futures use minimum price fluctuation values that are defined by the contract specification. The trade increment is known as the Tick Value, and must be defined for each futures symbol in the Futures Symbols Manager 271. In Futures Mode 36, Wealth-Lab Developer 4.0 will automatically adjust Stop and Limit prices to conform to tick values, and, this *rounding* or *ceiling/floor* behavior is controlled in the Futures Trading 257 options.

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### Testing Equality

Small precision errors can cause tests for exact equality between two floating point numbers to fail. When it makes sense to do so, avoid testing exact equality between **float** variables (double precision) and a Price Series value (single precision). Instead, use "<" and ">" operators in combination with "=" when making comparisons, or, define an acceptably-small value, EPSILON, that can be used to compare the absolute value of the difference of the floating point values as shown in the next example.

**Example**

```
const EPSILON = 0.00005;
var f1, f2: float;
f1 := 12.3456789;
f2 := 12.3456923;

{ Compare 2 floating point values for equality }
if Abs( f1 - f2 ) <= EPSILON then
  ShowMessage( 'The values are equal' )
else
  ShowMessage( 'Not equal' );
```

Another effective technique is to compare the string representation of a floating point number after rounding. We can use the FormatFloat function for this purpose rather effectively as shown in the example that tests for equivalence to 4 decimal places.

**Example**

```
const FMT = '0.0000';
var f1, f2: float;
f1 := 12.3456789;
f2 := 12.3456923;

{ Compare 2 floating point values for equality }
if FormatFloat( FMT, f1 ) = FormatFloat( FMT, f2 ) then
  ShowMessage( 'The values are equal' )
else
  ShowMessage( 'Not equal' );
```

---

## 3.7 Data Access FAQs

***How do I move Wealth-Lab and its data files to a new computer?***

Backup the entire "Database" and "Data" directories found in the main Wealth-Lab Developer 4.0 installation directory. You may wish to perform the ChartScript backup process first (from the File menu), which will create a separate ".WS" file for each ChartScript. That way, even if you have problems with the Databases, you will still be able to import the scripts.

Install Wealth-Lab Developer 4.0 on the new computer. Move the contents of the Database and the Data folders (and sub-folders) from the old computer to the new computer. Make sure you maintain the same directory structure. Also, copy any ASCII DataSources from the old computer to the new one, maintaining the same directories.

If you need a new unlock code after the installation, please complete a website support request identifying your new machine key, which can be found by clicking

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**Help|View Machine Key**.

---

***In my simulation, I bought a stock on the best tick of the bar, yet I get a MAE of 0.03%. Why is that?***

The simulated *entry price* was computed at a higher precision than 2 decimals. The low of the bar is slightly lower than the computed price, so you see a very slight MAE. Since some markets trade at a higher precision than 2 decimals we don't round the entry and exit prices. For more discussion, see Data Precision Considerations 36.

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***How do I set up my real-time data provider to act as an end-of-day provider for Daily data?***

See Intraday Historical DataSources 26.

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# 4 ChartScripts

## 4.1 Overview

ChartScripts are trading systems expressed in WealthScript code and are the foundation for producing results in Wealth-Lab Developer 4.0. In addition, ChartScripts almost always contain the code to plot indicators and other symbology on a symbol's chart.

ChartScript Explorer 42

Nearly everything you do in Wealth-Lab will involve selecting a ChartScript. No matter the tool ($imulator, Scans, Optimization, etc.) you will use the ChartScript Explorer over and over to locate a ChartScript to use.

ChartScript Windows 45

A ChartScript Window is used from the initial development of a trading methodology all the way to implementing it in real-time!

Creating a New ChartScript 88

You've just bought Wealth-Lab Developer 4.0, you've run some marvelous scripts created by programming veterans, but you have some of your own ideas to put into code. If this is your first script, you might like to start off with something simple, like a long-only, dual moving average crossover system. Try it yourself and then check it against the example here.

New ChartScript Wizard 91

Your copy of Wealth-Lab Developer 4.0 contains the most-advanced, auto-code-producing Wizard on the market today. Just point, click, and drag rules to form a complete trading methodology, and then let the New ChartScript Wizard generate all the code for you. It's true!

New Indicator Wizard 97

Wealth-Lab Developer 4.0 is second to none in providing you with a wealth of technical indicators to use in your scripting. But if you're innovative, it's likely you'll have new ideas for an indicator. The New Indicator Wizard will generate most of the WealthScript code necessary for custom indicators.

Download ChartScripts 98

Some of the best ideas come from other great ideas. Tap the Wealth-Lab community for a virtually unlimited source of fresh trading system ideas by downloading scripts and Wizard Rules submitted by other members.

Backup and Restore ChartScripts 99

ChartScripts are stored in a lightweight database on your computer. But an ounce of prevention being worth a pound of cure, it's never a bad idea to backup your work

Favorite ChartScripts 99

Mark the ChartScripts with which you work frequently as your "Favorites" to be able to quickly select them from the **Favorites** main menu item or from the main icon toolbar.

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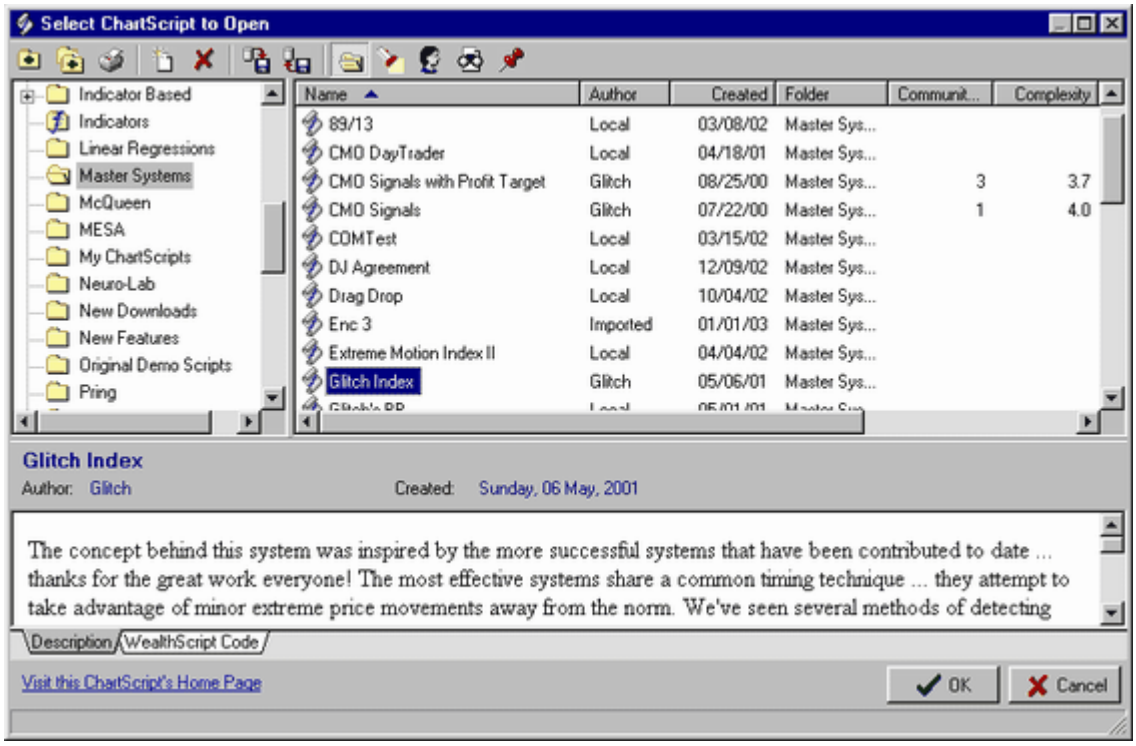
Preferred ChartScript for Symbol 100

You may find that some ChartScripts work better with some symbols than others. In these cases, you can tell Wealth-Lab to use a Preferred ChartScript when specific symbols are encountered in WatchList Scans and $imulations.

## 4.2 ChartScript Explorer

The **ChartScript Explorer** provides several ways to explore all of the ChartScripts available to Wealth-Lab Developer 4.0. It is comprised of three re-sizeable panels and offers five different views to quickly find ChartScripts that meet a range of characteristics as described below.




***ChartScript Explorer Folder View***

The ChartScript Explorer is used to choose an existing ChartScript for ChartScripts 88, Scans 136, $imulator 155, WatchList Rankings 184, and Optimization 112 Tools. To open the ChartScript Explorer for choosing an existing ChartScript, choose one of the following actions:

- Select **Open ChartScript** from the File menu
- Use the **Ctrl+O** shortcut.
- Click the **ChartScripts** icon on the main icon bar under **Tools.**
- Click the **Open** button on the toolbar.

### Explorer Views

You can explore and search for ChartScripts using five different views. To switch to a particular view, click its icon on the ChartScript Explorer's toolbar. Each view offers a different way to find a particular ChartScript based on its location, content, author,

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community ranking, or if you have marked it as one of your favorites. To open a ChartScript for any use, click on it once and then select the **OK** button. You may also right click the ChartScript and select **Open** in the pop-up menu.

### Folder View

The Folder View (shown above) displays ChartScripts by the folders in which they are contained. After clicking on a folder, the ChartScripts contained in that folder are displayed in the ChartScript List 42 to the right. Use the left mouse button to drag (move) ChartScripts from one folder to another, or create a new folder from the ChartScript Explorer toolbar. Drag a ChartScript with the right mouse button to copy it into a different folder, or to create a shortcut in a different folder.

### Search View

The Search View allows you to search for ChartScripts by name, WealthScript code, and/or author. Enter the desired keyword into one or more of the search fields and click the Begin Search button. The ChartScripts that meet your search criteria are displayed in the list to the right.

### Author View

This view displays a list of Wealth-Lab members who have submitted ChartScripts. Click on one of the authors to see the ChartScripts created by them in the list to the right.

### Search by Community Rankings View

Community Rankings has been integrated into Wealth-Lab Developer 4.0. Whenever you Download ChartScripts 98 the updated rankings are downloaded, and they are reflected in the ChartScript Explorer. Using the friendly interface of the Community Rankings View, you can search the database by one or more of the Community Ranking values.

### Favorites View

When you select this view, your favorite ChartScripts 99 are displayed in the list to the right.

---

## ChartScript List

The right side of the ChartScript Explorer contains the **ChartScript List**. This list displays the ChartScripts that relate to the currently selected view. Rename a ChartScript by right-clicking and selecting the **Rename** pop up menu item. Double click a ChartScript to open it in a ChartScript Window 45.

### Copying, Moving, and Creating Shortcuts

By dragging and dropping with the *right* mouse button you can copy, move, and create shortcuts for ChartScripts. Shortcuts are especially useful to place in dedicated folders of ChartScripts that you wish to rank, while maintaining a single copy for editing in its original location.

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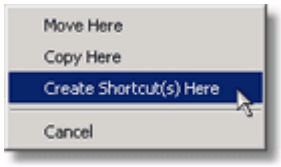
To perform this operation you must be in the ChartScript Explorer's Folder View as shown in the previous image. Select one or more ChartScripts in the ChartScript List using combinations of the Shift and Ctrl keys and the left mouse button. Next, *right click* one of the highlighted items and drag until the mouse pointer is over the desired destination folder in the Folder List. Upon releasing the button to drop the contents, you will see the following pop-up menu that you can use to choose the operation.




***Right click, drop & drag ChartScripts***

---

## ChartScript Description

Below the ChartScript List is an area that contains the ChartScript's **name**, **author**, **creation date**, **description**, and **WealthScript code**. The ChartScript's author will be reported as **Local** for scripts that you create locally. (You can also Download ChartScripts from the Wealth-Lab.com web site.) You can edit a ChartScript's description here, but not the actual WealthScript code. Click the save button on the ChartScript Explorer toolbar to save changes.

---

## ChartScript Explorer Operations

To perform "routine maintenance" of your ChartScripts, open the ChartScript Explorer using any of the methods given above. The following actions are available.

### Export ChartScripts

This action saves the ChartScripts that are selected in the ChartScript List to individual files on your computer. Each ChartScript is saved as its own file with a "WS" extension. Use the control key to select more than one ChartScript at a time for export. Both the Description and WealthScript Code are written to the file.

### Import ChartScripts

This action reads ChartScript files (*.WS) that have been previously created by the **Export** function. You can select one or more .WS files for import. The ChartScripts will be created in the currently selected folder. The Import function will warn you if you're about to overwrite an existing ChartScript with an import file. If you choose to overwrite a ChartScript, the ChartScript remains in the folder that it was in before the import.

### Delete Selected ChartScript / Folder

Use the left mouse button in combination with the Ctrl and Shift keys to select one or more ChartScripts for deletion. When satisfied with the selection, click on the Delete ChartScript icon or strike the "Del" key. Also, you may use this button to delete the selected folder. Note that to delete a folder, you must first remove all ChartScripts.

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### Open New ChartScript

This action opens a fresh ChartScript window, which will contain only the stored Template code 88.

### Print Description

Prints the Description section of the selected ChartScript(s). Note that you can print any of the ChartScript Window 45 views, including the Description, after opening a ChartScript by selecting **File | Print (Ctrl+P)**.

### New Folder

Activating this button will prompt you for the name of a new folder to be placed at the main parent level. After typing the name, select **OK** to create the new folder.

### New Subfolder

Activating this button will prompt you for the name of a new folder to be placed below the selected ChartScript folder. After typing the name, select **OK** to create the new folder.

---

## 4.3 ChartScript Windows

### 4.3.1 ChartScript Window Overview

A **ChartScript Window** provides the complete editing and testing tools required to build a ChartScript. It is also a multi-faceted workspace in which you control the primary symbol selection, data loading, position sizing, the script code and its description. You can drag & drop indicators, write system rules in WealthScript, and test trading system performance on single markets at a time (see the $imulator tool for portfolio level testing).

To open a ChartScript Window do one of the following:

- Use the ChartScript Explorer 42 to open an existing ChartScript in a ChartScript Window
- Select **New ChartScript (Ctrl+N)** from the **File** menu to open a blank ChartScript Window
- Click the **New** button on the toolbar to open a blank ChartScript Window

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***ChartScript Window in Real-time Mode, Chart View***

---

### ChartScript Window Views

The ChartScript Window contains a number of views, each on its own tab. The first tab contains the chart view, which displays the chart and any plotted technical indicators. Another tab contains the ChartScript Editor where you edit the WealthScript code for the selected ChartScript. The other tabs are performance views that report on the results of the ChartScript's trading strategy.

Control and Status Panels 46
Chart View 49
Performance View 76
Trades View 79
Profit View 80
MAE/MFE View 81
Editor View 81
Description View 86
Analysis Series View 87

---

## 4.3.2 Control and Status Panels

### DataSource Tree

The left side of the ChartScript Window contains the **DataSource Tree**. This tree contains a folder for each DataSource and WatchList that is defined within Wealth-Lab Developer 4.0. You can expand the folders to view all of the symbols that are contained in the DataSource or WatchList. When you click on one of the symbols, the ChartScript is executed, and, the Chart, Performance, Trades, Profit, MAE/MFE, and Analysis views are all updated with the data for the selected symbol.

When a new ChartScript window is opened, the DataSource tree is automatically displayed to allow selection of a primary symbol. The tree may be hidden or shown by right clicking in any view, excluding the Editor and Description views, and toggling the check mark next to **Show DataSource Tree**. You can show or hide the DataSource tree for all open ChartScripts with one action by selecting **View|Show (or Hide) All DataSource Trees** from the main menu.

The DataSource tree contains the Symbol Entry Panel 46 and Common Controls 46, and therefore must be shown for their manipulation.

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## Symbol Entry Panel

The Symbol Entry Panel appears above the DataSource Tree, which must be shown, in the ChartScript Window 45. You can type in any symbol into the entry field and click the **Go** button to display a chart for the desired symbol. If supported by the selected symbol's DataSource, you can display charts for a symbol even if it isn't contained within the currently selected WatchList.

### Which DataSource?

The Symbol Entry Panel uses the DataSource of the symbol that's currently clicked in the DataSource Tree. Only certain DataSources maintain complete symbol databases, and thus provide the ability to get data for a symbol on demand. The table below shows which DataSources can be used with the Symbol Entry Panel.

| DataSource | Can use Symbol Entry Panel? |
|---|---|
| Primate 19 | Yes |
| ASCII 21 | No |
| TC2000 24 | Yes |
| QuotesPlus 25 | Yes |
| MetaStock 21 | No |
| Tai-Pan 25 | No |
| Intraday Historical 26 | No |
| Web DataSources 18 | Yes (see below) |

### Web DataSources On-Demand Download

The Symbol Entry Panel functions when a DataSource created by a Web Provider is selected in the DataSource Tree. When you enter a new symbol into the Symbol Entry Panel, Wealth-Lab downloads the data from the financial web site last selected as the Web DataSource Provider in the DataSource Manager 28. The amount of data is controlled by the Data Loading 33 control selection.

This "on demand" data is stored in a special folder called "OnDemand" located beneath the "Data" folder under Wealth-Lab's home directory. If you use this feature, be sure to periodically check this folder and clean out any data files that are no longer needed.

**Note:** When a ChartScript Window is enabled for streaming, Wealth-Lab routes all data requests *for that ChartScript instance* to the real-time feed regardless of the DataSource/WatchList in which the symbol appears.

## Common Controls

In all ChartScript windows, the Data Loading Control 33 and Position Sizing Control 263 appear above the DataSource tree. Data loading controls the amount of data of the primary (or external) symbol used in the ChartScript. Likewise, position sizing may be configured in Raw Profit Only 263 or in Portfolio Simulation 263 mode. For details, refer to the individual topics for each control.

Note that in Portfolio Simulation mode, the ChartScript can now access the Portfolio Equity value as it executes. The means that functions previously reserved for SimuScripts, such as Cash, DrawDown, DrawDownPct and BuyAndHold, are available in ChartScript mode.

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### Assigning Risk Level in ChartScript Mode

In earlier versions of Wealth-Lab, the function SetPositionRiskStop assigned a risk level, which the $imulator used to calculate position size based on Maximum Risk Pct. Since the Position must be identified in the function, it must be called *after* creating the position as in the following code fragment.

```
if BuyAtLimit( Bar + 1, Lowest( Bar, #Low, 20 ), '' ) then
  SetPositionRiskStop( LastPosition, PriceLow( Bar ) - 0.5 );
```

Because the $imulator works with a trade list to size positions, this works just fine. However, in ChartScript mode, the position size routine is called *right as* the position is created. Since the risk stop is assigned in the next statement, this technique will not work in ChartScript mode.

Instead, a new function, SetRiskStopLevel, allows you to specify an initial stop level for the *next Position* to be created. Hence, the order of the statements in the code fragment above is reversed as follows.

```
SetRiskStopLevel( PriceLow( Bar ) - 0.5 );
BuyAtLimit( Bar + 1, Lowest( Bar, #Low, 20 ), '' );
```

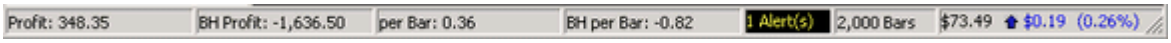
Using Maximum Risk Pct sizing in ChartScript mode is new to Wealth-Lab Developer 4.0, and for this reason a new function, SetRiskStopLevel, was created to support it.

---

## Status Bar

The ChartScript Window status bar (at bottom) contains a number of panels. You may have to expand the ChartScript window horizontally to see every panel.

***ChartScript Window Status Bar in Portfolio Simulation mode***




***ChartScript Window Status Bar with Raw Profit Only***

#### Profit

Displays the total net profit of the trading system, if any.

#### BH Profit

Displays the net profit for a Buy & Hold strategy. If you have selected a **Portfolio Simulation** in the Position Sizing Control 263, the BH profit represents taking a single, *full account value equity position* at the beginning of the simulation period. However, with **Raw Profit Only** the BH position is more-realistically sized as specified for this position-sizing mode.

As indicated in the image above, the contents of the next two panels change based on the option selected in the Position Sizing Control 263.

(Portfolio Simulation)

**APR**
The total profit (loss) of the trading system over the simulation period expressed as an annual percentage rate return.

**BH APR**
The total profit (loss) of the Buy & Hold strategy over the simulation period expressed as an annual percentage rate return.

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(Raw Profit Only)

**per Bar**
Displays the Profit per Bar of the trading system.

**BH per Bar**
Displays the Profit per Bar for a Buy & Hold Strategy. Your trading system is more efficient than Buy & Hold if it has a higher Profit per Bar.

**Number of Alerts**

The number of Alerts triggered by the trading system for the following bar. The Alerts themselves are visible below the Chart 49.

**Number of bars**

Total number of bars of data loaded for the current chart. You can manipulate the number of bars using the common Data Loading Control 33.

**Final Bar Summary**

The final panel contains the closing price of the last bar in the chart followed by the absolute and percentage changes from the previous bar on a closing basis.

---

## 4.3.3 Chart View

### 4.3.3.1 Chart View Summary

Pictures are worth a thousands words, but in Wealth-Lab our goal is to make charts worth thousands of dollars, euros, yen, etc. Using charts, one is able to observe support and resistance levels, discover recurring patterns, analyze trends, and make use of many other visual techniques to extract money from the markets.

Wealth-Lab Developer 4.0 will help you automate these chartist processes, but one of the most useful features of the Chart View is actually to help you validate your ChartScript's code! Since a ChartScript operates on *numerical data*, visualization is for *your* benefit. In the Chart View, you'll be able to verify that your methodology is actually doing what you had intended it to do.

Manipulating the Chart 50
Use the Chart and Scale Toolbars to configure the chart's style, scale, bar spacing, and much more.

Plotting Indicators 56
You have full control of what's painted on the chart, especially indicators, from within the ChartScript code itself.

Indicator QuickPlot 58
Use one of the most powerful visual features of Wealth-Lab Developer 4.0 to rapidly apply and remove any native or custom indicator to a ChartScript while prototyping a trading system. You can even apply an indicator directly to another, and when you're ready to start coding, just "push" all the indicators into the Editor view.

Studies and Custom Indicators 63
Find out what the difference is between a Study and an Indicator and how easy Wealth-Lab makes it to re-use and include them in new ChartScripts.

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Chart Drawing Tools 65
Wealth-Lab Developer 4.0 has two toolbars packed with advanced manual Drawing Tools that will let you quickly annotate and paint your charts with objects that will be saved automatically!

Chart Trading 73
Immediately place orders for the chart's symbols using the chart's context menu, or, create trading alerts by just drawing a *Tradable Trendline*!

---

#### 4.3.3.2 Manipulating the Chart

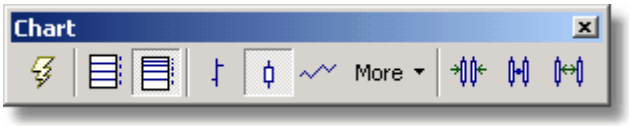
You'll use the Chart and Scale toolbars to control the appearance of the Chart View. Configure the default settings for Chart Color, Fonts, and Grid Lines using the Colors/Style 246 view of the Options Dialog 244 **[F12]**. You can override the Chart Color default options in WealthScript code using a variety of functions having the prefix "Set" from the Cosmetic Chart group.

### Price/Volume Panes

The most basic chart is composed of two panes. The top pane contains historical price information for the selected symbol. The bottom pane contains the corresponding volume information (if available). Indicators and/or drawing objects may also be plotted in either pane.

---

## Chart Toolbar




### Execute the Script (F5)

When you click on a different symbol in the DataSource tree, the ChartScript is automatically executed. Click this button, or strike the **F5** function key, to force the ChartScript to run again for the same symbol. This is useful after making changes in the Editor, for example.

### Linear Scale
### Semi-Log Scale

Switch between linear and semi-logarithmic scales on your chart by clicking these buttons on the Chart toolbar, or under the **Chart** main menu item. The semi-log scale option scales the Y axis of the chart by percentage change in price, rather than absolute price value. For example, with log scale, the distance between 10 and 100 on the Y axis would be the same as the distance between 100 and 1000. It's called "semi-log" because the X axis (time) is *not* scaled logarithmically.

**Tip:** To control the scale from your ChartScript code, use the **`SetLogScale`** function.

### Bar Spacing

To adjust the spacing of the bars on your chart, use the Increase, Decrease, and Restore bar spacing buttons on the Chart toolbar. These actions are also available

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from the **Chart** main menu item. By configuring your Mouse Wheel Options 255, you can also control the bar spacing by scrolling the mouse wheel after clicking on the chart. You can also use the +/- keys on the numerical keypad to increase/decrease bar spacing.

**Increase**

Increases the width of bars so that fewer are displayed in the chart area. Use this in combination with the Chart's horizontal scroll bar to see more detail in a specific area.

**Restore**

Restores bar width to Wealth-Lab Developer 4.0's default setting.

**Decrease**

Decreases the width of bars so that more are displayed in the chart area.

**Chart Styles** You can select to view your charts in several different styles. The Chart Style options are also available from the **Chart** menu. Note that the last selected style will be the one used when opening subsequent ChartScripts.

**Bar Chart**

Displays OHLC values using the traditional "Bar" style. The Opening price is represented by the left tick, the Closing price by the right tick, and the High/Low values are the top/bottom of the stick, respectively.

**Candlestick Chart**

Many think that Candlestick Charts provide a better visualization than Bar Charts of the supply and demand in a market. They are composed of "shadows" and a "body". When the body of a candlestick is very small or nonexistent, it can be interpreted that supply has equaled demand for the interval, or that the market is indecisive. The shadows, which represent the high and low prices of the session, are considered of less importance in candlestick charting, but nevertheless form a significant part of candlestick chart-patterns recognition.

Although candlesticks are colored based on the relationship between of the Opening and Closing prices, Wealth-Lab draws "up" candles as hollow so that they can be easily distinguished from "down" candles on black & white printers.

**Line Chart**

Simplest of all chart styles, the line chart reveals no information of the Open, High, and Low prices. Only Closing prices are drawn connected by a solid line, which maintains the up/down color scheme based on the direction from one close to the next.

**More Styles** are presented when expanding the **More** button (also in the **Chart** main menu item). Third-party developers can add new styles that are perfectly integrated with Wealth-Lab using the Chart Style Adapter API. This link contains instructions for creating your own Chart Styles as well as a fully-functional Point & Figure Chart Style Adapter available for download, free of charge. The styles appearing in the image below are included natively with your installation of Wealth-Lab Developer 4.0.

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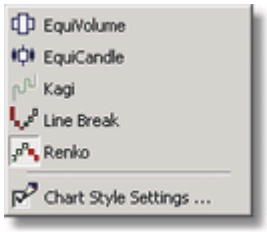


**Remarks:**

1. When one of the following Chart Styles are selected in real-time mode, the ghost bar will be drawn using the Candlestick Style. Upon completion of the interval, the new data will be incorporated into the selected style when the chart is refreshed.
2. Regardless of the Chart Style, ChartScripts maintain access to the original underlying Price Series. You cannot, for example, directly access the "bricks" that form a line-break chart.

### Chart Style Settings...

This selection is enabled in the "More" menu after a selecting a Chart Style that supports optional parameters. Additionally, when applicable to the current Chart Style, this option is enabled in a pop-up menu by right clicking a blank area in the chart.

### EquiVolume

EquiVolume charts combine *price movement* and volume into a single representation. Bars are composed of only the highest and lowest price for the interval, which are designated by the top and bottom, respectively. Bar width is determined by volume and consequently is relative to other bars in the chart. For example, you would expect the width of a bar on a day that traded 100,000 shares to be twice as wide as a bar on a day whose volume was only 50,000 shares.

Thin bars having large price variation can be interpreted to be "easy movement", whereas small bars having a squarish shape indicate lack of commitment from both bulls and bears. On the other hand, strong commitment from these camps are detected on days (intervals) of large volume, observed by thick bars. Large price movement on these days indicate a push from one side, whereas a short and wide bar signifies a battle between both sides.

### EquiCandle

EquiCandle simply combines the techniques of both Candlestick and EquiVolume chart styles. Opening and closing price information is preserved in this "EquiVolume" representation.

### Kagi **Chart Style Settings:** Kagi Reversal Amount

Steve Nison tells us in "Beyond Candlesticks" that Kagi comes from the Japanese word for key and that the lines drawn by this style resemble an old-fashioned key with an L-shaped head.

Wealth-Lab's interpretation of the Kagi chart is based on *closing prices only*. After choosing the Kagi Chart Style, configure the Kagi Reversal Amount in the Chart Style Settings. You can choose between percentage or point reversals. If you don't think you're seeing a sufficient amount of Kagi lines, try reducing the reversal amount.

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**Tip:** When using Kagi *percentage* reversal, switch to the semi-log Chart Scale 50 setting so that all same-percentage moves are viewed as equal vertical displacements. Likewise, use a linear Chart Scale for Kagi point reversals.

Kagi lines are constructed by drawing a continuing vertical line in the direction of gradually increasing price closes until a reversal occurs (on a closing basis) that meets or exceeds the Kagi Reversal Amount. When this occurs, a short horizontal line, called the inflection line, is drawn. A vertical line is then drawn in the reverse direction by the full value of the reversal and continues with decreasing price until another reversal of the specified magnitude occurs, and so on.

**Note:** Due to the manner in which Kagi charts are drawn, the time axis is irregular. Dates and price data are displayed only for the bar of the highest or lowest point before the next reversal.

**Line Break** **Chart Style Settings:** Number of Lines to Break (Break Prices)

Wealth-Lab Developer 4.0 offers a representation of the most popular Three-Line Break chart, also referred to as "Three-Price", "Three-Step, and "Three-Link" Break. The Line Break style uses closing prices only and allows you to visualize trends and trend reversals in any time frame. Although three (3) break prices is most often used, you can select any number of break prices, from 2 to *N*.

In a bull market, white (up) lines are drawn for each *new higher closing* price. After three white lines are drawn, the reversal or "break" price becomes the third previous higher close. Acting like a stop, the break price trails as new higher closes occur. When the break price is penetrated on a closing basis, a reversal (dark) line is drawn. At this point, a new [bear] trend can develop downward, or, the previous trend can resume if a new higher close occurs. When three dark lines are drawn, the bear trend has been established and the process is same. Trendless markets may be observed by alternating reversal lines, white and dark.

Consistent with the notion that price movement is unimportant if it does not create a new higher or lower price, the data displayed in the Data Window 269 and chart pop-up for each line, or brick, is comprised of the OHLC/V data from the bar on which the new price or break occurred. Consequently, the Volume Pane also indicates the volume from these bars.

**Note:** Since lines are drawn only for new price highs and lows, the time axis for Line Break charts is distorted and uneven. During periods of large price movement, more bars will be shown than in a similar less volatile period.

**Renko** **Chart Style Settings:** Renko Price Units (RPU)

Like the Three-Line Break style, Renko charts use only closing prices. However, the Renko chart style draws bars, or bricks, of the fixed amount that you specify in the Chart Style Settings as Renko Price Units (RPU). Price must move greater than this fixed amount for a new brick to be drawn, and, no matter how large the price movement, bricks are always drawn equally-sized. For example, in a 2-point Renko chart a 10-point move would result in five consecutive 2-point bricks.

The basis, or starting price is quite arbitrary and is based on your Data Loading configuration. Consequently, Wealth-Lab uses cardinal boundaries when determining to draw a new bar. For example, if you set an RPU of 1.0, bricks will be drawn for 1-point price changes relative to integer price levels, e.g. 10, 11, 12, etc. Because Renko bricks are all the same size, price changes in excess of an integer multiple of the RPU are discarded. Continuing the previous example, if our Closing Price Series were ..., 9.0, 9.1, 10.8, ..., only a single brick would be drawn from 9 to

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10.

Finally, for a brick to be drawn in the reverse direction, price must exceed the base price of the previous brick by the RPU. Expanding our example series ..., 9.0, 9.1, 10.8, 10.1, 9.2, 8.7, 7.3, ...., a reversal brick would be drawn from 9 to 8 upon the 7.3 close.

**Notes:**

1. Since "bricks" are drawn only when price exceeds the RPU, the time axis for Renko charts is distorted and uneven. During periods of large price movement, more bricks will be shown than in a similar less volatile period.
2. Price movement that does not result in the drawing of a brick is unimportant for Renko charts, therefore, the Data Window displays only the OHLC/V data for the underlying bar of data from which a brick is formed.

**Point & Figure** **Chart Style Settings:** Box Size, Reversal Boxes, Price Field, Log Method

The Point & Figure ("PnF" for short) chart style is implemented via the Chart Style Adapter API, which allows developers to create unique chart styles that are perfectly integrated with Wealth-Lab Developer 4.0. PnF charts have a long history and interpreting them are somewhat of a lost art, but several good (and thick) books have been published that treat this subject with fine detail. Below we simply cover how PnF charts are formed, whereas interpretation and trading strategy based on them are left to the motivated practitioner.

The basic PnF charting method divides the price axis into a user-specified *box size*. If the box-size is 1 point, a mark ('X' or 'O') is placed in the box into which the price falls. For example, if price were 18.65, a mark is placed in the box between 18.0 and 19.0. Price fluctuations between 18.00 (inclusive) and 19.0 are completely ignored until another price prints outside that range. When prices are advancing, we use X's for the marks, such that if the next price were 19.00, 19.02, etc. we would place another X in the same column above the previous X between 19.0 and 20.0, and so on as prices continue to rise into new box levels. In the event of gapping prices, all boxes are filled between the prior box and the box containing the price, such that no empty boxes are visible between marks in the same column.

What happens if price start to decline? The *reversal boxes* setting determines when to start a new PnF column of marks in the opposite direction. In our example, if 3 reversal boxes were set, once a mark had been placed in the 20.0 box, we ignore all pullbacks until price dropped *below* 18.0, i.e., into the box representing prices between 17.0 - 18.0. When this occurs, a new column is immediately formed with a corresponding number of O's, starting with the box below the most-recent X. (Vice-versa for the opposite direction.)

In the following illustration, we can tell that prices first advanced to 20 (but under 21), subsequently dropped below 17, and then rose above 22. Note that PnF charts are designed to track price action only without regard to time. Consequently, the chart progresses from left to right only as *price reversals* occur.

```
22      X
21      X
20    X X
19    XOX
18    XOX
17    XOX
16     O
```

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While true PnF charting uses tick data, the *Price Field* setting allows us to use either the Close or High/Low prices from OHLC data. The closing price is essentially treated the same as tick data, although an identical chart will not be formed since the high and low prices are ignored. The problem is partially remediated by using the high and low values of bar data, though this method also has limitations. In the high/low method, when prices are advancing, the high is tested to determine if another X can be drawn. If the high does not create a new box, only then is the low value checked. Vice-versa for declining prices.

The Log method is similar to the Point method, but mathematically more intensive since the log value of price is calculated and the box size is based on percentage movement. Finally, 1-box reversal charts have their own characteristics, the most notable of which is that an X can be drawn in the same column as an O.

---

## Scale Toolbar

The Scale Toolbar controls the scale of the data loaded by the Data Loading 33 control in the ChartScript Window only. Each ChartScript window is independent, therefore the Scale toolbar always reflects the configuration of the window *in focus* (currently selected). Typically, when opening a new ChartScript window, the Scale is initialized to the most recent selection, which you may change without affecting the other windows.

### Time Scale

Scale selections presented in the toolbar correspond as follows:

**D** Daily. Compresses all price action from 12:00:00 AM to 11:59:59 PM (from an Intraday DataSource) into a single Daily bar by date.

**W** Weekly. Compresses Intraday and Daily price action from Sunday through Saturday, inclusive, into a single Weekly bar.

**M** Monthly. Summarizes all price action for a calendar month in a single bar.

**5** Intraday Intervals. The numbers represent common bar interval selections for *X* minutes, seconds, or ticks per bar, depending on the format of the DataSource.

**3** Allows the specification of any, less-common, intraday bar intervals, for example: 3-, 8-, or 13-minute bars. Only valid selections that are *integer multiples* of the underlying DataSource are allowed. You cannot, for example, select 7-minute bars if the DataSource consists of 2-minute intervals.

**Min** If the current DataSource is intraday, the button will reflect the interval type of either minutes, seconds, or ticks. The selection is enabled for real-time DataSources that support this feature.

Wealth-Lab disables (grays out) Scale Toolbar selections that are not available for the currently-selected DataSource in the DataSource Tree 46. Generally, **D W M** selections are available for all DataSources, whereas the intraday intervals cannot be selected when using non-intraday DataSources. As previous outlined, you can *compress* a chart to any higher time frame that can be constructed from the base time frame. For example, if the base time frame of the DataSource is 5 minutes, you can compress the chart to 10, 15, 20 or any multiple of 5 minutes.

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What does this all mean with respect to your ChartScript? Choosing a scale that is different from scale in the underlying DataSource profoundly affects the data that is displayed and available for ChartScript processing. Assume that you are working with a DataSource consisting of 1000 bars of Daily data (approximately 4 years), and, you have set the Data Loading control 33 for "Fixed 500 bars" (Starting/Ending Date are not checked). When you execute the script, indicators and trading data will be based on information from the last 500 bars, or 2 years of data. Sounds reasonable, doesn't it?

However, changing the scale to weekly, for example, by clicking the W scale button, a huge data transformation in the *Primary Series* takes place behind the scenes. Wealth-Lab automatically converts the static Daily data into Weekly bars and attempts to load 500 bars as specified by the Data Loading control. In this case, since only 1000 Daily bars were available, approximately 200 Weekly bars will be formed. Consequently, the ChartScript's indicators and trading data will now be based on the information contained in the approximately 200 Weekly bars, or *4 years of data*.

**Tip:** To test over the same period of data when switching scales, use the date-filtering criteria of the Data Loading control 33.

By using the Scale toolbar, you can see the effect of trading methodologies on different timeframes while maintaining a DataSource with a single timeframe only. Other Wealth-Lab Developer 4.0 tools (WatchList Scans, Rankings, and the $imulator) exhibit a similar scaling feature that allows you to convert Intraday or Daily timeframes to Weekly or Monthly.

**Notes:**

1. Transforming intraday data to multiples of its underlying interval using the Scale toolbar is currently available only for ChartScript windows. A similar *intraday scaling* feature does not exist for the $imulator, Scans, and Rankings.
2. It is not possible to place trades on a Primary Series that has been time-compressed *from within a script* using **`SetScaleCompressed`** or **`SetScaleDaily`**, for example. These WealthScript Time Frame functions allow you only to generate indicators and other Price Series in a more compressed time frame that must be referenced back to the base time frame.

---

#### 4.3.3.3 Plotting Indicators

Because of the way the visual presentation of your trading system is bundled with the trading rules, all indicator plotting on the chart is controlled by the WealthScript code in the ChartScript Editor. Specifically, the **`PlotSeries`** or **`PlotSeriesLabel`** functions are used to plot indicators on the chart. The section Painting the Chart in the WealthScript Guide offers detailed information on this topic, but presented here are a few basics. Also, read the next topic, Indicator QuickPlot 58, to learn how to use tools to simplify the plotting of indicators.

---

## Chart Panes

The basic chart is divided into two panes. The top pane displays historical price information, and the bottom pane displays the corresponding volume information (if available). Hereafter, these panes will be referred to as the **Price Pane** and the **Volume Pane**.

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## Custom Panes

You can create custom Panes by using the **CreatePane** function in your WealthScript Code. The format or *syntax* of the **CreatePane** function is:

```
function CreatePane( Height: integer; AbovePricePane, ShowGrid: boolean
): integer;
```

| Item | Description |
|---|---|
| *Height* | The height of the new pane. A value of 100 will display most indicators well. In the Chart View you can resize the Panes manually with the mouse. |
| *AbovePrices* | Specifies whether or not the new Pane should be above or below the Price Pane. |
| *ShowGrid* | Specifies whether or not horizontal grid lines should automatically be drawn for the Pane. You can elect to not draw the automatic grid and instead draw your own grid lines with the DrawHorzLine function. |

Note that **CreatePane** is a function, and therefore it has a return value. This value is an integer number that represents the new Pane that you just created. You should assign the function to an integer variable to save this number to for use later in the ChartScript.

### Example

```
var Pane1, Pane2, Pane3: integer;
Pane1 := CreatePane( 100, true, true );
Pane2 := CreatePane( 75, false, true );
Pane3 := CreatePane( 200, true, false );
```

## Plotting an Indicator

The Technical Indicators section of the WealthScript Guide contains detailed information on how to access the various indicators available in WealthScript. Briefly, each indicator is accessed by a special function name. All indicator functions have two forms. The first form returns the **value** of the indicator at a specific bar. The second form returns an integer **handle**, which refers to the *entire* indicator series. When plotting indicators we use the second form of the indicator functions.

We use the WealthScript function **PlotSeries** to plot an indicator on the chart. The format of the **PlotSeries** function is:

```
procedure PlotSeries( Series, Pane, Color, Style: integer );
```

| Item | Description |
|---|---|
| *Series* | This parameter should contains the indicator that we're interested in plotting. It's the return value, a handle, of one of the Technical Indicator functions. |
| *Pane* | This parameter contains the Pane in which we want to plot the indicator. This can be the return value of a call to CreatePane to plot in a custom Pane. To plot the indicator in the Price Pane, pass a value of 0. To plot in the Volume Pane, pass 1. |
| *Color, Style* | See the Painting the Chart section of the WealthScript Guide for details on the Color and Style parameters. |

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### Example

```
{ Plot the 200 day moving average in the Price Pane }
PlotSeries( SMASeries( #Close, 200 ), 0, #Blue, #Thick );

{ Plot the 14 day RSI in a new Pane }
var RSIPane: integer;
RSIPane := CreatePane( 100, true, true );
PlotSeries( RSISeries( #Close, 14 ), RSIPane, #Navy, #Thick );

{ Plot Stochastic %K and %D in a new Pane }
var StochPane: integer;
PlotSeries( StochKSeries( 5 ), StochPane, #Purple, #Thick );
PlotSeries( StochDSeries( 5, 3 ), StochPane, #Black, #Thin );
```

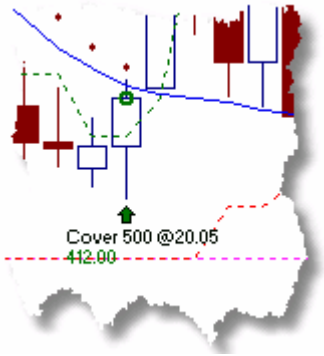
---

## Trade Notes

If your WealthScript code contains trading system rules, you'll see your buy, sell, short and cover orders appear on the chart. Arrows point to the bars where positions were opened and closed. Plus, the actual price level at which the order was executed is circled. Wealth-Lab uses the following colors and shapes to differentiate different order types:

| | Market Order | Limit/Stop Order |
|---|---|---|
| Long Position Entry | ▲ | ▲ |
| Long Position Exit | ▼ | ▼ |
| Short Position Entry | ▼ | ▼ |
| Short Position Exit | ▲ | ▲ |

In addition to the circles and arrows, all trades are annotated by default with the order type, position size, execution price, and, if exiting a Position, the net profit (loss).




**Tip:** To control the display of textual and graphical trade notes, use the EnableTradeNotes function in your ChartScript.

---

### 4.3.3.4 Indicator QuickPlot

If everything that you read in the previous topic made it sound like a lot of work to plot an indicator in your chart, don't worry. Wealth-Lab Developer 4.0 provides drag and drop tools that automate the process. Using the *QuickPlot* feature, you can:

- Plot an indicator for a specified Price Series
- Apply indicators to other indicators
- Automatically or manually create new panes for indicators

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- Save your work without applying code to a ChartScript so that you can re-open the QuickPlot session.
- Export a ChartScript with QuickPlot Indicators (they are restored when importing).

---

## QuickPlotting an Indicator

All native and custom indicators available in Wealth-Lab Developer 4.0 are accessible in the **Indicator List**, which is one of four tools in the Icon Bar along the left edge of the Wealth-Lab Developer 4.0 main window. Click the **Indicators** button to expose the Indicator List panel.

**Tip:** Quickly jump to an indicator by clicking on any indicator name in the Indicators panel and then typing the first few letters of the indicator.

To plot an indicator from the Indicator List, first make sure that you have a ChartScript Window open. Then, select the indicator that you want to plot. You have two methods for plotting:

**Step 1. Open a ChartScript Window.**

This can be a New ChartScript Window or one which you have previously saved.

**Step 2. Select the indicator.**

Find the indicator in the Indicator List and click on it once. Double-clicking an indicator's name will bring up the QuickRef window for a native indicator. (Native indicators do not have the red **+** symbol next to their name.)

**Step 3a. Click the Plot button.**

Click the **Plot** indicator button in the Indicators Toolbar 58, or right click the indicator and select **Plot** from the pop up menu.

**Step 3b. Drag and drop the indicator into the chart.**

Instead of using the **Plot** button, drag and drop the indicator into the chart. Using this method has the added advantage of applying the new indicator directly to another indicator! It's also possible to do this using the Plot-button method, however, it may require that you manually type the series handle name (which may not be readily available) in the Series selection combo box.

During the drag and drop operation, if the indicator is going to be applied directly to another indicator's Price Series, a series of small solid squares (see image below) will be placed on the plot of the *target indicator*.

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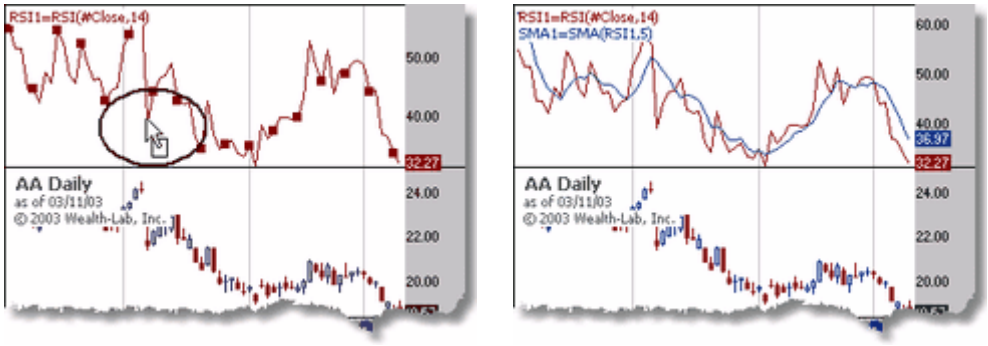
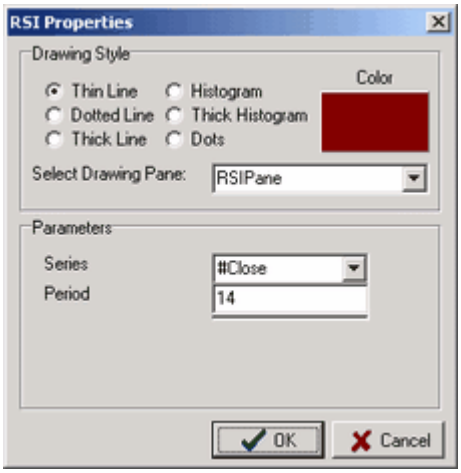



***Application of the SMA indicator to the RSI indicator via drag & drop***

**Step 4. Assign properties to the indicator.**

At this point you'll see a dialog box where you can specify the drawing style, color, drawing pane, and parameter values, if any, of the indicator to be plotted.

If the indicator is normally plotted in a pane other than the Price or Volume panes, then a new pane will automatically be named and selected. This name will later be used as the pane's variable name in the ChartScript, and, you have the option of typing your own name in the entry box for **Select Drawing Pane** (see image below).




***Indicator Properties Dialog***

Make your choices, press **OK**, and the indicator will be plotted on the chart.

**Step 5. Interact graphically with newly-plotted indicators.**

If not satisfied with your initial selections, edit the properties of an indicator by double clicking the indicator's plot or by hovering the cursor until its name and value can be seen in pop-up context menu, right click, and select **Edit Indicator** from the pop-up menu. You'll be taken back to the indicator's properties window. Note that you must position the mouse pointer directly over an indicator value at a specific bar, not between bars. Remove the indicator entirely by choosing **Delete Indicator**, or by clicking the Undo Last Plotted Indicator 58 button in the Indicator Toolbar.

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***RSI Indicator Pop-up (Chart View) and the right-click menu.***

**Note:** If Disable Price Box Rollover 246 is selected, the indicator's informational pop-up cannot be viewed.

**Step 6. Save your work!**

Repeat the preceding steps as often as you like. The next time you open a ChartScript that had an "open" QuickPlot session, you will be able to resume graphical interaction with the indicators. A QuickPlot session is open until you choose to Push All Plotted Panes & Indicators 58 to the ChartScript Editor.

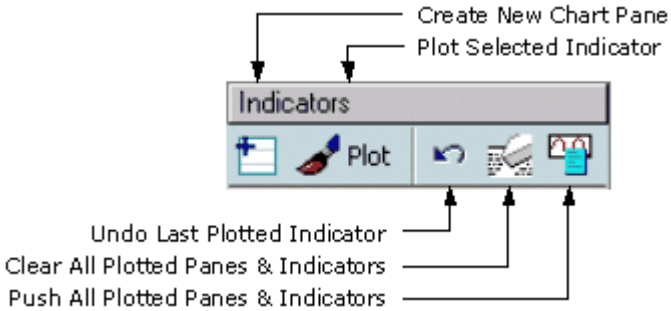
**Usage Notes:**

- You must use the normal cursor 65 for right click operations.
- If a plotted indicator closely follows a Price Series, it may be difficult to select the indicator for editing. In this case, it may be useful to use the Undo feature and then re-plot the indicator after editing the properties.
- To apply an indicator using drag and drop to an indicator graphed as a histogram, you must position the cursor over the envelope (the very top, or bottom if negative) of the histogram.
- Property settings for an indicator's last use are remembered for its next application.
- If a scripting error occurs during a QuickPlot operation (normally due to an error in a custom indicator) it will be necessary to perform the Push All Plotted Panes and Indicators 58 action to investigate the problem code.

The sections which follow describe important additional features that are available to you during your QuickPlot sessions.

---

## Indicators Toolbar




### Create New Chart Pane

Clicking this button brings up a dialog box to enter properties for a new chart pane. You can specify the pane's height in pixels, place the new pane above or below the Price Pane, and draw the default gridlines in the new pane. Panes added in this manner will be automatically named *PaneN*, where *N* is the Nth pane created. You can use your custom pane for new QuickPlot indicators, but be sure to select the pane in the Indicator's Properties dialog.

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### Plot Selected Indicator

Clicking this button will display the properties dialog for the selected indicator, as shown previously for the RSI Properties. Customize the indicator's properties and parameters, and specify the drawing pane.

**Tip:** Instead of clicking the Plot button after selecting the indicator, just drag the indicator and drop it directly into the chart!

### Undo Last Plotted Indicator

This selection removes the last QuickPlot indicator. Since is it possible to plot more than one indicator in the same pane, undoing the last indicator does not remove its pane even if it created one. To manually remove a pane created by QuickPlot, right click in the pane's area and select **Delete Pane**.

### Clear All Plotted Panes & Indicators

Click the button with the eraser icon to clear all panes and indicators plotted by your QuickPlot session. Indicators that were previously plotted manually in your code are not affected.

### Push All Plotted Panes & Indicators

End your QuickPlot session by "pushing" the panes and indicators into the Editor's code window. After this action you will no longer be able to graphically interact with the indicators. You may, however, edit them in the resulting WealthScript code. Save your work again after using this button!

---

## Controlling Chart Panes

Dropping an indicator into a pane does not *necessarily* mean it will end up in that pane, even when applied to another indicator. However, you have the opportunity to verify and/or change the target pane when the Indicator Properties Dialog 58 appears.

A new pane will be created if required, and, for native indicators this is controlled by an entry in the Docs.DAT database for the indicator. RSI needs a new pane, for example, but SMA can be plotted on the same pane as the "target". Custom indicators, however, are always defaulted to a new pane.

### Deleting a pane

Right click within a pane that you added during a QuickPlot session and select **Delete Pane** from the pop-up menu. This will also delete any indicators plotted in the pane. Like indicators, this action is not available once plotted panes and indicators have been "pushed" to ChartScript.

### Undo Last Plotted indicator

Removing an indicator does not delete its pane. If you do not want the pane to remain, you must delete it with the method above.

### See Also:

Create New Chart Pane 58

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### How does the QuickPlot Work?

At first, the Indicator QuickPlot *invisibly* generates the WealthScript code to plot the indicators and new panes. The code is invisible so that you can continue to graphically interact with the indicators as described above.

When you close the QuickPlot session by choosing Push All Plotted Panes & Indicators 58, Wealth-Lab makes the hidden code visible in the ChartScript. To see the code, switch to the ChartScript Editor. The Indicator QuickPlot generated the following code in our example above to plot the SMA of the RSI:

```
var RSIPane: integer;
RSIPane := CreatePane( 75, true, true );
var RSI1, SMA1: integer;
RSI1 := RSISeries( #Close,14 );
PlotSeriesLabel( RSI1, RSIPane, 900, #Thin, 'RSI1=RSI(#Close,14)' );
SMA1 := SMASeries( RSI1,5 );
PlotSeriesLabel( SMA1, RSIPane, 009, #Thin, 'SMA1=SMA(RSI1,5)' );
```

### QuickPlot and the Function QuickRef

The Function QuickRef is an integrated reference of every native function available in WealthScript. Excluding the drag & drop method, you can plot indicators on your chart in the way described above directly from the Function QuickRef. Just make sure you're looking at the **Indicators** category of functions. Select an indicator from the list and you'll see the familiar paintbrush button on the Function QuickRef entry. Click the paintbrush icon to plot the selected Indicator on the chart.

#### 4.3.3.5 Studies and Custom Indicators

This topic describes how to include **Custom Indicators** and **Studies** in your ChartScripts. For details on creating custom indicators and studies, see the New Indicator Wizard 97 topic, and the Creating a Custom Indicator topic in the WealthScript Guide.

Custom Indicators and Studies are nothing more than specially prepared ChartScripts that are stored in the **Indicators** and **Studies** folders in the ChartScript Explorer 42. You can use a special form of comment in your WealthScript code to include the code from these (or any other) ChartScripts into your own ChartScript.

The special "Include" comment format is:

```
{$I 'ChartScript Name'}
```

Whenever WealthScript encounters the Include comment in your code, it searches for the ChartScript with the specified name. It then inserts the ChartScript's code into your own ChartScript's code, right at the line where the Include comment was found.

You can use this feature to build a library of functions, procedures, and code snippets that you can easily include in any of your ChartScripts.

### Deleting Studies and Custom Indicators

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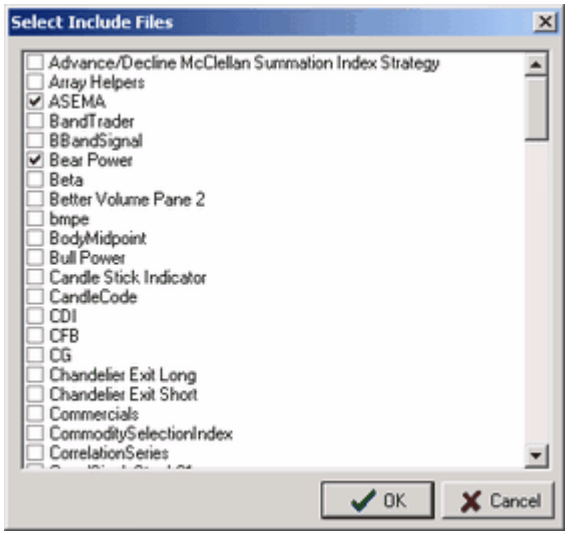
To delete a study or custom indicator from the Include Manager and Indicators Icon bar, use the following procedure:

1. Open the ChartScript Explorer 42 (Ctrl+O)
2. Navigate to the "Studies" or "Indicators" folder, as required
3. Locate the Study or Custom Indicator
4. Click the item to highlight it, strike the **Delete** key on the keyboard, and confirm the ChartScript deletion.

---

## The Include Manager

Wealth-Lab Developer 4.0 has a special tool that helps you manage included ChartScripts. The Include Manager {$I} can be found under the **Tools** menu, or by pressing F6.




The Include Manager lists all of the ChartScripts in the **Indicators** and **Studies** folders. You can check off which ones that you want to include in your ChartScript. The Include Manager then generates the Include comments for you in your WealthScript code. Refer to the Include Manager 270 topic for more details.

---

## Difference Between Indicators and Studies

Both Indicators and Studies are displayed in the Include Manager for easy inclusion in your code. Indicators, however, are specially formed ChartScripts that contain two functions, one to return the value of the indicator at a specific bar, and a second to return the complete indicator series. Use the New Indicator Wizard to generate the boilerplate code for a new Indicator.

The ChartScripts in the Indicators folder have one additional unique aspect. Wealth-Lab Developer 4.0 will scan the ChartScripts in the Indicators folder at startup time, and place any Custom Indicators found into the Indicator List 58.

Note that although only the ChartScripts in the Indicators and Studies folders are picked up by the Include Manager, you can include ChartScripts that are stored in any folder by manually typing the Include comment text.

**Example**

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```
{ The following line includes the ChartScript named MyTest }
{$I 'MyTest'}
```

#### 4.3.3.6 Chart Drawing Tools

Wealth-Lab Developer 4.0 provides an array of drawing tools that enable you annotate your charts manually. The focus of the product is on automated trading system development, and our WealthScript language offers an extensive set of functions for drawing all kinds of annotations programmatically. (To see how, open the WealthScript Guide to the topic Drawing Objects in a Pane in the chapter Painting the Chart.) But sometimes it's handy to just draw a trendline manually or add a note to a chart. You can actually use named trendlines that you have drawn manually in your code!

***Drawing on the chart is not limited to just lines and shapes. You can also add notes, callouts, and images.***

**How to Draw an Object**

Generally speaking, to manually place an object in a Chart Pane start by selecting the desired object from the Drawing Tools toolbar with a single left click. Then, identify the location to place it within the Chart Pane. Some of the more advance tools have a specific positioning method as described below, but generally it is accomplished using the click-and-drag method. Click the first point on the chart, and while maintaining the mouse button depressed, drag until reaching the second point. Drawing objects can be drawn in either static or streaming modes.

**How to Edit a Drawing Object**

To edit a drawing object, first ensure that the normal cursor (not the crosshair cursor) is selected on the Drawing Tools Toolbar. Position the pointer over an edge of the object, right click on it, and then select **Edit Object** from the pop up menu. Or, simply double click on an edge of the drawing item. Either action will launch a dialog box that will allow you to modify the properties of the object. New objects are initialized with the last-selected properties.

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**Note:** Some items have a selection point or control line other than an arbitrary edge. The exceptions are noted below for the objects to which this pertains.

### How to Move a Drawing Object

To reposition the entire object while preserving its original shape, first ensure that the normal cursor (not the crosshair cursor) is selected on the Drawing Tools Toolbar. When you place the pointer over the edge of a drawing object, the pointer will change to a small crosshair symbol and a handle will appear underneath. To reposition the object, use the drag-and-drop method by left clicking the movement handle.

Drawing objects remain contained in the pane (Price or Volume Panes only) in which they are drawn. However, by using a movement handle on an edge opposite of the direction in which you want to drag, it's possible to extend objects partially outside the top, bottom, or left portion of the pane while preserving the object's original shape. However, a drawing object cannot extend past the right edge of a chart. In this case, object's will distort (become smaller) in the horizontal dimension.

---

## Drawing Tools (1) Toolbar

Like all toolbars in Wealth-Lab Developer 4.0 the Drawing Tools 1 Toolbar is completely sizeable, moveable, and dockable. It contains the basic tools for controlling drawing, deletion, selection, and storage of manually-annotated objects on a chart. These are described in further detail below.

### Normal Cursor Tool

Turns off the Crosshair Cursor (see below) or cancels any pending drawing action. Activate this normal cursor to edit and interact with drawing objects. Additionally, striking the "." key on the keyboard will toggle between the Normal Cursor and Crosshairs Tool.

### Crosshairs Tool

Activates Crosshairs on your chart that can be positioned by dragging the mouse over the chart area. The current price level and date are displayed alongside the crosshair lines. Click again on the Cursor Tool to turn off the Crosshairs. Generally speaking, you must select the Normal Cursor when interacting with chart objects.

**Tip:** Typing a "**.**" on the keyboard will toggle between the Normal Cursor and Crosshairs Tool.

### Chart Book for Drawing Objects

Wealth-Lab Developer 4.0 is equipped with an unlimited number of ***Chart Books*** that *automatically* save all of your manually-drawn objects. Each Chart Book saves a complete set of drawing objects on a unique symbol/time frame and static/streaming basis. For example, you may have a different set of drawing items stored in the same Chart Book for the same symbol for various time frames like daily, weekly, monthly, as well as other intraday intervals.

**Note:** Objects drawn in one scale do not appear in other scales. Likewise, objects drawn on a real-time chart are *not* available in static charts for the same

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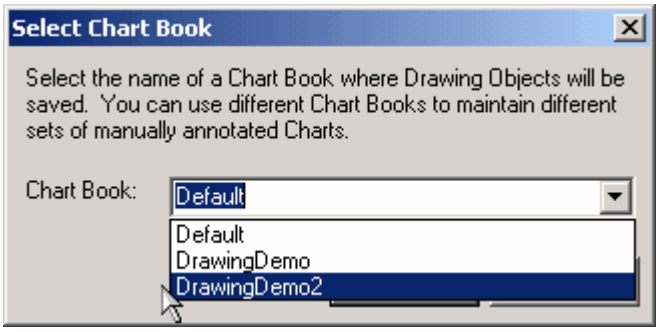
symbol and scale. Tradable Trendlines 73 are an exception to the latter rule.

Drawing objects are automatically stored in the selected Chart Book just prior to script execution and also upon saving or closing the ChartScript. At least one Chart Book is always selected, and, the last-chosen Chart Book is used by default for new charts. Before manually adding objects to a chart, it's a good idea to select a Chart Book in which you'd like the objects to be stored.

Click the Chart Book icon to select different Chart Books to store drawing objects for the current and subsequent charts. Create new Chart Books simply by clicking the drop-down control (or by tabbing to it), typing a new name, and then selecting **OK** or pressing the **Enter** key.




Objects drawn in panes other than the Price or Volume Panes are recalled based on the variable name of the pane in the ChartScript. For example, you may have a pane with a variable name *StochPane* for a stochastic indicator in one ChartScript and a pane variable *RSIPane* for RSI in another script. Drawing objects in *StochPane* and or *RSIPane* will be recalled from the Chart Book for a particular symbol and time frame, whenever these variable names are used to represent a Chart Pane.

---

### Delete Drawing Objects Tool

Click this tool to delete all drawing objects on the chart and to remove them from the Chart Book for the chart symbol's currently-selected time frame. An individual object can be deleted by positioning the normal cursor over an edge of the object, right-clicking, and selecting **Delete Object**.

---

### Show Drawing Object Handles

Closely-spaced and small objects can make it difficult to resize or select a specific item. Take the guesswork out of these tasks by showing all drawing object handles. This will make it easy to identify and select a handle associated with an object. When selected, the user-interface action sounds are disabled for chart objects.

---

### Text Note Tool

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To place a text note on a chart, click this tool, then click the area of the chart where you want the note to go. A dialog box will appear where you can enter the text for your note and specify the font. To move a note, move the mouse near its upper left hand corner until the mouse cursor changes into a small crosshair symbol. You can then drag the note around on the chart. To edit the note, place the mouse pointer above the note text, right click, and then select **Edit Object** or **Delete Object**.

---

### Callout (Text Balloon) Tool

As an option to using the Text Note tool, you can add a Callout and point to a specific area on the chart to highlight it. Add a Callout in the same manner as you would a Text Note. In addition to entering text and choosing a font, you can also specify the background color of the balloon.

When hovering the cursor over the balloon (or if "Show Drawing Object Handles" is selected), two handles will appear. The upper-left-most handle allows you to reposition the balloon. To locate the Callout's pointer, drag and drop the center handle. To move the pointer to a different location, repeat the process by dragging and dropping the center handle. Finally, the pointer may be removed by displacing the center handle slightly within the balloon itself.

---

### Bitmap Image Tool

Quickly add your company's logo or other bitmap image to a chart via the Bitmap Image Tool. Select this tool and then click on an area in the chart where you want the upper-left corner of the bitmap to appear. After identifying this area, select the image file from the dialog box that appears and click **Open**. The image can be repositioned using its selection handle.

---

### Vertical Line and Tool
### Horizontal Line Tool

To draw a vertical or horizontal line on your chart, click these tools, then click the point on the chart where you want the line to be placed. You can move a line by dragging the single handle that lies along the line. Right click the handle to get a pop up menu that lets you edit the line's properties or delete it.

---

### Rectangle Tool
### Ellipse Tool

Rectangles and ellipses are drawn in a similar fashion by defining two-opposing corners of either shape. In the case of the ellipse, the "corners" are the intersecting (and invisible) horizontal and vertical tangent lines. Select the shape desired, click on the first point on the chart, and while holding the mouse button drag until reaching the second point.

Resizing these objects are done in the standard manner, however, in the case of the ellipse you may find it useful to show the drawing object handles 65 to easily locate the resizing handles.

---

### Triangle Tool

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### Diamond Tool

The triangle and diamond-shape tools actually create 3 and 4-sided polygons, respectively. Choose the tool by clicking on it once, and then create a vertex by left-clicking a point on the chart. While maintaining the button depressed, drag the cursor to another point for a second vertex.

Generally, a third vertex is automatically created at the same value but 10 bars to the right of the initial point clicked. A fourth vertex is required for the diamond tool, and it is initialized above the 3rd vertex at a height 2% above the price of the 3rd vertex. The diamond shape *must* be formed at least 10 bars to the left of the final bar in the chart. After defining the points for the first two vertices, use the vertex handles to re-shape the polygon.

---

## Drawing Tools 2 Toolbar

### Trendline Tool

To draw a trendline on your chart, click this tool. Then click on the point of your chart where you want the trendline to start. Keep the mouse button pressed and drag until the trendline is completed.

Double-click or use right click|**Edit Object** to bring up the Trendline Properties dialog. You can set the color and drawing style of the trendline, as well as control whether the ends "snap" to the nearest price (open, high, low or close). To use the snap feature, you must drag the end points after initially drawing the trendline. When "Percentage Gain" is selected for display, two lines will be visible - the dominant line drawn by the user and a dotted grey close-to-close line that shows the percentage gain/loss between the bars defined by the end points.

Trendlines may be extended right and/or left on the chart by checking the respective options. When a trendline is extended you'll see a small handle where its actual end point is (when hovering the cursor). To delete a trendline, right click on the line and select **Delete Object** from the pop up menu.

Another useful feature is the ability to provide a name for your manually-drawn trendlines in the Trendline Properties dialog. You can then access the trendline's value at any specific bar in your WealthScript code, using the **TrendLineValue** function.

#### Example

```
{ Color bars red if they penetrate a trendline named Resistance to
the upside }
var NEWPANE, TL, BAR: integer;
NewPane := CreatePane( 100, true, true );
TL := CreateSeries;
for Bar := 0 to BarCount - 1 do
  SetSeriesValue( Bar, TL, TrendLineValue( Bar, 'Resistance' ) );

PlotSeries( TL, NewPane, #Blue, #Thin );
for Bar := 1 to BarCount - 1 do
  if PriceClose( Bar ) > GetSeriesValue( Bar, TL ) then
    if PriceClose( Bar - 1 ) < GetSeriesValue( Bar - 1, TL ) then
```

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```
SetBarColor( Bar, #Red );
```

### Tradable Trendline Tool

See the Tradable Trendlines in the Chart Trading 73 topic.

### Regression Channel Tool

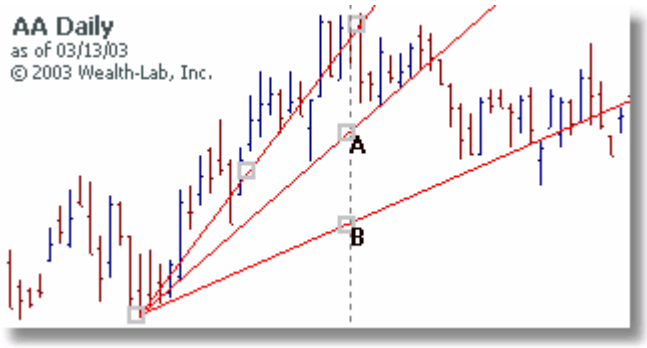
To draw a Regression Channel on your chart, click this tool. Then, click the point on the chart that you want the Regression Channel to begin. Holding the mouse button down, drag to the right until the channel is completed. The Regression Channel draws a linear regression line composed of the closing prices between the start and end points. It draws channels around the regression line.

The distance of the channels are based on the highest distance of a single point above or below the regression line. To edit or delete a Regression Channel, follow the same procedure as described for trendlines. Use the name property and the **TrendLineValue** function to access the value of the Regression line from within a ChartScript.

---

### Speed Resistance (S-R) Lines

Speed Resistance Lines are composed of three trendlines. Use this tool to define the line between a major high and low. After selecting the tool, click the left-most point on the chart. Continue holding the mouse button down and drag to the right until reaching the second point. The S-R lines are rendered on the chart during the drag operation to assist in positioning.




In addition to the defining trendline, which is the only line used for editing and movement of the S-R object, two resistance lines are formed automatically by drawing a line from the original price that intersects values at the final bar that are 1/3 and 2/3 the distance between the prices identified by the control trendline. The intersection points are illustrated by points A and B above. Note that points A and B are located at the same bar as the second, most recent point.

It may be convenient to show the drawing object handles 65 to easily locate the handles of the defining trendline to alter their location. It's easy to duplicate S-R lines and other objects in a ChartScript as the next example demonstrates.

**Example**

```
{ You can extend the lines drawn with this procedure using
LineExtendY
  or LineExtendYLog for semi-log charts (see Code Library) }
```

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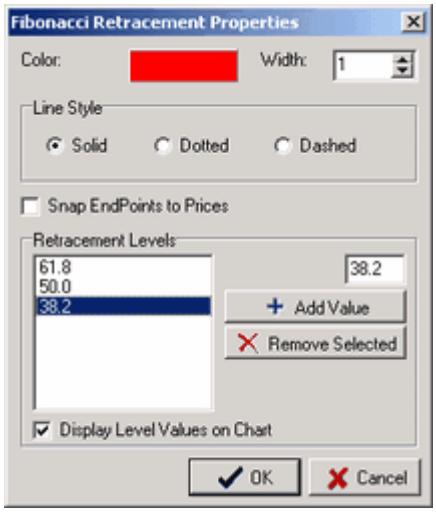
```
procedure SpeedResistance( Bar1: integer; Price1: float;
                           Bar2: integer; Price2: float );
begin
  var Delta: float;
  Delta := Price1 - Price2;
  DrawLine(Bar1, Price1, Bar2, Price2,0, #red, #thin);
  DrawLine(Bar1, Price1, Bar2, Price2 + Delta / 3, 0, #blue,
#dotted);
  DrawLine(Bar1, Price1, Bar2, Price2 + Delta * 2 / 3, 0, #blue,
#dotted);
end;

{ Find the latest 8% peak and trough and draw the S-R lines between
them}
var Bar, B1, B2: integer;
var P1, P2: float;

Bar := BarCount - 1;
B1 := PeakBar( Bar, #Close, 8.0 );
B2 := TroughBar( Bar, #Close, 8.0 );
if B2 > B1 then
  SpeedResistance( B1, PriceClose(B1), B2, PriceClose(B2) )
else
  SpeedResistance( B2, PriceClose(B2), B1, PriceClose(B1) );
```

---

### Fibonacci Retracement Tool
### Fibonacci Fan
### Fibonacci Arcs

Fibonacci Retracement, Fan, and Arcs tools project support and resistance area characterized by Fibonacci and user-defined ratios into the future. After defining a major peak and trough, these zones are represented in the various manners by dividing the difference between the peak and trough into the ratios configured in the Fibonacci Retracement Properties common dialog.




Although the principal Fibonacci ratios are 38.2, 50, and 61.8%, Wealth-Lab allows you to enter your own ratios, which may be any range of positive or negative numbers expressed as a percentage. The last-used settings are used for the next application of any of the three Fibonacci retracement tools.

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The manner in which each Fibonacci retracement tool is drawn is exactly the same. Select the desired tool, and draw a line from a swing high to a swing low, or from a low to a high. Upon releasing the mouse the Fibonacci retracement levels are displayed. The Fan and horizontal retracement levels are extended to the chart edge. You can modify the levels by editing the Fibonacci control line.

Fibonacci retracement tools cannot be moved, per se. They can, however, be repositioned by dragging each end point to a new location.

---

### Fibonacci Time Zones

Whereas the default percentages (38.2, 50.0, and 61.8) for the Fibonacci retracement tools are based on ratios of Fibonacci numbers, the Fibonacci Time Zones are based on the Fibonacci sequence itself. For reference, the sequence is 1, 1, 2, 3, 5, 8, 13, 21, 34, 55, 89, etc. Consequently, the Time Zone tool draws vertical lines at Fibonacci number distances, where each zone line is relative to the previous.

To draw the time zones, simply click the tool and then click the bar on which to begin the Fibonacci Time Zones. The [first] line drawn at the start bar is the control line used to select, edit and move the object. A number corresponding to the Fibonacci distance is displayed for each time-zone line. The illustration below indicates where lines will be drawn if the start bar were Bar Number 0 (the first bar in the chart).

```
TZ Line at Bar:   0 | 1 | 3 | 6 | 11 | 19 | 32 | 53 | 87 ...
Fib Sequence Num:   1   2   3   5    8   13   21   34 ...
```

**Tip:** If using more than one Time Zone tool in the same chart, you can easily distinguish them by changing the color or line style in the object's property settings. Double-click (or right click) the initial line to Edit Object Properties.

---

### Gann Fan

A Gann Fan is a set of lines emanating outward (forward in time) from a single price. The lines suggest possible points of support and resistance based on a simple rate-of-change relationship between time and price. Wealth-Lab's Gann Fan Properties Editor allows you to specify the Time/Price ratio as well as the number of price units for each time unit (bar).

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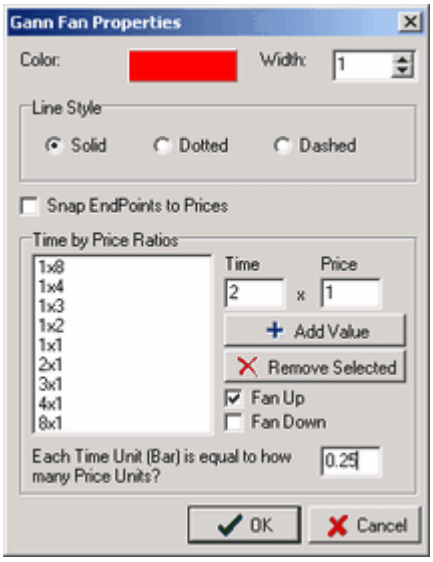


The Gann Fan properties shown above will attempt to draw 9 lines emanating forward and up using the Time/Price ratios shown. To demonstrate what these ratios signify, let's concentrate on the 2x1 line and notice that 0.25 is selected for the Time/Price ratio. If you were to start a Gann Fan on Bar Number 1000 at a price of 10.0, the 2x1 line would be drawn through a price of 11.0 at Bar Number 1008. In other words, we're adding 1 price unit (10.0 + 1) for each 2 time units, and, each time unit (bar) is equal to 0.25 price units. Consequently, the Bar Number is 1000 + (2 / 0.25 ).

Draw the Gann lines by clicking on the tool and subsequently clicking on the point that will serve as the origin for the lines. At this time you will have an opportunity to edit the Gann Fan Properties. Click **OK** to complete the drawing.

The selection point for the Gann Fan is the origin of lines. Ensuring that the normal cursor 65 is selected, hover it over the origin until it changes to a small crosshair symbol. Bring up the Gann Fan Properties dialog by double clicking the origin or by right-clicking and selecting **Edit Object**. While dragging the fan for repositioning, the object will automatically snap to the center of the nearest bar.

**Tip:** Due to their dependence on price and time, Gann lines will slope quite differently using the same properties for, say, the Dow 30 index and a stock trading at a price of 20. For this reason you will generally want to adjust the Time Unit setting to a number greater than 1 for indices. For daily stock charts start with a value of 0.25 to get good Gann lines. A value of 1.0 would be consistent for weekly charts.

---

#### 4.3.3.7 Chart Trading

### Tradable Trendline Tool

The Tradable Trendline (TT) tool as an extension of the regular Trendline tool 65 with the added ability to generate Alerts based on *closing price* crossing above or below the line. Optionally, you can configure the WatchList Scans 136 and RT Scans 201 tools to generate Alerts based on TTs drawn on charts in the same scale.

**Note:** TTs are persistent by *symbol* and *scale*. **Example:** A TT drawn on a MSFT 2-minute streaming chart will be available in a MSFT 2-minute static chart as well as in Scans using a 2-minute DataSource.

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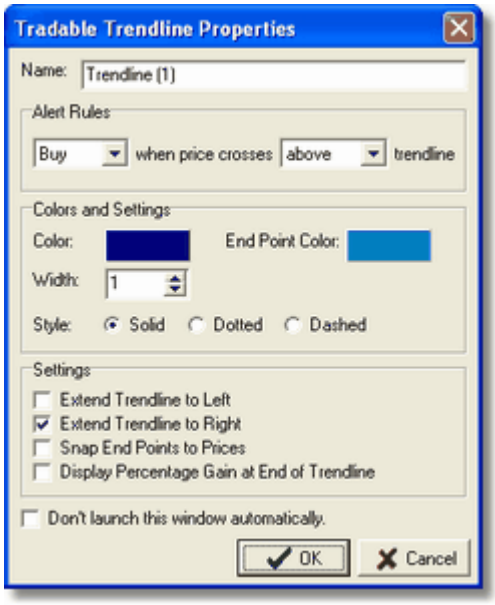


**By default, the Tradable Trendlines Properties dialog is displayed upon drawing the line.**

### Alert Rules

While most options are identical to the regular Trendline counterpart, you should verify and set the *Alert Rules* properties after drawing a TT. You can create an Alert to *Buy* (default), *Sell*, *Short*, or *Cover* when the closing price crosses above/below the trendline. If the trendline extends to a value above the closing price of the most-recently-completed bar (not the ghost bar) when drawn, then the selection defaults to "crosses above" and vice-versa.

**Warning!** Because TT Alerts are market orders, they will out-prioritize Stop and Limit Alerts from an underlying ChartScript while using the Auto-Pilot 232. Since Tradable Trendlines signals are discretionary in nature, we do not recommend mixing TT Alerts with automated system trading.

**Tip:** To draw a horizontal trendline, select the Trendline tool and simply click once on the chart and release. Drag the line (not the handle) to precisely the price level desired by monitoring the Trendline value displayed on the handle.

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***In this example, the Position size is calculated using the close of the last complete bar, 22.96. $50K * 45% / 22.96 = 979.97 shares, which is rounded to 1000 shares due to Round lots 257.***

### Include Trendline Alerts

Check this option to enable TT Alerts in the ChartScript Window.

**Warning!** It's possible that the same trendline generate more than one signal if the crossing condition occurs more than once.

**Remarks:**

- The trendline name will appear in the *SignalName* of the Alert, i.e., Trendline( [Trendline_name] ).
- TTs drawn on static charts are available on streaming charts, and vice versa. Tradable trendlines drawn on either chart type will also be available to Scans and Real-Time Scans
- Scale matters. TTs trigger only on the same scale on which they were drawn.
- TT Alerts are processed immediately following script execution

---

## Right-Click Trading

The ChartScript Window's main context menu includes options to Buy, Sell, Short, or Cover shares of the ticker currently viewed in the chart window. The order's share size displayed is determined by the setting in the Position Sizing Control 263. Upon selection, a *market order* is sent to the Order Manager's queue 223, and, if the Auto-Pilot 232 is enabled the order is immediately placed with your broker.

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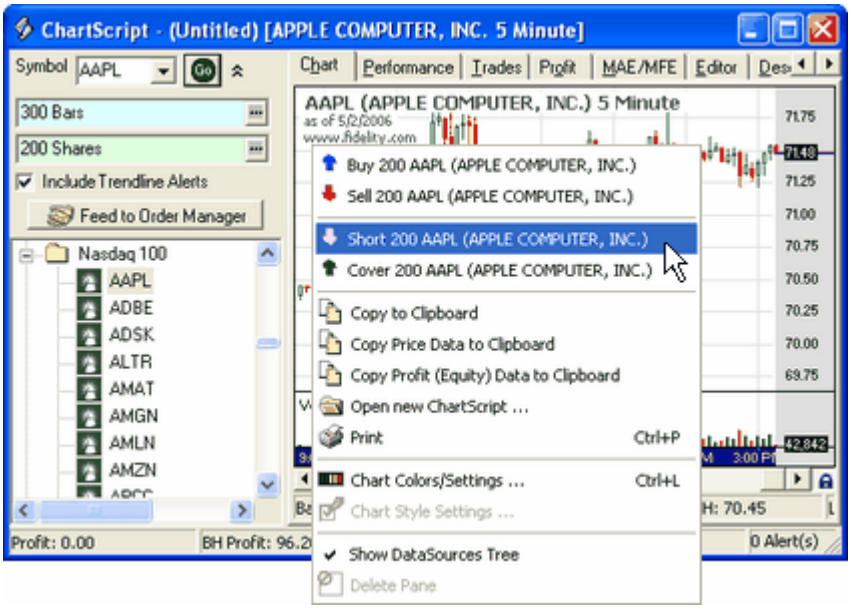


***Immediately send an order to Buy, Sell, Short, or Cover the underlying ticker to the Order Manager.***

### Determining Position Size

The following pseudo code summarizes how Position Size is determined for Right-click trading. For money-management options that are not shown, Right-click trading is *disabled*.

| | |
|---|---|
| **Fixed Dollar** | `Share_size = Trunc( Dollar_setting / PriceClose( mrb* ) )` |
| **Fixed Shares** | `Share_size = Fixed_Share_Size_setting` |
| **Percent of Equity** | `Share_size = Trunc( PctEq_setting * Equity( mrb* ) / PriceClose( mrb* ) )`<br>**Note:** Equity is based on the equity curve value at the last bar after running the ChartScript. |
| **SimuScript** | `Share_size determined by SimuScript` |

`* mrb = most-recent bar`

### Remarks

- Right-click trading is disabled for Portfolio Simulation sizing selections 263: **Maximum Risk Pct** and **SetShare/PositionSize Value**.
- Trades are destined to the default trading account 234 unless the ChartScript has an alternate account association 213.
- All trades are market orders, however, you can edit the trade once in the Order Manager's queue if the Auto-Pilot is disabled. If the Auto-Pilot is enabled, trades are immediately placed at market without the ability to edit the order.

## 4.3.4 Performance View

The ChartScript Performance View provides a summary of the trading system's performance. A list of performance metrics is presented along the left. Each

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performance metric is reported for All Trades, Long Trades, Short Trades, and Buy & Hold strategy. See the WealthScript Language Guide for instructions on using PerfScripts to customize the performance report.

**Important Note!**

Depending on the configuration of the Position Sizing Control 263 before you execute the ChartScript, Raw Profit Only 263 or Portfolio Simulation 263, Wealth-Lab Developer 4.0 will provide the appropriate set of data for the performance summary. In the case of Portfolio Simulation, the summary details can be found in the $imulator's Performance View 163 topic. In the Raw Profit mode, the performance metrics shown below are presented.

---

**Net Profit**
The total profit generated. This is the sum of the net profits, reduced by commissions and slippage, for each trade generated by the system. Each trade's position size is determined by the Position Sizing Control's setting, and, the commission value set by the Options dialog is subtracted from each trade (see Trading Costs/Control 257).

Note that in Raw Profit mode, by using a fixed position size for each trade you can more fairly compare the trading system's performance with that of Buy & Hold. If Fixed Dollar/Margin is selected, the Buy & Hold strategy determines the number of shares by dividing the closing price of the first bar into the designated amount. Otherwise, Buy & Hold simply uses the Fixed Share/Contract setting. It then buys that number of shares at the open of the second bar.

Once your ChartScript is developed in the Raw Profit mode, you can switch to Portfolio Simulation or use the $imulator tool to experiment with advanced money management techniques.

**Profit per Bar**
The total net profit divided by the total number of bars of exposure. Note that for systems that average down and open multiple positions the total bars held may actually be higher than the total number of bars in the chart. Profit per Bar provides a fair comparison to the Buy & Hold strategy, and gives us an idea of the efficiency of the trading system.

Even though a system doesn't beat Buy & Hold in terms of net profit, if it has a higher Profit per Bar we can say that it's more efficient than Buy & Hold. We can exploit this efficiency by applying more aggressive Position sizing techniques in the $imulator to maximize actual profit.

**Number of Trades**
The total number of round-trip trades plus open positions. For Buy & Hold, this will always equal 1 in the ChartScript window.

**Avg Profit/Loss**
The average profit/loss per trade.

**Avg Profit/Loss %**
The average percentage profit/loss per trade.

**Avg Bars Held**
The average number of bars held per trade.

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**Winning Trades/Losing Trades Breakdown**
The performance summary next breaks the trades down into winners and losers (a trade is marked a winner if its return after costs is above zero), and presents the same metrics as above, plus the following:

**Gross Profit / Gross Loss**
The total profit generated by the winning trades, and the total loss generated by the losing trades, minus commissions and slippage (if enabled).

**Max Consecutive**
The maximum number of consecutive winners and losers generated.

**The Bottom Line**
The bottom of the performance view lists a number of general system performance stats:

**Max Drawdown**
Max Drawdown is the largest peak to valley loss of the trading system's historical profit curve. In the Raw Profit Only mode, we present Max Drawdown in dollars rather than percent because we don't have a concept of starting capital. Here we're interested in determining the core efficiency of a trading system strategy.

In Portfolio Simulation mode or when using the $imulator tool, we take the next step of running the system on a portfolio and calculating overall return based on starting capital. In these cases, we do report Max Drawdown as a percentage (see the summary details in the $imulator's Performance View 163 topic).

**Profit Factor**
Profit Factor is the system's Gross Profit divided by Gross Loss. Look for systems that have a Profit Factor of 2 or higher.

**Recovery Factor**
Because Max Drawdown is reported by actual amount, it makes little sense to compare it to Buy & Hold's Drawdown. However, we can compare Recovery Factor, which is equal to the absolute value of Net Profit divided by Max Drawdown. It's desirable for a system to have a Recovery Factor greater than that of Buy & Hold.

**Payoff Ratio**
Payoff Ratio is the system's average percentage profit per trade divided by the average percentage loss per trade. Unless the system has a particularly high Win/Loss ratio, we look for high Payoff Ratios.

**Ulcer Index**
The Ulcer Index measures a portfolio's overall volatility. It is calculated by summing the squared draw downs, and then taking the square root of the quotient of this sum divided by the period. A lower Ulcer Index indicates less volatility and draw down, indicating that the system might be easier to tolerate in real-world trading.

**Wealth-Lab Error Term**
The Wealth-Lab Error Term measures the volatility of the profit curve. It is calculated by averaging the absolute value of all percentage distances along the profit curve from its linear regression line.

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**Luck Coefficient**
The Luck Coefficient, or LC, shows how the largest trade compares to the average trade and is calculated by dividing the percentage profit of the largest winning trade by the average percentage profit of all winning trades. The larger the LC value, the greater portion of the system results are attributed to the largest winning trade, or, luck.

**Pessimistic Rate of Return**
The Pessimistic RoR is a statistical adjustment of the wins to losses ratio for the purpose of estimating the worst-expected return from previous results. Its calculation is outlined in the $imulator's Performance View 163 topic.

---

## 4.3.5 Trades View

The ChartScript Window Trades View presents a list of all trades generated by the trading system. The trade list contains a number of details for each trade. You can sort the trade list by any of its columns by clicking on the column header. Click the column header again to sort the list in the opposite direction. Double click on the right border of a column header to resize the column to the minimum width necessary to display its values. Double click on one of the trades in the list to be taken directly to that trade on the Chart.

**Tip:** If your script generates many trades, you can speed up ChartScript execution by limiting the number of Trades loaded in this view. For more information, see General Settings 255 in the System Options 255 topic.

**Position**
Long or Short. The Position column is also flagged with the same Trade Note 56 icons as in the Chart view. The symbols for closed Positions are filled in, while the symbols for open Positions are hollow.

**Symbol**
Contains the symbol in which the Position was taken. This is generally the symbol that you clicked in the DataSource Tree. However, ChartScripts can use special WealthScript functions to change the primary data series, so it's possible to have different symbols in the same trade list.

**Shares (or Contracts)**
The number of shares or contracts in the Position.

**Entry/Exit Date**
The dates that the Position was opened and closed. A time will also be displayed for DataSources that contain intraday data.

**Entry/Exit Price**
The price at which the Position was opened and closed.

**% Change**
The percentage profit of the trade, less commissions (and slippage).
Note:

**Net Profit**
The total net profit generated by the trade. This subtracts any Commission or Slippage values set in Trading Costs/Control 257 tab of the Options Dialog.

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**Bars Held**
The number of bars that the trade was held.

**Profit per Bar**
The trade's total profit divided by bars held. Profit per Bar measures the efficiency of the trade.

**Entry Signal/Exit Signal**
The names of the Entry and Exit signals that were supplied by the entry/exit functions in your WealthScript code. You can give signals different names to track the performance of different types of entry and exit strategies in the same script.

**Cum Profit**
The cumulative profit from trade to trade. This column is recalculated whenever you sort the trade list.

**MAE %**
The Maximum Adverse Excursion percentage of the trade. MAE is the largest intraday loss that the trade has suffered during its lifetime.

**MFE %**
The Maximum Favorable Excursion percentage of the trade. MFE measures the highest intraday profit that the trade gained within its lifetime.

**Custom Columns**
You can use the AnalyzeSeries function in your WealthScript code to add custom columns to the trade list. See the topic on Analysis Series in the WealthScript Function Reference for details.

---

### 4.3.6 Profit View

The ChartScript Profit tab shows two graphs depicting the historical profitability of your trading strategy. The graphs illustrate Profits after all trading costs.

**Profit Curve / Equity Curve**

The Profit (or Equity) Curve graph displays the profit (or equity) history of your system. A *Profit* curve is displayed when operating in Raw Profit Only mode, whereas an *Equity* curve is shown for Portfolio Simulation mode. Profitable areas of the graph are filled in green, while areas of loss are red. The Buy & Hold profit curve is overlaid as a blue line. You can turn the Buy & Hold line on and off by clicking the check box near the graph's title.

You can zoom into the profit/equity curve by dragging a rectangle (*upper left to lower right)* around the area of interest with the mouse. Once zoomed in, you can drag the visible view port with the right mouse button. To return to the fully expanded view, drag a reverse (right to left) rectangle with the mouse. Additionally, by right clicking and dragging, you can manually center the graph.

**Profit Distribution (%, $, Point)**

The Profit Distribution histogram displays the profit distribution of all of the trades that were generated by the system in a percentage (default), dollar, or point representation. Net profit [percentages] of the trades are divided into a number of evenly-distributed bins. You can get a good idea of your system's dynamics by looking at the Profit Distribution graph.

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Each bar on the graph contains a number of trades whose profit falls within the upper bounds of the bin. For example, imagine that the bins are spaced apart by 5% each and that the bin labeled 10% contains 20 trades. This means that 20 trades had a net profit between 5 and 10%.

---

## 4.3.7 MAE/MFE View

**MAE** stands for Maximum Adverse Excursion, and represents the largest loss that a trade suffered within its lifetime. **MFE** stands for Maximum Favorable Excursion, and is the largest profit that a trade achieved during its life. The graphs show you MAE/MFE breakdowns for all of the trades generated by the system.

**Note**: Only *closed* trades are represented in the MAE and MFE graphs.

### MAE Graph

The MAE graph displays a breakdown for **all** closed trades, and another for **winning** closed trades only. Use this in combination with the Profit Distribution 80 to help set appropriate stop loss levels. The Profit graph will show you the potential losses that could be capped by setting a stop loss, and the MAE graph will show you how many potential winning trades would be converted to losers if the stop loss was placed.

### MFE Graph

The MFE graph displays two breakdowns also. It shows MFE for **all** closed trades, and also for **losing** closed trades only. Use this in combination with the Profit Distribution 80 graph to help determine effective profit target levels. The Profit graph will tell you how much profit you're likely to lose by capping it with a profit target. The MFE graph can show you how many losing trades could have been converted to winners by establishing a profit target at a certain level.

---

## 4.3.8 Editor View

### 4.3.8.1 Summary

The ChartScript Editor is where you compose and enter WealthScript code for your ChartScripts.

Using the Editor 82
The Editor has a variety of subtle information features like syntax color coding, QuickRef integration, and more!

Smart Code Editor 83
There's no need to imagine having a list of all WealthScript functions and syntax at your virtual fingertips. You've got it in Wealth-Lab Developer 4.0!

Editor Keyboard Shortcuts 85
This list of shortcuts can save you a lot of time while typing and formatting code in the Editor. Print it out and keep it handy.

---

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#### 4.3.8.2 Using the Editor

The ChartScript Editor is where you compose and enter WealthScript code for your ChartScripts. The ChartScript Editor is color coded to help you with your coding. Although Wealth-Lab Developer 4.0 gives you the ability to personalize the Editor's color code in the Options dialog 244, traditional text coloring is as follows:

```
Comment                          green
Number                           teal
String                           lavender
WealthScript reserved word       dark blue
WealthScript function            light blue
WealthScript constant            red
```

Text colors will help you avoid using variable names that are the same as existing function names. For example, when you enter "Lastposition" in the Editor, upon typing the final "n" the entire word will change to a light blue color. This is your cue that you are dealing with a WealthScript function and that it cannot be used as a variable name.

Quickly bring up the Editor Options dialog 248 right from the Editor view by right clicking and selecting **Editor Options...** from the pop-up menu. In addition to setting your color preferences, you also have control of the Font style and size. Regardless of the font, the Editor will align the text into columns, so you may find that it's best to stay with a proportional font like Courier New.

The Editor features multiple levels of undo by pressing **Ctrl+Z**, or using the right click pop up menu **Undo** option.

---

### Testing a ChartScript

As you write your code, you can quickly test your script by pressing the **[F5]** function key. This performs the same function as clicking the **Execute** button on the Chart toolbar. Alternatively, just click a symbol in the DataSource tree if you wish to run the script on a symbol other than the one selected.

Any errors in your code will appear in the error list directly under the Editor. Click on an error in the error list to be taken directly to the statement the code that caused the error. For difficult-to-solve errors that occur during a ChartScript's execution, use the ChartScript Integrated Debugger 103 to assist you in error isolation and resolution.

**See Also:** Common ChartScript Errors 101

---

### Editor Integration with Function QuickRef

If you need help with any WealthScript function, click on the function in the Editor and press the F1 function key. The Function QuickRef 267 will open, pointing to the entry for the function that you have selected.

---

### Preferred #OptVars

A useful feature when working with a ChartScript that includes optimization variables, or #OptVars, is the ability to use a particular symbol's Preferred #OptVars as the scripts #OptVar default values. As a quick review, consider the following line of code.

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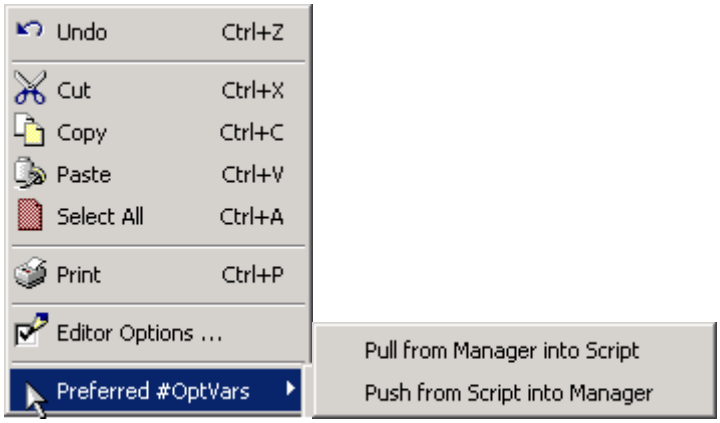
```
{#OptVar2 14;10;18;2}
```

Here, the optimization variable, *#OptVar2*, has a default value of 14. This means that if the ChartScript is not running in an optimization process, *#OptVar2* will be assigned the constant value 14 wherever it is used in the script. If the script were opened for optimization, however, *#OptVar2* could be assigned a value in the range between 10 and 18, inclusive, in increments of 2.




***The ChartScript Editor pop up menu (right mouse click).***

**Note:** The following actions have effect only for ChartScripts containing #OptVars.

**Pull from Manager into Script**

If a Preferred #OptVars entry exists in the Preferred Values Manager 273 for the current Symbol/ChartScript combination, you can easily replace the #OptVars default values in the editor view by selecting the *Pull* option. In reality, this simply changes the script's text, and you need to re-save the ChartScript (Ctrl + S) if you want these default values to be remembered for future uses of the script.

**Push from Script into Manager**

Although it's more likely to find optimal values for a symbol during a script's optimization process, you can quickly create a Preferred #OptVars entry for a symbol in the Preferred Values Manager by clicking the *Push* option. This action creates or replaces an entry for the Symbol/ChartScript combination using the current #OptVars' default settings.

---

#### 4.3.8.3 Smart Code Editor

Although the Quick Reference is a handy resource for WealthScript function syntax and descriptions, using it can be somewhat cumbersome to be reminded only of a function's syntax. Enter the **Smart Code Editor**.

---

### Smart Code Function List

The Smart Code Editor is your personal coding assistant for those hard-to-remember function names with long parameter lists. It helps you by offering a list of all *native* WealthScript functions at your virtual fingertips in the ChartScript Editor view. Easily navigate the function list by typing the first few letters of the function name and using the arrow keys to highlight the exact function you're looking for. When found, hit Tab, Enter, or Space to paste the code at the position of the cursor in the Editor.

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Your Smart Code assistant is just one keystroke away at all times. Follow these simple instructions, and you'll discover how much simpler it is to code in WealthScript! The order of steps 1 and 2 is unimportant.

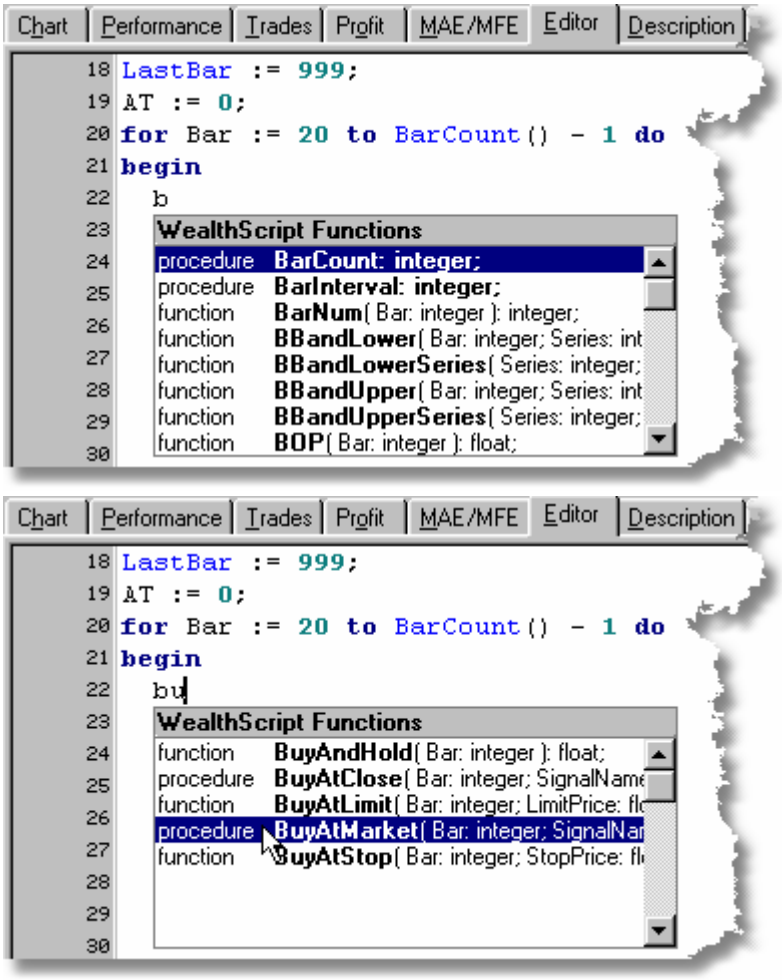
**Step 1.** Select **Ctrl+Space** to make the pop-up list of available functions appear.

**Step 2.** Quickly jump to a WealthScript function desired by typing the first few letters. Function names that do not correlate with the typed letters are automatically filtered from the list. Alternatively, you may start by typing a few letters and then invoke the Smart Code list by selecting **Ctrl+Space**.

**Step 3.** Use the mouse, PgUp/PgDn, and/or Up/Down arrow keys to navigate to the function desired.

**Step 4a.** Using the mouse pointer, select the function to be placed in the editor by double clicking it, **or**,

**Step 4b.** With a function highlighted, strike any of the following keys: Tab, Enter, or the Space bar.




Following the final step, the complete function name is entered in the code window and the Smart Code list automatically disappears. You may cancel the auto-text operation (prior to the last step) by moving the Editor cursor with the right or left arrow key, or by clicking in another area of the editor.

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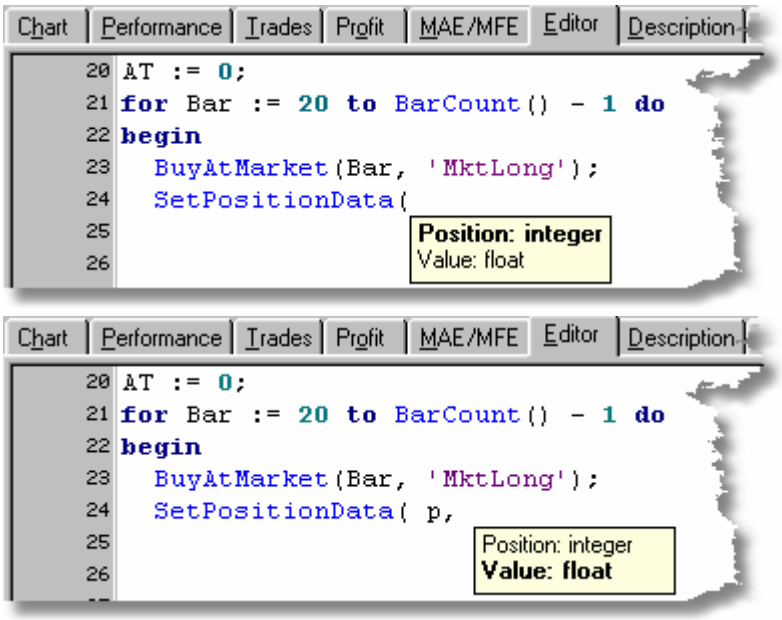
### Smart Code Parameter List

Help doesn't stop with the function list. When you utilize a native WealthScript function that has a parameter list, after typing the opening parenthesis the parameter list syntax for the current function will automatically appear in the form of tooltip help below the cursor. As you enter constants and variables and separate them by commas, the tooltip help will embolden the argument that corresponds to the current position in the parameter list. With this aid, there's little chance of making a mistake like entering a string in place of an integer variable, for example.




***After typing the opening parenthesis, the parameter list will appear after a small delay.***

Additionally, when re-editing a parameter list, you can force the parameter list to pop-up at any time by placing the cursor anywhere after the opening parenthesis and striking **Ctrl+Shift+Space Bar**. Note that the parameter list activates only if the cursor is on the same line as the WealthScript function.

#### 4.3.8.4 Editor Keyboard Shortcuts

See Keyboard Shortcuts 10 for non-Editor specific shortcuts in Wealth-Lab Developer 4.0.

(Press **Shift** to add text selection to any keyboard shortcut action)

| | |
|---|---|
| Up | Up |
| Scroll Up | Ctrl+Up |
| Down | Down |
| Scroll Down | Ctrl+Down |
| Left | Left |
| Word Left | Ctrl+Left |
| Right | Right |
| Word Right | Ctrl+Right |
| Page Down | PgDn |
| Page Bottom | Ctrl+PgDn |
| Page Up | PgUp |
| Page Top | Ctrl+PgUp |
| Line Start | Home |
| Editor Top | Ctrl+Home |

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```
Line End                    End
Editor Bottom               Ctrl+End
Toggle Mode                 Ins
Copy                        Ctrl+Ins
Paste                       Shift+Ins
Delete Char                 Del

Copy                        Ctrl+C, or Ctrl+Insert
Cut                         Shift+Del, or Ctrl+X
Delete Last Char            BkSp
Delete Last Word            Ctrl+BkSp
Find                        Ctrl+F
Find & Replace              Ctrl+H
Undo                        Ctrl+Z or Alt+BkSp
Redo                        Shift+Alt+BkSp
Line Break                  Enter
Select All                  Ctrl+A
Block Indent                Shift+Ctrl+I
Block Unindent              Shift+Ctrl+U
Paste                       Ctrl+V
Delete Line                 Ctrl+Y
Delete EOL                  Shift+Ctrl+Y
Goto Marker 0-9             Ctrl+0 through Ctrl+9
Set/Reset Marker 0-9        Shift+Ctrl+0 through Shift+Ctrl+9
Normal Select mode          Shift+Ctrl+N
Column Select mode          Shift+Ctrl+C
Line Select mode            Shift+Ctrl+L
Tab                         Tab
SmartCode Function Popup    Ctrl+Space bar
```

The following shortcuts apply to Debugging Mode only:

```
Step Into                   F7
Step Over                   F8
Run to Next Breakpoint      F9
Reset ChartScript           F10
Add to Variable Inspector   Ctrl+F5 (automatically shows Variable Inspector)
Show Variable Inspector     Ctrl+Alt+I
```

---

### Edit Toolbar

For mouse-button diehards, the options are available for (left to right) **Cut**, **Copy to Clipboard**, **Paste**, **Undo**, and **Select All** in the Edit Toolbar. If the Edit toolbar is not visible, be sure to select **View|Toolbars|Edit** from the main menu.

---

## 4.3.9 Description View

You can write a general description of your ChartScript in this view. The description is an HTML document, and you can use any valid HTML formatting code when writing the description. To edit a description, click the **Edit** button in the Description view. This action places you in edit mode, and the HTML markup codes become visible in the description entry field. After completing your edits, click the **Edit** button again to return to view mode. The HMTL markup tags are no longer visible as they are applied to the description content.

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### Saving your Edits

After completing your edits, be sure to click the **Save** toolbar button to save your changes.

### Other Information

The Description view also displays the ChartScript's author information and creation date. This is important for ChartScripts that you download from the Wealth-Lab.com web site. ChartScripts that you create locally will always contain "local" in the author field.

---

## 4.3.10 Analysis Series View

You can use the Analysis Series feature to experiment with how different indicator filters would have affected the performance of your trading system. Analysis Series compares the indicator or series that you select with the net profit of the trades generated by your system. For example, you could see if applying a filter based on RSI or CMO would have improved the average profit per trade.

Use the special WealthScript function **AnalyzeSeries** in your ChartScript code to specify which indicator or series you want to analyze. Simply call the function at the end of the script (do not place this call inside the trading loop).

The format, or *syntax*, of **AnalyzeSeries** is:

```
procedure AnalyzeSeries( Series: integer; Name: string );
```

| Item | Description |
|---|---|
| *Series* | any native or custom Price Series (see Handles to Price Series in the WealthScript Guide). |
| *Name* | Specifies title of the series for the Analysis Series graph. |

You can analyze more than one indicator or series in a single script. The following code analyzes both RSI and CMO indicators.

### Example

```
AnalyzeSeries( RSISeries( #Close, 30 ), 'RSI(30)' );
AnalyzeSeries( CMOSeries( #Close, 30 ), 'CMO(30)' );
```

**Tip:** Each call to **AnalyzeSeries** adds a custom column to the Trades View 79. The values displayed are taken from the trade's *EntryBar - 1* and do not change based on selections in the Analysis Series Controls.

### Interpreting the Results

After executing the ChartScript, the Analysis Series view will contain two graphs. The first graph is a plot of the analyzed indicator value by net profit. Each dot of the graph represents a single trade. The graph contains a linear regression line that allows you to quickly identify the slope of the correlation. The strength of the correlation is also provided at the top of the chart.

The second graph depicts the average percent profit of the trading system if different levels of filtering were applied. For example, you might expect that if the system was filtered by increasingly lower values of RSI then you would see a steady increase in average profit per trade.

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**See Also:**

AnalyzeSeries Tutorial in the Wealth-Lab site's Knowledge Base.

---

### Analysis Series Controls

Above the two graphs are tools that let you control the output of the Analysis Series view.

#### Analysis Series

This drop down list contains all of the indicators or custom series that you analyzed in your ChartScript. There will be one entry for each call to AnalyzeSeries that you made in your WealthScript code. Just select one of the items to regenerate the graphs.

#### Analysis Bar

This specifies at which bar the analysis will take place. You can specify the bar before entry, the bar of entry, the bar before exit, or the bar of exit. The most useful Analysis Bar is the bar before entry, because this is typically the bar in which the entry signal was generated. The only time the actual entry bar might be useful is when your system enters on market close, and thus has a more or less complete picture of the bar's composition when making the entry decision. Analyzing the indicator values at the time of exit can be interesting, but is less useful. This is because the Analysis Series filter removes the trades in its filter analysis, but in reality you couldn't undo a trade that was already created.

#### Filter Type

The Filter Type control determines which type of filter is applied in the lower graph. You can select a greater than or a less than filter.

---

## 4.4 Creating a New ChartScript

To create a new ChartScript from scratch, click the **New** toolbar button, or select **New ChartScript** from the **File** menu. This causes a new ChartScript Window 45 to open and a blank chart to be displayed. Switch to the Editor 81 tab to begin programming WealthScript code, or start by plotting some indicators using the Indicator QuickPlot 58.

### Template Code

New ChartScript Windows always contain skeleton WealthScript code in their Editor view. You can control the template code that is used for new ChartScripts. If you have Add-ins, Include Manager 270 references to studies and indicators, and/or variables that you continually use in ChartScripts, you can save yourself time by editing the Template and then setting it with your preferences.

Modify the code in the Editor until it contains the desired template code. Then, select **Set Template Code** from the **Chart** menu. The next time you create a new ChartScript, the Editor will contain the new template.

**Example (Template code)**

```
var Bar: integer;
```

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```
for Bar := 20 to BarCount - 1 do
begin
  if not LastPositionActive then
{ Entry Rules }
  begin

  end
  else
{ Exit Rules }
  begin

  end;
end;
```

## Getting Started

If you've never written a program before, then be assured that other possibilities exist in Wealth-Lab Developer 4.0. Instead of starting from scratch, let the New ChartScript Wizard 91 generate some or all of the WealthScript code for a trading methodology.

Do-it-yourself types, who have worked with computer code at some time in the past, may understand the structure in the code template in the above example but just don't know where to begin typing. The WealthScript Guide will introduce you to programming in WealthScript and perhaps re-familiarize you with the Pascal or Delphi programming languages - of which WealthScript uses a subset of statements. Many examples are included in the WealthScript Guide, not to mention hundreds of other public ChartScripts that can be found on the website and right in your local installation of Wealth-Lab Developer 4.0.

### A Dual Moving Average Crossover System from Scratch

Assuming you've reviewed the WealthScript Guide, let's go through the process of writing a basic system from scratch - a dual moving average crossover system.

A good way to start is by defining requirements. Putting requirements in black and white isn't absolutely necessary, but it motivates you to think logically about all parts of a trading methodology. It's necessary for even the most experienced programmer to have a set of requirements, and it's best to have it in print. Use the Description view 86 in the ChartScript window for this purpose. It's a great place to collect your ideas and they will automatically be stored with the ChartScript when you save it.

**Dual Moving Average Crossover System Requirements:**

1. Allow Multiple Open Positions? No.
2. Allow Exit and Reverse on same bar? No.
3. Entries: Buy at market on the next bar when the slow period Weighted Moving Avg (WMA) crosses over the fast period WMA. Make it easy to vary the slow and fast periods.
4. Initial Stop: Use an 8% maximum initial stop loss.
5. Exits and Trailing Stops: Sell at market when the slow period Weighted Moving Avg (WMA) crosses under the fast period WMA. Use a trailing stop that is activated when the position has achieved a profit of 5%. Exit the position to protect 75% of the profit achieved.

Admittedly, our trading system requirements are a bit contrived so that we can take full advantage of the template code above. It's easy to see how the requirements are translated into code and logically placed in the ChartScript.

### Example

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```
{ Dual Moving Average Crossover System }
var Bar: integer;
var SlowPer, FastPer: integer;  // fast & slow periods
var SlowMA, FastMA: integer;    // indicator handles

SlowPer := 20;  // Assign values to the period variables
FastPer := 14;

{ Create the indicators to use in the remainder of the script }
SlowMA := WMASeries( #Close, SlowPer );
FastMA := WMASeries( #Close, FastPer );

{ Use WealthScript auto stops }
InstallTrailingStop( 5, 75 );
InstallStopLoss( 8 );
PlotStops;

{ Start the main trading loop }
for Bar := SlowPer to BarCount - 1 do
begin
  ApplyAutoStops( Bar );
  if not LastPositionActive then
{ Entry Rules }
  begin
    if CrossOver( Bar, FastMA, SlowMA ) then
      BuyAtMarket( Bar + 1, 'CrossedOver' );
  end
  else
{ Exit Rules }
  begin
    if CrossUnder( Bar, FastMA, SlowMA ) then
      SellAtMarket( Bar + 1, LastPosition, 'CrossedUnder' );
  end;
end;
```

If you enter the code above in a ChartScript window and execute it by clicking a symbol in the DataSources tree, you'll see that buys and sells occur but that the moving average indicators do not appear on the chart. This demonstrates that plotting indicators is for *your* benefit in visualizing that a system is performing per specifications. (You can retrieve the values of a manually-drawn trendline in your ChartScript, so this is an exception.)

Append the following statements to the bottom of the code above and re-run the script:

```
PlotSeriesLabel( SlowMA, 0, #Blue, #Dotted, 'Slow = ' +
IntToStr(SlowPer) );
PlotSeriesLabel( FastMA, 0, #Green, #Thin, 'Fast = ' +
IntToStr(FastPer) );
```

You should now be able to verify that on the bar **following** a crossover/under a trading action is performed. Also notice that we have taken advantage of the *SlowPer* and *FastPer* variables not only to control the period for the moving average series, but also as the value to start the loop and to appropriately label the chart.

Consequently, you have a single place where you can modify script variables that will be used throughout the script. The practice of using variables "globally" throughout a script is quite common in programming, and we'll show you how to take full advantage of this technique when modifying ChartScripts for Optimization 112.

Finally, if you wrote this script yourself, it may look completely different than in the

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example above. This is yet another characteristic of programming - there's [almost] always more than one way to code the same idea.

---

## 4.5 New ChartScript Wizard

Wealth-Lab Developer 4.0 has the most advanced and capable Wizard available allowing you to design and produce complete trading systems in WealthScript without the need for you to write a single line of code! The *New ChartScript Wizard* allows you to visually design a trading system by combining various types of Entries, Exits, and Conditions via an easy-to-use drag and drop interface. When satisfied with the design, you're only one click away from exporting to a ChartScript for testing. Even if you enjoy writing code, the New ChartScript Wizard can give you a head start in rapidly prototyping new trading systems.

The New ChartScript Wizard utilizes a database of Entries, Exits, and Conditions, which are collectively referred to as *Rules*. The Wealth-Lab Developer 4.0 installation comes with a database full of Rules, however, you can create your own with the *RuleBuilder* and submit them for inclusion into Wealth-Lab Developer 4.0. Anyone can add new Wizard Rules by selecting **Community|Download ChartScripts**.

---

### Using the New ChartScript Wizard

The following steps outline a suggested procedure for using the New ChartScript Wizard. Except as noted below, you need not worry about the order in which you add, delete, or modify Rules. Click the "Hints" tab for more information.

**Step 1. Activate the Wizard.**

Select **File|New ChartScript (Wizard Mode)** or clicking on the Wizard icon in the File toolbar. The ChartScript Wizard dialog shown below appears along with a new ChartScript window (Untitled) in the background to which the Wizard will ultimately cast its rules.

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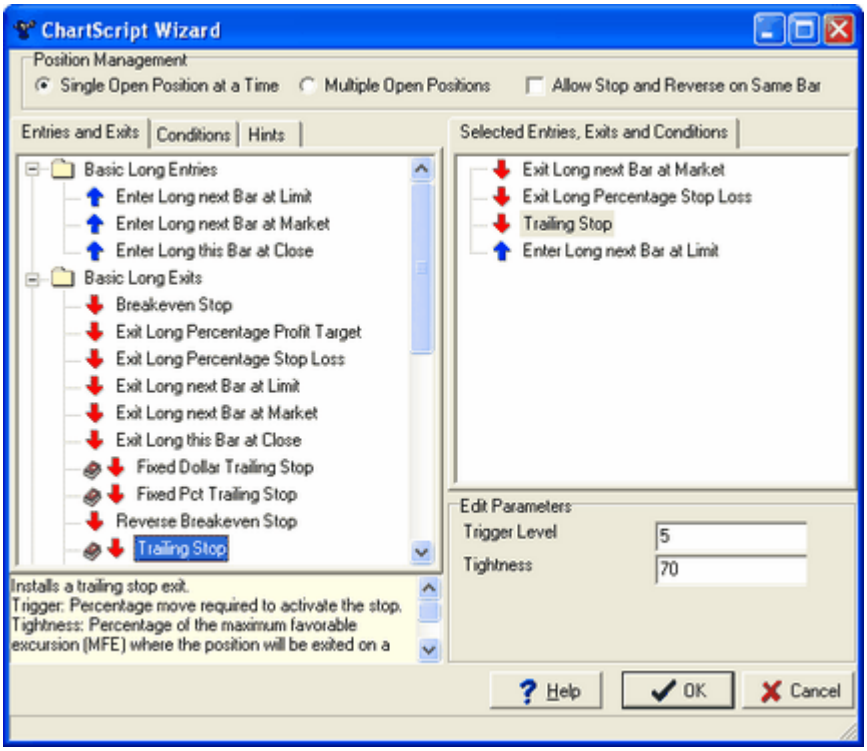


***The ChartScript Wizard dialog***

The color code of the arrows is the same as that used for Trade Notes 56 in charting.

**Step 2. Elect your Position Management options.**

**Single Open Position at a Time**

Choosing this option will result in a script that manages only a single open position at any given time. You may select "Allow Stop and Reverse on Same Bar" with a single position.

**Multiple Open Positions**

Elect this option to allow your script to manage more than one open position simultaneously.

**Allow Stop and Reverse on Same Bar**

This option is admitted only when "Single Open Position" is selected. You must specify conditions for both sides of the trade (long and short).

**Step 3. Form your basic strategy by selecting Entry and Exit types.**

Drag and drop an Entry or Exit type to the "Selected" window on the right. You can also double click an Entry or Exit to select it, which is then added to the bottom of the list.

An Exit is paired with the Entry **directly above it**. The Wizard accomplishes this by assigning a unique Position Signal Name to each Entry selected, as you can later verify in ChartScripts with multiple Entry and Exit strategies. Placing an Exit at the top of the list (above any Entries) applies it to all Entries of the same type in the strategy. For example, you may wish to place a Trailing Stop, Basic Long Exit, at the top of a list so that it will be used all Long Entries, as shown above.

**Note:** A Help book icon is displayed next to items having a description, such as the Trailing Stop exit shown above. Click on the item to

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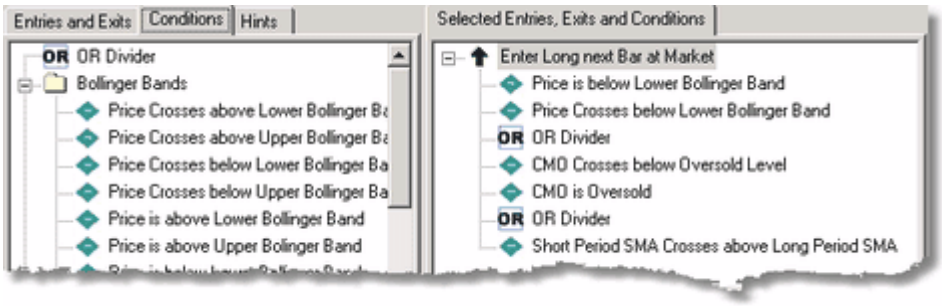
display descriptive information about the rule and its parameters in a small pane at the bottom left of the Wizard.

**Warning!** Multiple exit/entry criteria should be selected so that Market orders appear above Stop orders and Stop orders appear above Limit orders in the list so that the proper order of execution is preserved for backtesting.

### Step 4. Assign conditional Rules to your Entries and Exits.

Click the Conditions tab to begin assigning conditional Rules to your selected Entries and Exits as shown in the image below. Qualify Conditions by dropping them *on top* of a selected Entry or Exit. Multiple Conditions added to the same Entry or Exit are **ANDed** together. To **OR** Conditions, separate them with the **OR Divider** by dropping it on top of the second (lower) Condition in an **ORed** pair.




To logically 'OR' two conditions, separate them with the **OR Divider**, found at the top of the Conditions list. In this example, the Long Entry Rule above would generate code for the script to accomplish the "pseudo code" here:

**if** ( Price is below **AND** Crosses the Lower BBand ) **OR**
**if** ( CMO Crosses below Oversold **AND** is Oversold ) **OR**
**if** Short Period Crosses above Long Period SMA
**then** Enter Long next Bar at Market

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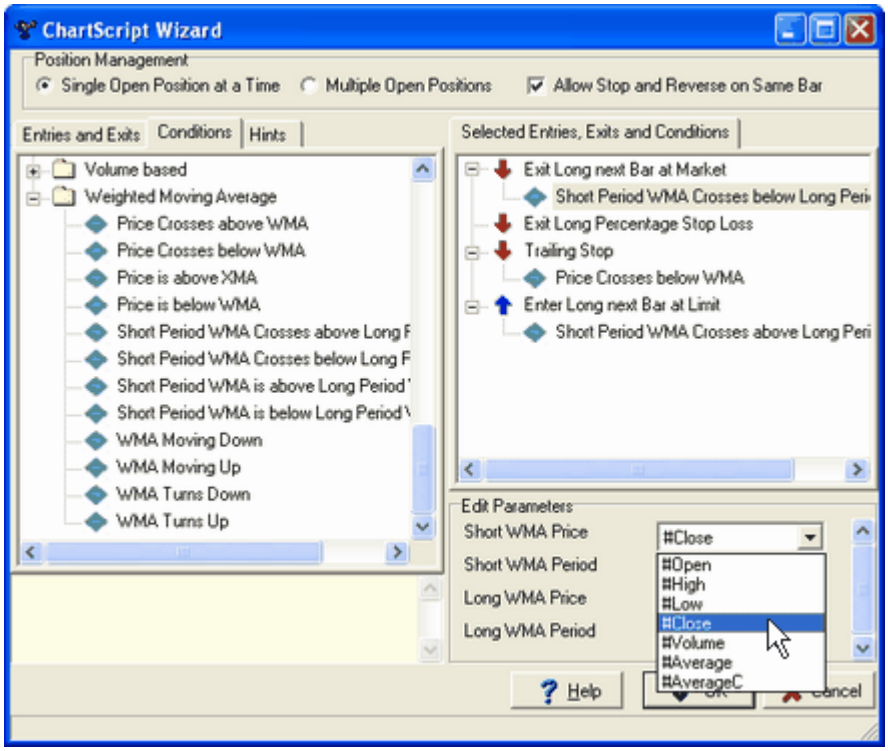
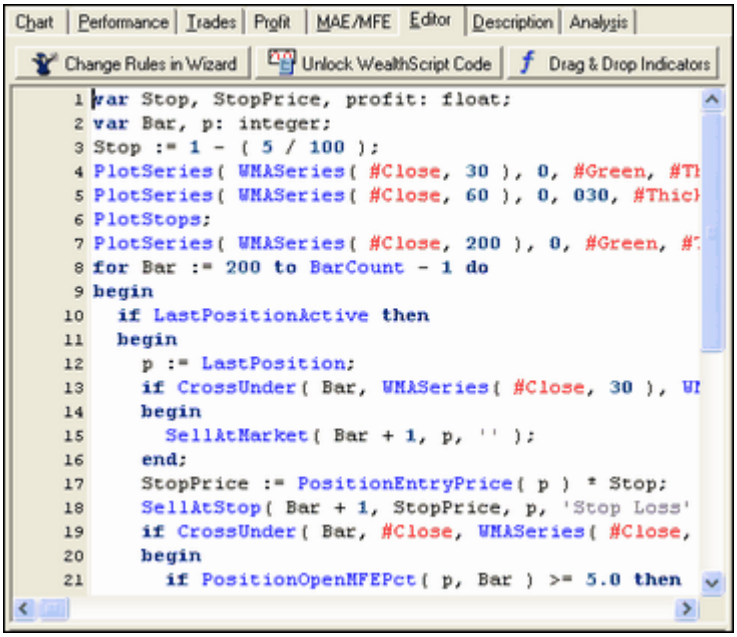



***Make adjustments to Entry, Exit, and Conditions by highlighting the item and editing its parameters.***

### Step 5. Go to the ChartScript Editor view and run your script.

You may go back and forth, altering Entries, Exits, and Conditions, and refining parameters. When satisfied, click the **OK** button and watch how quickly the Wizard turns your work into WealthScript code. Notice that the Wizard automatically adds the necessary code for plotting any indicator that you have selected for trading conditions in the ChartScript.




***The 3 buttons in the second row below the Editor tab indicate that the Wizard has complete control of the WealthScript code.***
***After unlocking the code window, you can no longer use the Wizard to modify the ChartScript.***

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**Step 6. Save your work!**

If you wish to continue working with the Wizard at a later time, save your ChartScript normally and Wealth-Lab will remember that the script is under the Wizard's control. The next time you open the script, you may re-visit the Wizard by clicking the **Change Rules in Wizard** button in the ChartScript Editor view.

---

The following buttons appear only when the Wizard mode is active.



**Change Rules in Wizard**

By clicking this button you can return to the ChartScript Wizard dialog to further manipulate your trading system.

**Unlock WealthScript Code**

While the Wizard can complete all the coding necessary for an entire trading methodology, you may arrive at a point where you need to refine or add code manually. Simply click the **Unlock WealthScript Code** button at the top of the Editor view to leave the Wizard behind. With the code unlocked, you can edit it in the SmartCode Editor 81, but you can no longer modify the Rules using the Wizard. Note that this action does not "push" QuickPlot indicators to the Editor.



**Drag & Drop Indicators**

This single action switches from the Editor view to the Chart view and readies Indicator QuickPlot 58 (located in the main Icon toolbar) for you to add native and custom indicators to your chart.

**Remarks:**

- During or after Rules selection, you can re-arrange their order in the "Selected" window using drag and drop. To place Rule1 above Rule2, drop Rule1 on top of Rule2. To place a Rule at the very bottom of the Selected Rule's list, drop it in the blank area below the list.
- To delete a rule, drag and drop it back in the selection window at the left. Alternatively, you may highlight it and then strike **Delete** on the keyboard.
- Many Wizard Rules contain variable parameters. After selecting a Rule, you can configure them in the **Edit Parameters** frame.
- Limits do not exist for the number of times the same Rule can be used. Each Rule may be paired and configured independently as you please, so it's up to you to do it in an intelligent manner.
- Wizard settings and Drag & Dropped Indicators are also saved when exporting a script. They will be restored when importing.

---

## QuickPlot Integration with the New ChartScript Wizard

While working with the New ChartScript Wizard, you may wish to visually inspect other indicators to consider adding them in your system's rules. You can easily do this with the Indicator QuickPlot 58 feature by clicking the **Drag & Drop Indicators** button above the Editor code. This action automatically switches to the Chart View and opens the **Indicators** panel in the main icon bar.

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You can add and remove new indicators and panes just as you would expect. However, you cannot push the newly-added items to the ChartScript until you have Unlocked WealthScript Code 91 from the ChartScript Wizard. Attempting to do this will generate a message to remind you of this fact.

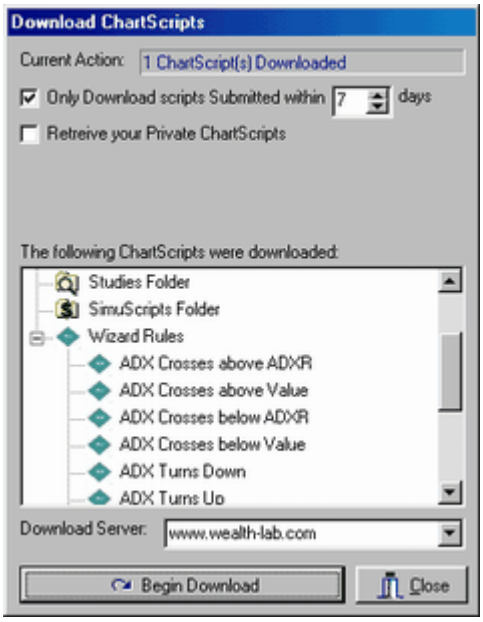
---

## Limitations

The New ChartScript Wizard will produce *correct* WealthScript code that will function perfectly. However, because of the general nature in which the code is formed, the final code may not be *optimal,* i.e., the code may be transcribed for faster execution or possibly for a memory savings.

Possibilities are literally endless when programming in WealthScript, but the New ChartScript Wizard is limited to the Rule entries available in a database. The New ChartScript Wizard helps you build simple strategies visually, but as previously noted, it doesn't cover the full range of possibilities by coding a script manually.

Nevertheless, these possibilities will continue to grow each week. By using the RuleBuilder 91 you can personally help expand the Wealth-Lab New ChartScript Wizard Rules database on computer terminals all over the world! When your rules have been submitted and accepted, they will be uploaded into Wealth-Lab site's download database for distribution when other users request to Download ChartScripts 98.




***New Wizard Rules are also downloaded when you perform Download ChartScripts.***

---

## ChartScript Wizard RuleBuilder

The RuleBuilder is a stand-alone utility for experienced Wealth-Lab ChartScript writers. With it, you can form new rules for indicators that have not yet been added to the ChartScript Wizard's database. Integrated help and examples will assist you in properly constructing new rules. For more information and download see the ChartScript Wizard RuleBuilder in the Wealth-Lab Knowledge Base.

---

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## 4.6 New Indicator Wizard

Select **New Indicator Wizard (Ctrl+I)** from the **File** menu to launch the New Indicator Wizard. This tool helps you create the specially-formed ChartScript required for custom indicators. For more details on the custom indicator format, see the section Creating a Custom Indicator in the WealthScript Guide. To plot add an existing indicator to your chart, see the Indicator QuickPlot 58 topic.

### Step 1. New Indicator Name.

The first step of the Wizard is to specify the new indicator's name. The Wizard will warn you if you select the name of an existing ChartScript or internal function.

### Step 2. Indicator Parameters.

The next step of the Wizard involves specifying the parameters that the indicator can accept. Be sure to give each parameter a unique name (select from the drop down box or type one manually) and click **+Add Parameter**.

**Note for Price Series Parameters:**

A Price Series is a set of indicator or price values that are collectively referred to by an integer value (the "handle"). If you want your custom indicator to accept a Price Series parameter, select the integer parameter type. But, use the word "Series" is in the parameter's name (e.g., Series1, Series2, MySeries, etc.). If you do so, the Indicator QuickPlot 58 will treat the parameter as a Price Series when you plot it on a chart, and provide the appropriate choices for values for the parameter.

### Step 3. Completing the Indicator.

After you define the parameters, click the **OK** button. The Wizard creates the shell WealthScript code for your indicator, and saves the indicator in the **Indicators** folder of the ChartScript Explorer 42.

It's now your job to write the code that actually calculates the indicator value. In the generated code you'll see the following lines:

```
  for Bar := Period to BarCount() - 1 do
  begin
{ Calculate your indicator value here }
    Value := 0;
    SetSeriesValue( Bar, Result, Value );
  end;
```

Replace the code "Value := 0" with your own custom code that calculates the indicator value. For example, we can duplicate a simple moving average by modifying the template code as follows:

```
  for Bar := Period to BarCount - 1 do
  begin
{ Calculate your indicator value here }
    Value := Sum( Bar, Series, Period );
    Value := Value / Period;
    SetSeriesValue( Bar, Result, Value );
  end;
```

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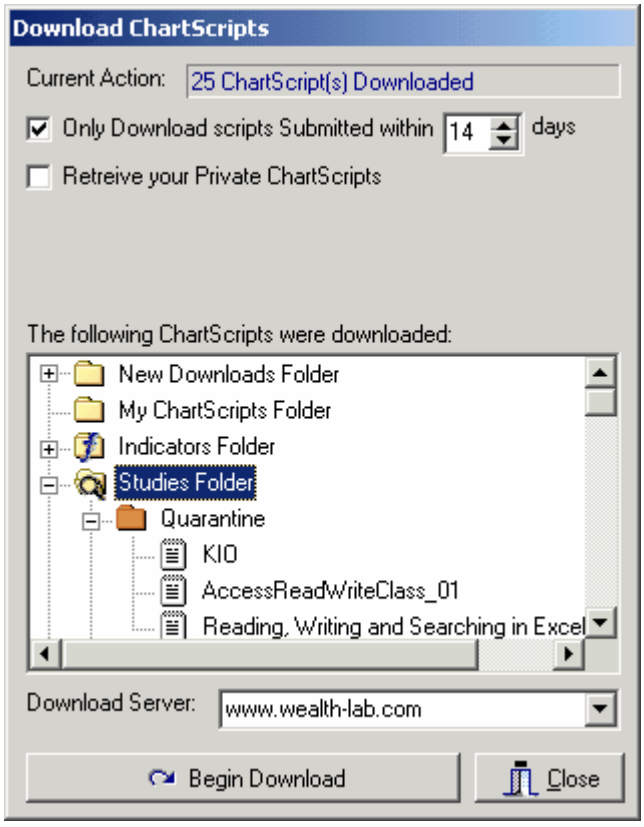
## 4.7 Download ChartScripts

You can download new ChartScripts from the Wealth-Lab.com web site and always have a source of fresh trading strategy ideas. Select **Download ChartScripts** from the **Community** main menu selection to begin the download process. You can elect to download any new ChartScripts that you don't currently have, or limit the download to scripts published within a certain number of days. You can also choose to download your own private ChartScripts from the site as well as all public ones. Click the **Begin Download** button to begin the download process.

Your downloaded scripts are categorized automatically. New ChartScripts are stored in the *New Downloads* folder in the ChartScript Explorer 42. New Indicators and Studies are placed in the *Indicators* and *Studies* folders, whereas SimuScripts are added to the *SimuScripts* folder. Rules for the New ChartScript Wizard 91 are placed in the Rules.DAT database.




Once the download operation has completed, a summary of the number of ChartScripts downloaded will appear in the *Current Action* box. You can quickly open one of the new downloaded ChartScripts by double clicking it.

### Quarantined ChartScripts

Scripts that interact with the file system (i.e., that use functions RunProgram, CreateOleObject, or those included in the File Access category), will be downloaded into special subfolders named *Quarantine*. To open these ChartScripts, you must drag them out of quarantine. Additionally, you may need to modify script constants to be compatible with your computer's environment, e.g., directory structure, file names, etc.

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## 4.8 Backup and Restore ChartScripts

Wealth-Lab Developer 4.0 stores your ChartScripts in a lightweight local database format. You can perform a bulk backup that copies each ChartScript to an individual file on your system. Select **Backup ChartScripts** from the **File** menu item to begin a bulk backup.

### How the Backup Works

The bulk backup first creates a folder called **Backup** under the primary installation folder. It then makes backup copies of your ChartScript database files in this folder. Next, the backup creates individual files for each ChartScript. The files have the same name as the ChartScript, with a ".WS" extension. Each WS file contains a ChartScript's description and its WealthScript code.

**Important!**

The bulk backup will first delete all existing folders and files in the **Backup** folder, so be careful that you don't have anything important there before beginning the backup operation.

---

### Restore

Select **Restore ChartScripts** from the **File** menu to start a bulk restore. The bulk restore first replaces your ChartScript database with the backup copy created by the backup. It then processes each individual backup ".WS" file and copies their contents into the ChartScript database.

The bulk restore will overwrite the contents of existing ChartScripts with the contents of the backup files. It won't affect ChartScripts in your database that do not have corresponding ".WS" files.

---

### ChartScript Database Damage

If your system crashes in the middle of an operation, there's a remote chance that your ChartScript database might become corrupted. If this happens you'll see errors such as "Table Header Corrupted" when trying to start Wealth-Lab Developer 4.0.

You can restore your last backup to get a clean copy of the ChartScript database, but you'll lose any work that you did since the last backup. If you encounter this problem please complete a request for support at www.wealth-lab.com. We can give you instructions on how to repair the damaged table and get you back up and running quickly.

---

## 4.9 Favorite ChartScripts

Flag your Favorite ChartScripts for quick access from the Favorites menu item, or from the Favorites list panel in the Icon Bar as shown in the following images.

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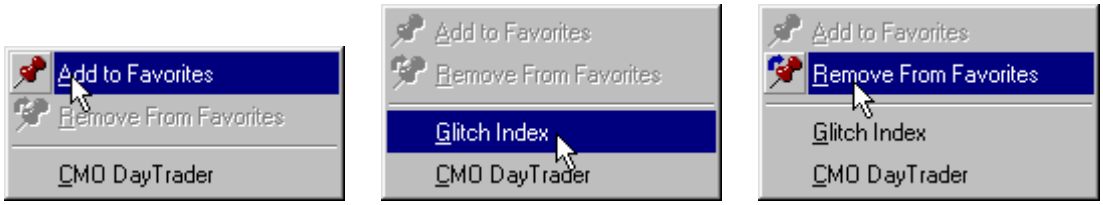
***Favorites in the main icon toolbar.***

To flag a ChartScript as a Favorite, open it from the ChartScript Explorer 42 and then select **Add to Favorites** from the **Favorites** menu. Conversely, select **Remove from Favorites** from the **Favorites** menu to remove a ChartScript from the Favorites list. Open the ChartScript for deletion in order to activate the menu item.




***Adding, selecting, and removing from the Favorites main menu item.***

The **Favorites** menu and toolbar opens a single window (only) of the Favorite ChartScript. Once an instance of the ChartScript is open, re-selecting it from the ChartScript from **Favorites** quickly places the window back into focus. To open multiple windows of the same favorite ChartScript, use the ChartScript Explorer 42.

By pressing the **Favorites View** button, you can see all of your Favorite ChartScripts for repetitive selection.

---

## 4.10 Preferred ChartScript for Symbol

You can designate a ChartScript as the "Preferred" ChartScript for a particular symbol. To assign a Preferred ChartScript, first open the ChartScript in a ChartScript Window 45, then select the desired symbol in the DataSource Tree. Finally, select **Set as Preferred ChartScript** from the **File** menu.

You can also assign Preferred ChartScripts for individual symbols or for an entire WatchList from the ChartScript Ranking Tool.

### Enabling Preferred ChartScripts

You must activate the Preferred ChartScript feature so that the script you selected is automatically used during a WatchList Scan 136 or a $imulation 155. Normally, these tools apply a single ChartScript to a list of symbols. By activating the Preferred ChartScript feature, you tell the Scan/$imulation to use the preferred ChartScripts (if assigned) for each symbol. If the Scan or $imulation tool comes across a symbol in the WatchList that you haven't assigned a Preferred ChartScript for, it uses the ChartScript that was selected when you started the operation.

To activate the Preferred ChartScript feature for Scans and/or $imulations see the Preferred Values 250 section in the Options Dialog 244.

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## 4.11 Common ChartScript Errors

It's inevitable. As much as you try to avoid it, everyone makes mistakes when programming - except perhaps the New ChartScript Wizard 91! Because of this, Wealth-Lab Developer 4.0 has equipped you with the professional programming tools necessary to help you find and fix errors.

When an error occurs in a ChartScript, click on it the Errors Window and you'll be taken to the statement which caused the error. If the line to which you are taken is blank or is out of context with the error described, it's likely that you have used the Include Manager 270 to reference another ChartScript(s). In this case, you'll need to fix the error by opening the included script(s). For other difficult-to-find errors that occur during a ChartScript's execution, use the ChartScript Integrated Debugger 103 to assist you in isolating and resolving logic errors and those that occur during run-time.

### Unknown Name Error

You have used a variable that has not been declared, or that has not been declared for the current scope (see Scope of Variables in the WealthScript Guide). Fix the error yourself, or use the **Fix ChartScript (F4)** feature under the **Chart** menu to automatically generate **var** statements for all undeclared variables. Make sure that the variable declaration precedes the code segment in which they are used.

### Name "variable" already exists

The indicated variable has been declared more than once in the current scope. If you can't find where the variable was previously declared, it's likely that the variable name is used in a Study that you have included in your script via the Include Manager 270. In either case, you can easily solve the problem by modifying the variable name.

### List index out of bounds

Probably the most common of the common errors. The Line and Col numbers point to the statement having the out-of-bounds (OOB) index. The number in the parentheses *indicates the value of the index* that is out-of-bounds.

1. Check to see if you're referencing a "negative" bar number. This is common if you start your main loop at 0, as in "`for Bar := 0 to BarCount - 1`" and then use a statement like "`Bar-1`" within the loop, for instance, to obtain an indicator value from a past bar.
2. Check if you're using Bar + 1 (or Bar + X) for *anything other than* the Bar number parameter in a BuyAt, SellAt, ShortAt, or CoverAt function. These latter functions will properly generate an **Alert** if you should place an order for a future bar. However, trying to access Bar + 1 for anything else will generate an out-of-bounds error on the last bar if the statement is executed.

   **Example:**
   ```
   StopPrice := PriceOpen( Bar + 1 ) - MaxStop; { Generates error when Bar = BarCount - 1 }
   ```
3. You may be trying to obtain information from a Position Number that does not exist. Alternatively, you may be trying to exit a Position Number (using a Sell or Cover function) that does not exist.
4. Ensure that you have loaded a sufficient amount of data for the longest-period indicator used by the ChartScript.

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**Example 1:** If the script uses a 200-bar moving average, then it requires at least 200 bars of data. Note that one year of daily data is approximately 250 bars.

**Example 2:** An intraday script creates a 10-period **daily** ATR indicator after calling SetScaleDaily. For a 5-minute intraday interval, you must load 78 bars/day x 10 days = 780 bars *at a minimum* to avoid an OOB index error.

### Number expected ("0")

If the error points to a line in which you have used an #OptVar, be sure that you have the special Optimization control comments that define the value of the #OptVar at the top of your script.

**Example:** `{#OptVar1 50;20;100;10}`

### Script Timed Out (Run time exceeded Timeout value)

The length of time that it takes a script to execute is dependent on 3 main factors: 1) the number of bars selected, 2) the complexity of the script, and, 3) computer hardware factors such as processor type, speed, memory, etc. See General Settings 255 in the Options Dialog topic for more information.

### Invalid Range Error

Wealth-Lab has detected a zero price in one or more of the OHLC bars or another problem with price structure in the DataSource. You must find and correct the error in the DataSource.

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# 5 ChartScript Integrated Debugger

## 5.1 Overview

Debug your WealthScript code like a pro with the *ChartScript Integrated Debugger* (CID)! Even if your code runs smoothly and a fault diagnosis is not necessary, the Debugging environment can give you great insight into a script's logical flow of execution. Most likely, however, you'll use the debugger to find those difficult-to-solve programmatic errors, or *bugs*. The types of errors that you can encounter when writing code in WealthScript can be classified in the following three groups:

1. Compilation errors
2. Run-time errors
3. Logic errors

Ideally, a ChartScript debugger would find and fix all the errors in your script for you. Unfortunately, here on planet Earth, a debugging environment neither finds nor fixes errors. Rather, the debugger *assists* you with both tasks by providing the tools necessary for you to follow a script's code and peek at its variables while it executes. Of the aforementioned errors, the CID helps you track down the latter two types, run-time and logic errors. Prior to opening a ChartScript for debugging, you should fix all compile-type errors.

Debugging Quickstart 103
If you're a seasoned programmer, you'll find the Debugging mode easy to use and similar to other popular programming debug environments.

Breakpoints 104
Setting breakpoints allows you to suspend the execution of your script at precisely the line of code you've marked for this purpose.

Debugging Tools 105
Once a script is suspended in "break mode", you can use an arsenal of debugging tools to *step* through your code at a pace that allows you to think along with your computer.

Variable Inspector 107
The real power of the debugging tools is to be able to get a snapshot of the variables in use during break mode.

Debugging Approach Notes 110
There's nothing magic or procedural in the approach to debugging. Just do it!

**Note:** Don't confuse the Debug Messages Window 269 **(Ctrl+Alt+D)** with the ChartScript Integrated Debugger (CID). The former displays string messages from the **`Print`** function whether or not a ChartScript is opened for debugging.

---

## 5.2 Debugging Quickstart

If you are familiar with debugging in other development environments, these notes may be all you need to get you going. Keep the following points in mind when using the Integrated Debugger:

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- You cannot debug a protected ChartScript.
- Only one ChartScript may be open for debugging at a time.
- A script should execute without compilation errors before opening it for debugging so that you can find run-time and logic errors.

**Open ChartScript for Debugging**

To begin, simply strike **Ctrl+G**, or from the main menu select **File | Open ChartScript for Debugging**. Continue by selecting the desired ChartScript using the ChartScript Explorer. The ChartScript will be opened in debug mode, and you'll then have the Debugging Tools available for your use as described in the subsequent topics.

**Note:** The CID automatically adds code from $Include scripts to the beginning of the debug script at the moment of script execution. This allows you to "Step Into" these functions and procedures during debug mode.

---

### Debugging a Custom Indicator

Because of the manner in which custom indicators are created and stored in memory after initial execution, it's slightly more difficult to debug them. The reason is that the "beefy part" of a custom indicator's script is skipped on subsequent runs, not allowing breakpoints that are further down in the code flow to be hit.

To alter this behavior, you'll need to make a small modification to the indicator's script for debugging. Find the section of code illustrated below and comment out the section as indicated. This will allow the code to flow into the remainder of the Indicator's routine. When finished debugging, don't forget to undo the comments!

**Typical indicator code fragment:**

```
Result := FindNamedSeries( sName );
if Result >= 0 then
  Exit;
```

**While debugging, change to:**

```
Result := FindNamedSeries( sName );
{ if Result >= 0 then
  Exit; }
```

---

## 5.3 Breakpoints

The process of debugging largely revolves around the ability to suspend script execution at specific statements so that you can examine the contents of variables and subsequently step through the code in the order of execution. A breakpoint allows you to define a specific statement at which you wish to suspend a script's execution.

By simply running your script in the normal fashion (clicking a symbol, , or the striking the [F5] function key) and using the non-debug results, you'll often be able to quickly isolate a section of code, or a routine, that is giving you problems. You may even Print results to the Debug Window for this purpose. Once you have identified the area of the suspected malicious code, set a breakpoint at an executable statement just prior to the trouble spot. In break mode you'll be able to get a snapshot of the

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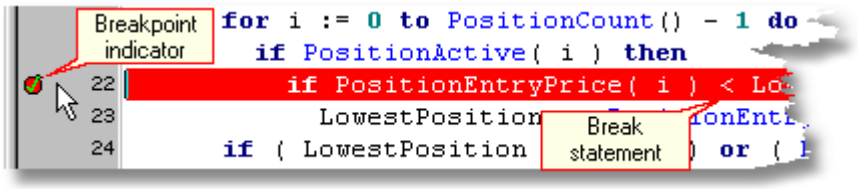
contents of your script's variables by using the Variable Inspector[107].

To set a breakpoint in the CID (ChartScript Integrated Debugger), click in the gray column on the row of the statement at which you want the break. You may repeat this process for as many breakpoints as you wish. Breakpoints can be added to a ChartScript during either edit or break mode, but only when it has been opened for debugging. The following image shows a breakpoint being set at the if/then statement on row 22.




You can remove breakpoints individually by left-clicking on the row of a breakpoint. Breakpoints are not recalled between debugging sessions.

**Note:** Breakpoints must be set on executable statements. Statements that are *not* executable include variable declarations (e.g., var), comment or blank lines, and statement block delimiters like "begin" and "end". Although it may appear that you can set a breakpoint on *any* statement, script execution can be halted only on those that are executable.

So, we can set breakpoints. Now what? In the next topic, we'll discover one of the several debugging tools[105] that are used in conjunction with breakpoints - one of which can clear all breakpoints in one action.

---

## 5.4 Debugging Tools

Now that we've discovered how to set breakpoints[104], it's time to investigate the tools that utilize them.

### The Debug Toolbar

When a ChartScript is opened in the CID, the *Debug Toolbar* appears above the DataSource Tree. The DataSource tree is shown automatically upon opening a ChartScript, and it must be remain shown for the Debug Toolbar to be available. You can show DataSource Trees for all ChartScripts from any view by selecting **View|Show All DataSource Trees** from the main menu.

#### Run to Breakpoint [F9]

This action runs a script at normal execution speed until the next breakpoint is encountered. A breakpoint defines a line in the Code Editor where Wealth-Lab will suspend script execution. You must use the "Run to Breakpoint" action to suspend execution at the next breakpoint. When encountered, a breakpoint will halt the script *just prior to* executing the line containing the breakpoint.

**Remarks:**

- You cannot make edits to a ChartScript that is suspended in "break mode".
- Chars are not rendered during break mode. To see price data or the result of ChartScript drawing functions, run the script normally by clicking on a symbol, the

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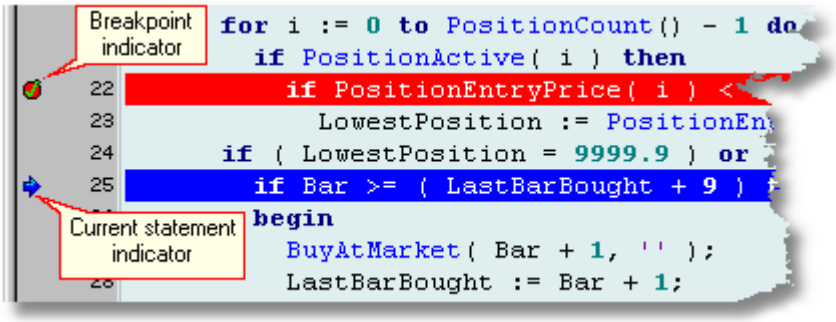
Execute button, or by striking the **F5** key.

### Step Over [F8]
### Step Into [F7]

"Stepping" is the manner by which you can follow the execution of your script at your own pace. The two actions, Step Into and Step Over, perform the same action until executing a statement that contains a function or procedure call. The former, Step Into, will execute the next executable statement, and, if the statement contains a function or procedure call, it will branch to the named routine and begin stepping within it. Step Over, on the other hand, will execute the next executable statement in the application without stepping into routines.

Notice the light-blue background in the image below. It shows a ChartScript in break mode, which was entered initially by pressing **[F9]** and then **[F8]** (or **[F7]**) three times. The blue arrow and line of code indicates the current statement that will be executed next upon selecting any step or run action.




### Script Reset [F10]

This action, which is available only in break mode, will reset the script, exiting break mode and returning to an edit mode.

### Variable Inspector [Ctrl+Alt+I]

Displays the Variable Inspector 107 window, which is used to show the current value of local variables in break mode.

### Clear all Breakpoints

To turn your attention to another section of code, you may clear all breakpoints quickly using this one-click action.

---

## Debug Main Menu Item

After opening a ChartScript for Debugging, a new main menu item, **Debug**, becomes available. If you prefer to work with the DataSource Tree hidden to give the Editor view more real-estate, then you have access to the Debugging actions via this menu, the Variable Inspector's toolbar, or the keyboard shortcuts.

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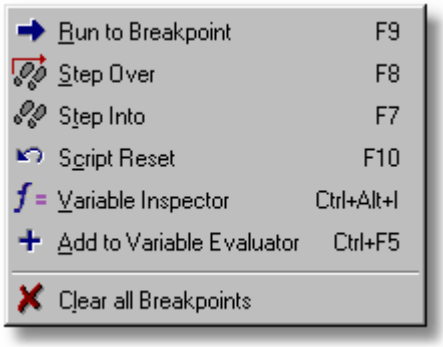
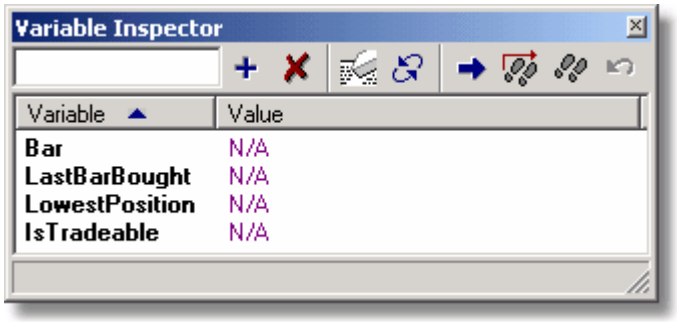



## 5.5 Variable Inspector

At the heart of debugging is the ability to watch variables during run time. The Variable Inspector provides this capability by displaying snapshots of the values of variables in which you are interested. It is a resizable and moveable window, and it contains all commands of the debug toolbar excluding "Clear Breakpoints".

The image below shows the Variable Inspector set up to monitor several variables in the current ChartScript. "N/A" indicates that a value is "not available" at that instant for the variable of the name shown.




The meanings of following icons are specific to the Variable Inspector:

### Add a Variable to List

Add a "watch" variable to the Variable Inspector by typing its name in the entry box and clicking this icon. Additional information and other shortcut methods for entering variable names are described below in Adding Variables to the Variable Inspector 107.

### Remove Selected Variable from List

Click on a specific watch variable to highlight it in the list and then delete it by clicking this button.

### Clears All Variables from List

Delete all of the watch variables at once by clicking the eraser icon button.

### Refresh Items

It may be necessary to refresh variables that are added to the Variable Inspector while in break mode.

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## Adding Variables to the Variable Inspector

### Evaluating Variables

In general, you can watch variables that have been formally declared with a **var** statement, that appear in an argument list of a function or procedure, or object field variables. "Watch" variables can be of any data type.

Add variables to the Variable Inspector using either the following actions. Either action may be accomplished in Break mode or in ChartScript Edit mode.

1. Type, or copy and paste, a variable name in the Variable Inspector's text-entry box (upper left corner) and hit the Enter key or select the + icon.
2. Place the editor cursor (not just the mouse pointer) over the desired variable. Subsequently right click and select "Add to Variable Evaluator" or strike **Ctrl+F5**. Adding a variable using this method will automatically open the Variable Inspector.

### Evaluating Functions

You can evaluate user-defined or WealthScript functions directly in the Variable Inspector. To return the result of a "watch function", the Variable Inspector periodically processes the function's code. Consequently, unlike simple variables, the process of *evaluating a function can actually cause program flow and other variables to be altered in a manner different to the way the script would behave if it were not being debugged.* For this reason, you should avoid evaluating functions in the Variable Inspector that change the value of "global" variables, or that include trading functions

- User-defined functions may be evaluated, but they must be added manually with their complete parameter list (copy and paste is useful for this).

  **Example**

```
function MyFunction( f1: float; b1, b2: integer ): float;
begin
  Result := f1 * b1 - b2;
end;
```

For the function above, enter **MyFunction( f1, b1, b2 )** into the Variable Inspector.

- WealthScript functions *that return values* can be evaluated by including the parameter list as shown in the ChartScript Editor.

  **Example**

  To evaluate the closing price of the current bar and assuming that *Bar* is the loop index variable, enter **PriceClose( Bar )** into the Variable Inspector.

  **Note:** Do not add functions to the Variable Inspector that could alter the program flow or change the value of other global variables. For example, attempting to evaluate **BuyAtLimit( Bar + 1, Price, '' )** may cause **PositionCount** to increase continually if the function evaluates true on the current break-mode *Bar*.

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- Do not include *procedure* names nor @-syntax calls. If you want to see a Price Series value at a specific *Bar*, evaluate it with **GetSeriesValue** or assign it to a properly-typed variable and add the variable to the Variable Inspector.

**Example**

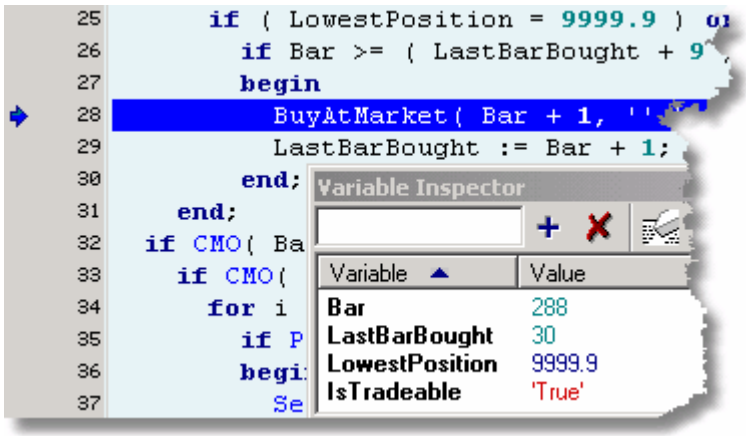
```
{ Declare temporary variable(s) to use for "watch" items }
var Bar, SomeMA, Period: integer;
var tmp: float;

Period := 20;
SomeMA := WMASeries( #Close, Period );
for Bar := Period to BarCount - 1 do
begin
{ Add GetSeriesValue( Bar, SomeMA ) as a watch function }
  if PriceHigh( Bar ) < GetSeriesValue( Bar, SomeMA )
    continue;

{ or assign it to a variable, tmp, then add tmp as the watch
variable }
  tmp := @SomeMA[Bar];
end;
```

## Using the Variable Inspector

After adding "watch" variables to the Variable Inspector, and setting at least one breakpoint, press **[F9]** to run the script until the next breakpoint. Upon entering break mode, the current value of all listed variables will be displayed. The image below shows an example during break mode with several variables entered for evaluation.




***The Variable Inspector shows the current value of the variables and functions when the ChartScript is in break mode.***

The Variable Inspector will recall the variables from a script's last debugging. Additionally, although you cannot edit a script while in break mode, you can add more variables to the Variable Inspector during this time.

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## 5.6 Debugging Approach Notes

There's no magic fool-proof debugging procedure, and, like anything else, you get better and more efficient with practice. Of course, the best defense is a good offense - write perfect code the first time! But since we're all human, bugs in our code will be a fact of life for the foreseeable future.

The CID won't automatically fix your coding errors for you, but by analyzing the flow of your code and peaking at key variables in human time you'll be able to answer what, where, and why "it" happens. Once you have the answers to the "w" questions, you will be well on your way to solving the run-time and logic errors, if any, in your ChartScripts.

---

### Correct Syntactical Errors First

Although all compilation errors should be corrected before using the CID, you *can* quickly determine if your script has these types of errors by simply stepping into a ChartScript which is open for debugging by pressing the [F7] function key. If the Editor background does not turn blue and you do not see the current statement indicator, then the ChartScript likely has syntactical errors. At this point you should exit the CID, and re-open the ChartScript normally (not using the CID) to correct the syntax errors that appear in the Editor's Error window.

---

### Examining the Application at a Breakpoint

Generally, the following approach may be used for debugging with the CID:

1. Identify the suspect area of code based on run-time errors or results. Create entries for associated variables in the Variable Inspector.
2. Set a breakpoint at or just before the line of code or at the call to the suspect routine. If this is located in a large loop, you may wish to add a conditional statement that you can use as a breakpoint.

```
if Bar = 520 then
  Bar := Bar;  { Place breakpoint on this statement }
```

3. Run the script to the first breakpoint by striking **F9** or by clicking  in the Debug Toolbar.
4. While observing the watch items in the Variable Inspector, step through the code by striking **F7**/**F8** or by clicking / as previously described. You may introduce more variables into the Inspector while the code is in break mode.

   **Note:** A breakpoint suspends the script just before executing the line of code that contains the breakpoint. To observe what happens when the line with the breakpoint executes, you must execute at least one more statement. To do this, use either **Step Into** or **Step Over** ( or ).

Once you reach a breakpoint and the ChartScript is halted, you can examine the current state of the variables. Note that peeking into functions and procedures used in the ChartScript is easy, because the CID automatically inserts the code from $Included studies. Therefore, if you use "Step Into" ( or **F7**) on a function/procedure call statement you will be able to see the contents of these routines when used by the script.

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Besides potential logic errors that may become obvious while you step through the code, we present a *short list* of common errors that you may notice while using the CID debugging features:

- variable not properly initialized
- wrong formula used
- incorrect operator typed (e.g., "<" instead of ">")

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# 6 ChartScript Optimization

## 6.1 Optimization Overview

The process of trading system optimization involves testing the system with a range of different values for one or more parameters. For example, if you have a system that enters and exits based on price closing above or below a moving average, you could optimize the system to see which moving average period produced the most profitable results.

In Wealth-Lab Developer 4.0, you can optimize up to 10 parameters at once, and optimize on a single stock/future, or a complete WatchList. You can also select between two different optimization methods.

Getting Started with Optimization 113
To begin the optimization process, you must modify a ChartScript to use Optimization Variables, or #OptVars. Most often, you'll write scripts without #OptVars to make sure it functions correctly with a default set of constants. Planning ahead by using variables for each value gives your code better readability and will make the modification task a snap.

Optimization Variables 114
After having modified a ChartScript for optimization, you need define a default value and a range for each of the #OptVars. Using the graphical interface presented in the section, Wealth-Lab assists you in this expeditious process and puts the requisite comments in your ChartScript for you.

Optimization Control 117
Wealth-Lab Developer 4.0 offers two types of optimization methods - Exhaustive and Monte Carlo. Since an Exhaustive optimization systematically goes through every possible combination of #OptVars to always find the most profitable set of values. You can use Monte Carlo to speed things up and/or to optimize on performance metrics such as Profit, Recovery Factor, and more!

Performing the Optimization 119
After preparing the ChartScript and defining the #OptVar ranges, just hit the Begin button and let Wealth-Lab do the work for you!

Results Explorer 120
In a nutshell, the optimization process automatically executes the ChartScript over and over using a different combination of variables each time. The Results Explorer displays the outcome of each ChartScript run in a tabulation view, which can be sorted by any metric. Additionally, for Exhaustive optimizations generate 2 and 3-dimensional graphs for visualization relationships between #OptVar values and performance metrics.

Preferred #OptVars 123
If you find that certain combinations of variables work better for some symbols than for others, you can establish Preferred #OptVar values for a ChartScript/symbol combination.

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## 6.2 Getting Started with Optimization

### Opening an Optimization Window

To open a ChartScript for optimization, select **Open ChartScript for Optimization (Ctrl+T)** from the **File** main menu item. Select the ChartScript that you want to optimize from the ChartScript Explorer 42. The ChartScript will open in a special ChartScript Window 45 that has two new tabs: **Optimization** and **Results Explorer**.

**Note:** To speed up the process, the Optimization Tool loads the data of the symbol undergoing optimization only once. The Primary Data Series, then, are used for each subsequent optimization run for the symbol. Therefore, functions that make changes to the Primary Data Series, such as **ChangeBar** and **AddFutureBars,** should not be used in scripts opened for Optimization.

---

### Modifying a ChartScript with #OptVars

Wealth-Lab Developer 4.0's optimization process revolves around the concept of optimization variables, or ***#OptVars***. #OptVars are replaced with a range of different numerical values during the optimization process. You can use up to 10 #OptVars, #OptVar1 through #OptVar10.

#OptVars are used like integer variables in a script. The main difference is that you let the Optimization Tool control their values instead of changing them yourself. (We'll show you a trick that you can use for optimizing on a floating point number later.)

Here is our simple dual moving average crossover system from the Creating a New ChartScript topic 88. Notice that instead of assigning the Slow and Fast period variables to a number, we assigned them to #OptVar1 and #OptVar2, respectively. The instances of any #OptVar in the script *will be replaced by a range of values* by the Optimization control as the optimization progresses. Consequently, everywhere SlowPer and FastPer are used in the script, they will take on the value of their respective #OptVar.

#### Example

**Note:** The example is not complete. It is the first step to incorporate #OptVars in an existing ChartScript. For the completed example, see Performing the Optimization 119.

```
{ Dual Moving Average Crossover System }
var Bar: integer;
var SlowPer, FastPer: integer;  // fast & slow periods
var SlowMA, FastMA: integer;    // indicator handles

SlowPer := #OptVar1;
FastPer := #OptVar2;

SlowMA := WMASeries( #Close, SlowPer );
FastMA := WMASeries( #Close, FastPer );

InstallTrailingStop( 5, 75 );
InstallStopLoss( 8 );
PlotStops;

for Bar := SlowPer to BarCount - 1 do
begin
  ApplyAutoStops( Bar );
```

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```
    if not LastPositionActive then
    begin
      if CrossOver( Bar, FastMA, SlowMA ) then
        BuyAtMarket( Bar + 1, 'CrossedOver' );
    end
    else
    begin
      if CrossUnder( Bar, FastMA, SlowMA ) then
        SellAtMarket( Bar + 1, LastPosition, 'CrossedUnder' );
    end;
  end;
```

Instead of assigning the #OptVars like this to an existing variable, you *could* use #OptVar in place of the variable itself. However, doing it in this manner has 2 major disadvantages:

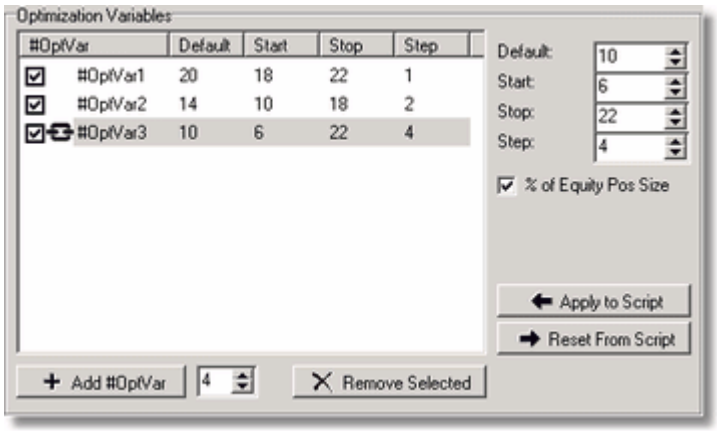
1. You are not at liberty to give #OptVars meaningful names like you can with other variables.
2. A ChartScript must be written before choosing to optimize it. It's best to plan ahead and use variables in place of numeric values (like in the script above). If you don't, you'll have to search the script for every instance in which you used a number, like 20 for a moving average period, and replace them with an #OptVar.

To complete the script for use in Optimization, we only have to define the range of our #OptVars, which we show you how to do in the next section, Optimization Variables.

---

## 6.3 Optimization Variables

The **Optimization** tab in the ChartScript Optimization Window 112 defines the #OptVars that are used in the ChartScript, and actually controls the optimization process. The meaning of each of the controls in the **Optimization Variables** frame can be found below its image. See the Optimization Control 117 topic for descriptions of its controls.

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### Add #OptVar

You can add up to 10 #OptVars in the Optimization Variables list. Click the **Add #OptVar** button to add a new #OptVar. The new #OptVar will appear in the list with each of its values set to the values of the currently-selected #OptVar, or all zeroes if no #OptVar is highlighted in the list.

De-select an #OptVar by unchecking it in the list. When an #OptVar is deselected, it's range of values won't be applied during an optimization. Instead, the #OptVar will always assume its **Default** value shown here.

**Note:** The **Default** value must lie along the Start/Stop/Step sequence. For example, if you select a Default value of 15, with a Start of 10, Stop of 18, and Step of 2, since the value does not lie in the sequence it will be replaced with the **Start** value during the optimization process.

After adding a new #OptVar you should set its optimization range. Do this by changing the values in the Default, Start, Stop and Step entry fields to the right of the list. Each of the values is explained below:

### Remove Selected

Deletes the *highlighted* #OptVar from the control list. However, since you still may be using the removed #OptVar in your ChartScript as a variable, this action does not remove the #OptVar from the Editor. You may do this manually if you no longer need the #OptVar for any part of your script.

#### Default

This is the value that the #OptVar will assume when the ChartScript is run in a normal ChartScript Window, or during a WatchList Scan, $imulation, or Ranking.

#### Start, Stop, Step

These fields control the range of values that will be applied to the #OptVar during the optimization process. For example, if Start = 10, Stop = 18 and Step = 2, the optimization process will test the system 5 different times with the values 10, 12, 14, 16, and 18.

The Optimization runs "From" the Start value "To" the Stop value while incrementing by the Step, which must be a positive number. Consequently, the Stop value should be greater than the Start value.

#### Apply to Script

Click this button to apply ***checked/selected*** #OptVar value changes to the ChartScript. The #OptVar settings are actually stored in the ChartScript as specially-formatted comments. Save the ChartScript to store the changes. Our example above would generate the following comment at the top of the script:

```
{#OptVar2 14;10;18;2}
```

The first value, 14, represents the #OptVar's **Default** value.

**Note: Apply to Script** will *ignore* the #OptVars that are deselected (not checked) in the #OptVar List.

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### Reset From Script

Click this button to read the #OptVar settings from the ChartScript and apply these to the entry fields and #OptVar List in the Optimization tab. It's only necessary to use this if you have manually modified the Optimization control comments while the ChartScript is open for Optimization.

**Note: Reset from Script** will *ignore* the #OptVars that are de-selected (not checked) in the #OptVar List.

### % of Equity / $Pos Size / % Max Risk / Share Pos Size

In Wealth-Lab Developer 4.0 you can apply one of your ten #OptVars to optimize one of four standard Position Sizing methods during a Portfolio Simulation. This option is displayed if you select one of the first four options for Portfolio Simulation in the Position Sizing Control. When you enable this feature by checking it, a chain link icon will appear next to the *selected* #OptVar. An additional field will be included in the #OptVar comment when linked to Position Sizing. Be sure to perform the action **Apply to Script** after creating the link.

```
{#OptVar3 10;6;22;4;PosSizeLink}
```

**Note:** The chain link icon indicates that the linked OptVar controls the Portfolio Simulation Mode Sizing. If the OptVar is not selected for optimization (i.e., not checked) but the chain link is showing, then the OptVar's *default value* will be used for the selected sizing option. To completely uncouple an OptVar from sizing, click it, and then uncheck the box below "Step".

---

## Optimizing Floating-Point Numbers

You may have noticed that #OptVars use only integer values. Then, how can a floating-point number be used in optimization? The answer is quite simple and is best described with an example.

Assume that you use percentage risk, *R*, to set an initial risk stop. You'd like to investigate a range of risk between 2% and 4% at increments of 0.25% that would optimize profit. Since #OptVars use only integers, you must convert the incremental factor (0.25) to a whole number by *multiplying it* by 100, and then apply the same conversion to your default value and range. The derived numbers are then used in the Optimization Variables' control when assigning Default, Start, Stop, and Step values.

Finally, when assigning the #OptVar for use within the script, just *divide it* by the same factor that you used in the conversions above. The resulting script will have code similar to the example below.

### Example

```
{#OptVar1 300;200;400;25}
var R: float;

R := #OptVar1 / 100;
{ Use R in the script as normal }
```

Therefore, as #OptVar1 is assigned the values 200, 225, 250, ..., etc., *R* will be assigned 2.00, 2.25, 2.50, ..., etc.

---

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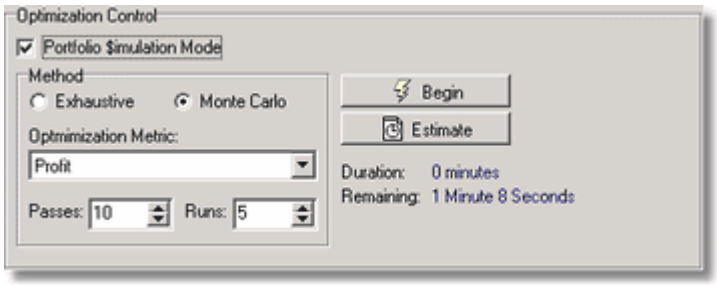
## 6.4 Optimization Control

After having set the default values, ranges, and step factors in the Optimization Variables 114 frame and applied them to the ChartScript, it's a good time to save your work. As noted below, depending on your selections, an optimization process can take anywhere from several seconds to days.

Make your final selections in the Optimization Control frame and then click **Begin**.




***Optimization Control frame.***

### Optimization Target

You can elect to optimize on a single symbol only or an entire WatchList by highlighting your choice in the DataSource tree on the left side of the window. If you have hidden the DataSource tree, select **View|Show All DataSource Trees** from the main menu.

### Portfolio $imulation Mode

**Note:** This option is enabled provided that you have selected Portfolio Simulation 263 in the Position Sizing Control 263.

By placing a checkmark next to the Portfolio $imulation Mode option, you instruct the Optimization Control to optimize using a true portfolio-level $imulation. One result of this mode is that trades may be dropped due to insufficient capital. Consequently, instead of obtaining results for individual symbols, tabulations are shown for the portfolio level. In the Results Explorer 120, **[Portfolio]** will be indicated as the symbol in the Tabulations view if a WatchList is selected as the target for optimization.

In summary, the steps to perform a Portfolio-level optimization are as follows:

**Step 1** Open a ChartScript for Optimization, **Ctrl+T**.

**Step 2** Modify the ChartScript 113 for Optimization, if required.

**Step 3** Using the Position Sizing control 263, select Portfolio Simulation and the sizing method.

**Step 4** In the Optimization Control frame, place a check mark in the box next to "Portfolio $imulation Mode".

**Step 5** Configure the desired Optimization mode, Exhaustive or Monte Carlo.

**Step 6** Click the WatchList desired in the DataSource tree.

**Step 7** Click **Begin** to start the process.

Note that you can use Portfolio Simulation 263 in the Position Sizing Control 263 when **Portfolio $imulation Mode** is *not checked*. In effect, this control combination performs $imulations on each symbol in the WatchList, individually. In the Results Explorer, the metrics for each permutation of the optimization are available by symbol or as an average (see Filter and Grouping 120 in the Results Explorer 120 topic).

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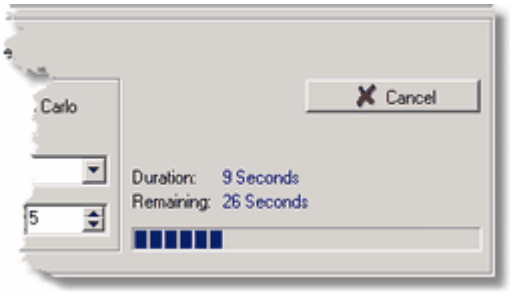
### Estimate

Click the **Estimate** button to get an idea of how long the optimization procedure will take based on the current settings. This action will execute the ChartScript on one or more symbols in the currently-selected WatchList. The estimate is most often a worst-case scenario. The actual time required is often less than the estimate because of time savings introduced because of data caching.

### Begin

Starts the optimization process. While optimizing, the Optimization Control constantly updates to show you the duration and time remaining. Additionally, a status bar appears to give you an idea of where you are with respect to the beginning and end of the operation.




***Optimization progress bar.***

### Cancel

Use this button to interrupt an Optimization in progress. Incomplete results up to the point at which the operation was canceled will be available in the Results Explorer 120.

### Optimization Method

You can select either **Exhaustive** or **Monte Carlo** as the optimization method.

#### Exhaustive

This method iterates through each of the #OptVar ranges in a series of nested loops. The ChartScript is executed once for every possible combination of #OptVars. If you've defined several #OptVars then this type of optimization can run for a very long period of time. Here are some examples of the number of individual ChartScript runs required for different combinations of #OptVars:

| #OptVar1 | #OptVar2 | #OptVar3 | Runs | Runs |
|---|---|---|---|---|
| 1-5 by 1 | 1-5 by 1 | N/A | 5 * 5 | 25 |
| 10-100 by 5 | 10-100 by 5 | N/A | 19 * 19 | 361 |
| 10-100 by 5 | 10-100 by 5 | 20-60 by 5 | 19 * 19 * 9 | 3,249 |

As you can see, you must carefully choose the number of #OptVars and the ranges that you establish or you could soon enter the range of optimizations that would take years to complete.

#### Monte Carlo

The Monte Carlo optimization methods attempts to zero in on a range of #OptVar values that maximize the selected Optimization Metric (see below) by trying different random combinations. Because of its random nature, the Monte Carlo optimizer will not always discover the values that truly maximize the selected metric, but it can find ranges much more quickly than an Exhaustive search over a large number of #OptVars.

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You set a number of **Passes** and a number of **Runs** per Pass. During each optimization pass, the optimizer will try a different set of random parameters for each run, remembering the values that maximize the chosen metric as it continues. Assume that you have chosen "Profit" to be maximized. At the start of each pass, the range of random values is decreased and centered on the most profitable value determined in the previous pass. The Monte Carlo Optimizer keeps shrinking the parameter windows as it proceeds, until it winds up centered on a set of values that maximize the targeted metric.

**Note:** Since the Monte Carlo process chooses random combinations of values that fall between the Start and Stop values defined for the #OptVars, the *Step* value is meaningless.

### Optimization Metric

For the Monte Carlo method (only), you can target one of a variety of performance metrics for optimization. The table below indicates the metrics available based on the active selection in the Position Sizing Control 263. For more information on "User Defined" see SetOptimizeValue.

| Metric | Raw Profit Only | Portfolio Simulation |
|---|---|---|
| Profit | ✓ | ✓ |
| Profit per Bar | ✓ | |
| APR | | ✓ |
| Trades | ✓ | ✓ |
| Win/Loss | ✓ | ✓ |
| Profit Factor | ✓ | ✓ |
| Payoff Ratio | ✓ | ✓ |
| Recovery Factor | ✓ | ✓ |
| DrawDown | ✓ | |
| DrawDown % | | ✓ |
| Avg Profit % | ✓ | ✓ |
| WL Score | | ✓ |
| Sharpe Ratio | | ✓ |
| WL Error Term | | ✓ |
| WL Reward Ratio | | ✓ |
| Equity Drop Ratio | | ✓ |
| Exposure | | ✓ |
| Ulcer Index | | ✓ |
| User Defined | ✓ | ✓ |

## 6.5 Performing the Optimization

Once all of the #OptVar settings are established in the #OptVar List, you're ready to begin the optimization procedure. At this stage, make sure that you've modified your code in the Editor 81 to actually replace the parameter values with their corresponding #OptVars.

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Here's our previous example to illustrate a script containing three #OptVars, one of which will be applied to our Position Sizing selection, ready for optimization. Click the **Begin** button to start the process. When the "Optimization Completed" message appears, you're ready to move on to the Results Explorer 120 view to examine the outcome.

**Example**

```
{#OptVar1 20;18;22;1}
{#OptVar2 14;10;18;2}
{#OptVar3 10;6;22;4;PosSizeLink}

{ Dual Moving Average Crossover System - READY FOR OPTIMIZATION }
var Bar: integer;
var SlowPer, FastPer: integer;  // fast & slow periods
var SlowMA, FastMA: integer;    // indicator handles

SlowPer := #OptVar1;
FastPer := #OptVar2;

SlowMA := WMASeries( #Close, SlowPer );
FastMA := WMASeries( #Close, FastPer );

InstallTrailingStop( 5, 75 );
InstallStopLoss( 8 );
PlotStops;

for Bar := SlowPer to BarCount - 1 do
begin
  ApplyAutoStops( Bar );
  if not LastPositionActive then
  begin
    if CrossOver( Bar, FastMA, SlowMA ) then
      BuyAtMarket( Bar + 1, 'CrossedOver' );
  end
  else
  begin
    if CrossUnder( Bar, FastMA, SlowMA ) then
      SellAtMarket( Bar + 1, LastPosition, 'CrossedUnder' );
  end;
end;
```

## 6.6 Results Explorer

In a nutshell, the optimization process automatically executes the ChartScript over and over using a different combination of variables each time. Once the optimization is complete, switch to the **Results Explorer** tab to view the results of each ChartScript run. The Results Explorer lets you examine the optimization results in a variety of ways.

**Note:** Only the Results Explorer view contains the results of an optimization. Other ChartScript views, such as Performance, Trades, Profit, etc., will summarize the results of the last ChartScript execution, which may have been when you opened the ChartScript for Optimization or when estimating the length of an optimization.

Descriptions for the displayed metrics can be found in the

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$imulator's Performance View 163 topic for optimizations utilizing Portfolio Simulation mode sizing, and in ChartScript Window's Performance View 76 topic for Raw Profit mode sizing.

---

### Result Set (Saving/Loading Optimization Results)

The first thing you might want to do after running a lengthy optimization is to save the result set to disk file. By default, results are saved in the \OptResults subfolder with a ".wor" file extension. You can re-load this file at a later time to analyze the findings without having to re-run a mammoth optimization session.

**Save to File** Saves an optimization result set.

**Load from File** Loads a previously saved result set.

---

### Filter and Grouping

You can filter the results that are displayed in the Tabulations by using the **Filter and Grouping** controls. These controls are meaningful only if you ran an optimization on an entire WatchList instead of a single symbol, and with Portfolio $imulation Mode 117 *not checked* in Optimization Control. In the latter case, the controls are disabled if a WatchList was selected.

**Show all Symbols:** Displays all results processed in the Tabulations list.

**Show only Symbol:** Displays Tabulation results only for the symbol selected in the drop-down control.

**Average:** Displays average results for a given set of #OptVars. Generally, the [Avg] value displays the value for the set of pooled trades. For some metrics like Number of Trades and the User-Defined value the result is a simple arithmetic mean, whereas for other metrics like Profit Factor and Payoff Ratio the result is derived by combining the trades from every symbol as is done in a Portfolio $imulation.

---

### Graph Options

*Applies to:* Exhaustive optimization (only)

The Graph Options specify the control variables for the X and Y axes of the One #OptVar Graph 120 (histogram), and the X, Y, and Z axes for the 3-dimensional Two #OptVar Graph 120. As you make new selections in the drop down controls, the Graphs will automatically be updated.

**Value** Choose the metric that you want to use as the Y-axis Value for both One and Two #OptVar Graphs. The Y axis is the vertical axis on the left side of the graphs.

**First** The X-axis of both One and Two #OptVar Graphs will be derived from the range of the **First** #OptVar number chosen here. Select 1 for #OptVar1, 2 for #OptVar2, etc. In our example, #OptVar1 had a range from 18 to 22 with a Step of 1. Consequently, you would see X-axis values for 18, 19, 20, 21, and 22 for #OptVar1.

**Second** The Z-axis ("into the screen") of the Two #OptVar Graph 120 (only) will be taken from the range of the **Second** #OptVar number chosen here. To see a change in the graph, the #OptVar number must be different than that chosen in **First**.

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**Change #OptVar Value** *Applies to:* Exhaustive optimization (only)

Use the controls in this frame to change the value of an #OptVar *not chosen* as First or Second in the Graph Options frame. The Graphs will automatically be updated as you make changes to values of #OptVars different from the ones included in the Graphs.

**#OptVar** Select the #OptVar number whose **Value** you wish to modify. The **Value** displayed will be the one that is reflected in the results of the One or Two #OptVar Graphs.

**Value** The Value control will be loaded with all the possible values of the #OptVar selected (above). The graphs will reflect the results of all optimization runs when the selected #OptVar had this Value.

For example, for an optimization using 2 #OptVars, if you're viewing the One #OptVar Graph using #OptVar1 for the X-axis values, you can change #OptVar2 values here to see the effect on the graph results.

In summary, the graphs will show you the results for the entire value range of the #OptVars selected in Graph Options 120, but only the for the other #OptVar values that are set in the Change #OptVar Value frame.

## Results Explorer Views

For Exhaustive optimizations, three results views are provided. Click on the tabs below the result tabulations to see each one, which is described below. For Monte Carlo optimizations, only the tabulations view is available.

### Tabulations

The tabulation view shows the detailed optimization results based on the Filter and Grouping (above) settings specified. Each row of data represents the performance results of the trading system with a particular set of #OptVar values whose specific values are displayed in the first data columns.

Following the #OptVar values are a number of performance metrics, which are dependent on the active mode of the Position Sizing Control 263. See the ChartScript Performance 76 topic for details on each of these terms.

You can sort by any column in the Tabulations by clicking on the column header. Click the column header a second time to reverse the sort order.

To display the chart with a specific set of #OptVar values, just double click on the row in the Tabulations.

**Note:** Due to the random nature of its process, it's normal to see duplicate sets of #OptVars for the same symbol after performing a Monte Carlo optimization.

**One #OptVar Graph** *Applies to:* Exhaustive optimization (only)

The One #OptVar Graph displays a graph of a single #OptVar. You first select the value that you want to graph in the **Value** drop down list. You can select Profit, Profit per Bar, Trades, Win/Loss, Profit Factor, Payoff Ratio, Recover Factor, or Risk-Reward-Ratio. Next, select which #OptVar you want to graph in the **First** drop down list.

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The graph presents the selected metric (Profit, etc) for each of the values of the #OptVar. You can modify the values of the other #OptVars by using the Change #OptVar Value 120 controls. Select the #OptVar that you want to change (a different one from the one being graphed) in the **#OptVar** drop down list. Then, change its value using the **Value** control. As you change a secondary #OptVar's value, you'll see the graph update to reflect the new combination of values.

An example will help clarify the above situation. Imagine that you've optimized a script containing 2 #OptVars, #OptVar1 and #OptVar2. #OptVar1 was the period of a moving average, and #OptVar2 was a profit target level. You can graph the Profit of #OptVar1 to see how effective the system was using different moving average periods. Next, you can cycle through the different values of #OptVar2 in the **Change #OptVar Value** control. This will let you see how changing the profit target levels in #OptVar2 affected the Profit ranges of the different moving average periods.

**Two #OptVar Graph** *Applies to:* Exhaustive optimization (only)

The two #OptVar Graph lets you visualize the results of two #OptVars simultaneously. Select the metric that you want to graph as was done in the One #OptVar Graph. Then, select two different #OptVars in the **First** and **Second** drop down lists.

The result is a three-dimensional surface showing the results of the first #OptVar mapped to the second #OptVar. You can rotate this 3D view by clicking and dragging with the mouse. This graph can help you easily visualize profitable ranges in your #OptVars.

If your optimization session consisted of more than 2 variables you can control the values of the additional variables by using the controls in the **Change #OptVar Value** section, as described above.

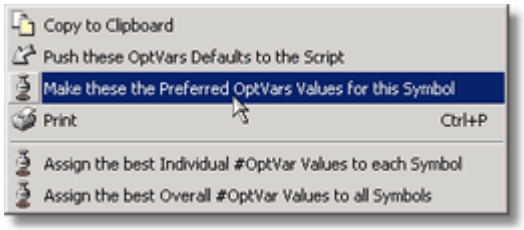
---

## 6.7 Preferred #OptVars

You can establish Preferred #OptVar values for a Symbol/ChartScript combination. Doing this will instruct Wealth-Lab Developer 4.0 to automatically load your preferred #OptVars when the symbol is run in the ChartScript Window 45, WatchList Scans 136, $imulator 155, or while performing ChartScript Rankings 177. You can control in which of these situations Preferred #OptVars are applied from the Options Dialog 244 on the Preferred Values 250 tab.

### Assigning Preferred #OptVars

To assign a set of Preferred #OptVars to a symbol, right click the row in the Results Explorer Tabulations 120 that contains the #OptVar values you desire. The pop-up menu in the image below appears:

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#### Push the OptVars Defaults to the Script

Modifies the ChartScript's OptVar Default values for the *OptVars checked/selected for Optimization* only.

#### Make these the Preferred #OptVars

Writes the #OptVar values of the selected Results Explorer record to the Preferred #OptVars for the Symbol/ChartScript combination. This option is not available when Portfolio $imulation Mode 117 selected in the Optimization Control.

#### Assign the best Individual/Overall #OptVar Values

Using these two actions, you can assign the best overall #OptVar values to all symbols in the list, or assign the best individual #OptVar values for each symbol automatically. In each case, the appropriate entry or entries are made on Preferred #OptVars tab 273 in the Preferred Values Manager 273. The "best" is based on the selected Optimization Metric for Monte Carlo optimizations, otherwise it is the set of variables corresponding to the best Profit. Assigning "best Individual" cannot be accomplished when Portfolio $imulation Mode 117 selected in the Optimization Control.

### Managing Preferred #OptVars

Although existing Preferred-#OptVar entries for a Symbol/ChartScript combination will be changed when making an updated assignment, you can manually manage the Preferred #OptVar values using the Preferred Values Manager 273.

## 6.8 Optimization FAQs

#### *Why doesn't my Porfolio Simulation Optimization match the $imulator's results?*

Using the exact same settings and parameters the results will be identical. For the comparison, the $imulator should be set to use 0 Lead Bars 158 and none of the other optional settings 158 should be enabled. Additionally, if you use Preferred Values 273, be sure that the $imulator is not checked in Tools|Options|Preferred Values 250. For more information, please consult the Wealth-Lab Knowledge Base article $imulator Processes and Compatibility with Selected Functions.

---

#### *Why does the Results Explorer show zero for every permutation of the Optimization?*

This often occurs because you have linked an #OptVar to Position Sizing, but the values do not make sense for the current sizing method. For example, assume you initially intended to link #OptVar3 to % of Equity Sizing, and you selected a range from 2 to 5 percent. Later, you change the sizing method to a Fixed Dollar size. Consequently, optimizations will now attempt to size positions from $2 to $5, which will likely result in no trades. In this case, you will want to completely uncouple an #OptVar3 from sizing by clicking it to select it and then unchecking the "$ Pos Size" box below "Step".

---

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***What's the difference between Passes and Runs in the Monte Carlo optimization control?***

*Passes* controls how many times the MC optimization will shrink the parameter windows and re-center them around the optimal values discovered. *Runs* controls how many random tests will be made within each *Pass* without shrinking or moving the windows.

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# 7 Real-Time ChartScript Windows

## 7.1 Real-Time ChartScripts Overview

Wealth-Lab Developer 4.0 has the ability to retrieve data from any real-time data provider that publishes an API (Application Program Interface) for this purpose. Interfaces for several real-time data providers are included in your installation and others may be added using Wealth-Lab Developer 4.0's extensive COM interfaces 27 via 3rd-party adapters. You can open Real-Time ChartScript Windows for any of your ChartScripts to monitor trading systems live and to route orders to Wealth-Lab's Order Manager 222.

Real-time ChartScript Window 126
ChartScripts that are applied to intraday trading systems are most often tested using static data. Employing them in actual trading requires that you have a reliable real-time DataSource integrated with Wealth-Lab Developer 4.0.

Features of Real-time ChartScripts 128
When you open a ChartScript Window after enabling streaming from a live feed provider, additional features become available such as scrollbar locking, the ghost bar, and the ability to route trading signals directly to the Order Manager 222.

Real-time Considerations 131
Keep in mind the considerations described in this section before applying a ChartScript, one which has been tested in a static "laboratory" context, to a real-time, high-risk, and dynamic environment.

Real-Time Vendors Supported 132
A number of real-time data vendors serving markets all over the world have been integrated for use with Wealth-Lab Developer 4.0.

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## 7.2 Real-time ChartScript Window

ChartScripts that are applied to intraday trading systems are most often tested using static data, but employing them in actual trading requires that you have a reliable real-time DataSource integrated with Wealth-Lab Developer 4.0. Unlike static DataSources, real-time DataSources continually update, adding bars to the chart at the close of each new interval.

Live or "streaming" feeds most often provide some amount of historical data to "seed" a ChartScript's trading system. Seeding refers to having a sufficient amount data available that will make your indicators valid. For example, if a trading signal involves a 10-period moving average crossing a 20-period average, you will need at least 20 *historical bars* for both indicators to valid. Seed data is also required if you intend to use PortfolioSynch to synchronizing actual trading positions with the chart.

### Enable Streaming

To open a Real-Time ChartScript Window, first *enable* streaming by clicking "Enable Streaming - [*Provider*]" from the **DataSources** menu. When enabled, a checkmark is displayed next to the selection. If your provider is not already configured, select it from the "Select Streaming Provider" menu item. After enabling streaming, open a ChartScript Window as you normally would, i.e., by opening an existing ChartScript

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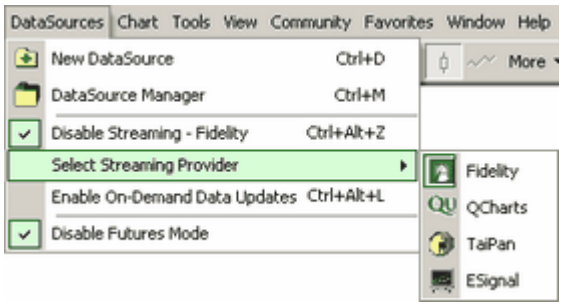
using the ChartScript Explorer, **Ctrl+O**, or by creating a new ChartScript, **Ctrl+N**.




***Streaming providers may vary depending on installed adapters***

Once a ChartScript Window has been enabled for streaming data, Wealth-Lab will route all data requests *for that ChartScript Window instance* to the real-time feed regardless of the DataSource/WatchList in which the symbol appears. You can work with a Static DataSource by first **DataSources | Disable Streaming** and then opening a different ChartScript Window.

**Data Loading**

The Data Loading Control's 33 interface adapts to the type of DataSource (Static or Real-time) that is active for the ChartScript window. As described in Real-time Data Loading Options 33, select the number of historical bars to seed the ChartScript. For the best real-time performance, you should select a minimum number of bars that will allow all of your indicators to be valid. Using additional historical bars is your choice, but in general, more bars will mean that a ChartScript operates in "less than" real-time. As real-time bars become available, they are appended to the end of the chart, one by one.

### Position Sizing

The manner in which you size your positions in real time is exactly the same when using static data. Please refer to the Position Sizing Control 263 topic for detailed information.

### Select the Symbol

Real-time ChartScript Windows will open with a blank chart. Enter a symbol in the Symbol Entry Panel 46 and click the **Go** button. This action will request the historical data from the streaming provider and populate the chart. As new streaming data arrives, the ChartScript Window will update with the latest *complete* bar data. Recall that when a ChartScript is opened after enabling a streaming feed 126, clicking any symbol in the DataSource tree, regardless of the DataSource in which it appears, will result in a request to the *real-time DataSource*.

### Removing Symbols

To delete a symbol from the real-time provider's *Recently-Used* list in the DataSource tree, first click the symbol to select it and wait for the real-time data request to complete. Right-click the symbol and select **Remove Symbol** from the pop up menu. The symbol below the one removed will automatically be selected for a new chart. If the symbol is last in the list, choose a new symbol to load. To enable the Recently-Used list, select **Show Recently-Used Symbols** from the Colors/Style 246 options group.

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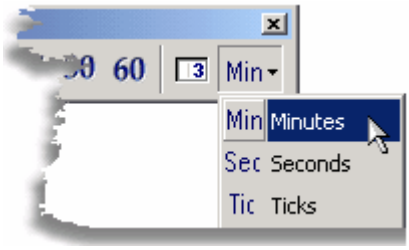
### Changing Real-Time Chart Properties

Wealth-Lab Developer 4.0 offers a gamut of possibilities for bar-data retrieval. You can choose bar intervals consisting of as little as a single tick to as large as one month. Additionally, you may select any multiple of minutes, seconds, or ticks for intraday bars.

The bar interval for a new real-time chart will be initialized to the last selected, or select an interval in the Scale Toolbar prior to entering a symbol. To change the Bar Interval after a chart is opened, click on one of the intraday interval buttons on the Scale toolbar. Use the "3" toolbar button to specify less common intervals (2, 3, 4, 6, 7, etc.) that are not available for selection in the toolbar. Specify the desired interval in the dialog's drop down list, or simply type a numeric interval.

***Use the Scale Toolbar to control your Real-time ChartScript's bar interval.***

Wealth-Lab Developer 4.0 has opened the door to a completely new dimension for intraday trading. For more *granular* intraday charts, choose between minutes, seconds, or ticks for the bar's make up. Instead of basing your trading system on time bars, you may prefer to react to price movements that occur every 15 trades, for example. In this case, you would choose a "Tic" chart with an interval of 15.




***Specify intraday charts consisting of minutes, seconds, or ticks.***

**Remarks:**

- Not every real-time data provider offers second and/or tick intervals.
- For real-time charts, changing the scale using the toolbar results in a new request for historical data from the real-time provider. (If your real-time provider uses cached data, new requests for the same symbol can be very quick.) Contrast this behavior with that of the Scale toolbar 50 for static DataSources.
- See the Feed to Order Manager 128 feature of Real-time ChartScripts for additional information on changing scale.

---

## 7.3 Features of Real-time ChartScripts

### Ghost Bar

For real-time providers that support this feature (most do), the **ghost bar** is the last bar at the far right edge of a real-time chart. As new data comes in the ghost bar updates dynamically giving you a visual indication of the open, high, low, close, and volume of the *incomplete bar* in formation. Trading system rules and indicators are *not* updated as the ghost bar value changes. Instead, indicators are updated, and the ChartScript is automatically executed only when a new bar has been completed.

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**Note:** The ghost bar is not displayed for non-intraday time frames (DWM) in eSignal or IQFeed.

### How Wealth-Lab Works with Real-time Data

When you open a real-time chart, the script is run until the last complete bar, whose Bar Number is given by *BarCount-1*. The ghost bar does not have a Bar Number and therefore its data is not accessible from a ChartScript. However, when the ghost bar finishes forming, the chart is updated, and the new complete bar becomes the last accessible bar in the chart having a Bar Number equal to *BarCount-1*. At this time, the Wealth-Lab engine automatically executes the ChartScript. Meanwhile, a new ghost bar starts forming.

Since the ghost bar provides only visual feedback of an incomplete bar, you should program your real-time scripts as if the ghost bar did not exist.

### Lock Scrollbar to Last Bar

When monitoring a real-time chart, Wealth-Lab won't let you miss seeing the most-recent update of a completed bar. With the scrollbar lock selected, which is the default upon opening a real-time ChartScript, anytime a newly-completed bar interval is received, the chart will automatically snap to the right-most bar. You can override this behavior by "unlocking" the scrollbar. This enables you to view past history of a tick chart, for example, without continuously being taken back to the most recent bar or tick.

### Feed to Order Manager

As with the Quote Manager 190, Real-Time Scans 201, and WatchList Scans 136, alerts generated by a real-time ChartScript may be routed directly to the Order Manager (OM) 222. All new real-time ChartScript windows are initialized with the "Feed to Order Manager" button disabled. Consequently, a decisive action is required on your part to enable this feature for each new window.

**Warning!** If you edit a real-time script while processing, for the changes to take effect you must perform one of the following actions: 1) Save, Close, and Reopen the ChartScript, or 2) click another symbol, or 3) type in a new symbol and press **GO**.

With the "Feed" button activated, new Alerts generated by the ChartScript will appear in the OM's queue. When the OM is operating in Auto-Pilot mode, these Alerts are immediately converted to orders, which are transmitted directly to the connected broker for execution. Note that the same order for a given ChartScript/Symbol/Scale combination will not be duplicated in the Order Manager - even if generated from a new instance of the same ChartScript. However, if changing the scale of the real-time ChartScript results in an Alert for the same symbol, this order *may appear to be duplicated* in the Order Manager if one previously existed.

**Warning!** The Order Manager does not currently support **AtClose** signals. *Do not* use a ChartScript containing an AtClose order (*BuyAtClose*, *ShortAtClose*, *SellAtClose*, or *CoverAtClose*) in combination with the Order Manager.

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Alerts generated *prior to selecting* the "Feed" option are not transmitted to the Order Manager. To enter these orders, if so desired, you may perform one of the following actions:

1. Assuming the interval has not passed, select "Feed" and manually Execute the ChartScript, *or*,
2. Simply right click the Alert field in the chart window, and select "Send Alerts to Order Manager" as shown below. (This option also applies to non-real-time ChartScript windows.)

***You can right-click on an Alert in the ChartScript window to send it to the Order Manager.***

If the intention is to continue trading with the "Feed" option selected, entering a position by creating a Manual Order Entry 234 in the Order Manager for a missed trade is not recommended. This is because the Portfolio Manager must contain the associated ChartScript and Scale information for the symbol to be able to exit the position via automated trading. You can, however, correct this condition by using the Portfolio Manager's Edit Position 217 feature.

### Multiple Alerts

Although it is possible to send more than one alert to the Order Manager, the Order Manager can process only one entry order per bar. The following logic applies when multiple Alerts are generated to *enter a position* from a real-time ChartScript:

- The OM will accept a logical combination of limit AND stop orders.
- If multiple limit orders are generated simultaneously, the OM picks the one closest to target. The same mechanization applies for stop orders.
- Market orders have the highest priority and override all other [simultaneously-generated] Alerts.
- AtClose orders are not supported by the Order Manager and therefore cannot be routed.

The Order Manager can *exit* multiple positions on the same bar, provided that each position was entered on a unique bar number. Therefore, you may loop through open positions to "dump" them, or you can use the #All constant to exit all open positions. See the Order Manager 222 for more details.

Finally, if not already selected for display, the Order Manager will automatically open with the first real-time update if Feed to OM is enabled.

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## 7.4 Real-time Considerations

Using ChartScripts with real-time data is simple, but it requires that you consider other time-dependent and equipment factors. As you have likely spent many hours testing your ChartScript in a static environment, we recommend that you also test the dynamics of your script and interaction of order execution in real-time prior to committing real money.

**Remarks**

- Windows® 2000/XP is recommended if opening numerous real-time ChartScript windows.
- When using multiple symbols in a script (e.g. pairs trading) it's crucial that each symbol receives an update within a few seconds of each other. Symbols that do not receive regular updates should not be used together in the same script.

**Summary of factors to consider for real-time ChartScripts:**

- Script complexity - including File Access, Cosmetic Chart, and Print operations.
- Number of historical bars loaded for processing. For real-time ChartScripts (and RT Scans) the number of bars increases with each new interval throughout the trading day.
- Near simultaneous updates required for multiple (external) symbols used by a script.
- Erratic (spiking) data.
- Computer hardware - processor, internal bus bandwidth, memory, etc.
- Connection bandwidth with real-time data provider.
- Other resident applications requiring real-time resources and memory.

**Connection Bandwidth**

The bandwidth, or speed of the connection with your ISP is likely to be one of the most limiting factors for the number of real-time charts that you are able to request. A heavily-traded stock at peak moments can easily require upwards of 25 Kbps of bandwidth. This means that when monitoring only two real-time charts you may be running near 100% of your bandwidth capacity with a 56 Kbps modem.

**Multiple Symbols**

If your ChartScript utilizes data from multiple symbols (other than the primary symbol only) in the same time frame, it's essential that their data is updated near simultaneously. In this case, it is wise to include synchronization code in your script. Rapid, near simultaneous updates are largely dependent on your real-time data provider and connection, which again is influenced by the number of real-time symbols requested.

**Data Spikes**

In real-time, ChartScripts are executed automatically over a symbol's data when a new bar interval is completed. OHLC values of the new bar, however, can include erratic data, typically caused by "bad prints". The result is known as data spikes, which can drastically affect (for better or worse) the outcome of a trade. Note that data spikes are observed more often in the high/low values of bars simply because more trades have the ability to influence them than the open or closing values.

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While vigilant data vendors often correct bad prints in their historical data, it's simply not done in real-time. Consequently, you must be aware of these phenomena when using automated trading in real-time and make appropriate changes to your scripts to account for them.

**Data Loading and Execution Time**

Wealth-Lab Developer 4.0 automatically executes ChartScripts when it detects the close of a new interval. All scripts require a finite amount of time to complete execution, and the length of time is roughly directly proportional to the amount of historical data (bars) that you request. Furthermore, if you have multiple ChartScripts open that operate on the same interval (or a multiple of the interval) then each ChartScript window will be contending simultaneously for a slice of the computer's processing time.

**Note:** The number of *historical* bars increases throughout the trading day. Each real-time symbol with a 1-minute interval, for example, will have approximately 390 additional bars to process at the end of a 6½-hour trading day than at the beginning.

Although most scripts with perhaps 1,000 bars take only tens of milliseconds to complete, for the sake of an example, a ChartScript operating on 100,000 bars could easily require several seconds to complete. Multiplying these several seconds by 10 or 20 ChartScript windows, one can easily verify that this degrades real-time capability.

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## 7.5 Real-Time Vendors Supported

### 7.5.1 Real-Time Vendors Summary

The following providers are natively supported by Wealth-Lab Developer 4.0 to deliver real-time for ChartScripts:

QCharts 132
ESignal 133
Tai-Pan Real-time 134
Medved QuoteTracker 134
Real-time COM Adapters 135

Real-time providers that are currently integrated by means of Wealth-Lab's Real-Time Adapter API include:

Interactive Brokers 135
Townsend Analytics (RealTick®) 134
DTN IQFeed 135

More are on the way!

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### 7.5.2 QCharts

QCharts is a real-time charting package from Quote.com. The QCharts feed can power Real-Time ChartScript Windows 126 and the Quote Manager 190. To use Quote.com with Wealth-Lab Developer 4.0, you need a QCharts Basic or QCharts Intermediate subscription from Quote.com (Terra Lycos).

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QCharts users have a special option to **Show Special Vendor Symbol Lists** when using Real-time charts. See Colors/Style Options 246 for details.

### Support Library

QCharts subscribers can use the QCharts live feed in Wealth-Lab Developer 4.0 by installing the Quote.com Continuum Client support libraries.

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## 7.5.3 eSignal

eSignal provides a real-time stock and futures market feed and a quote and charting package. You can use the eSignal feed to run Real-Time Charts 126 and power the Quote Manager 190.

**Note:** Daily, Weekly, and Monthly charts fed by eSignal will not update in real time. The ghost bar is displayed for *intraday charts only*.

### Support Library

Using the eSignal feed requires the installation of a special support library. See the eSignal Support page on the Wealth-Lab.com web site for details. If you receive the message "Class not registered" when attempting to use eSignal for data, you must properly install the support library.

### Tick Days

You can request up to 10 market days (max) of historical tick data from eSignal. Edit the **WinRos.ini** file, which should reside in your Windows or WINNT directory, and add the key *TickDataDays=N* to the [winros] section, where *N* equals the number of calendar days of historical tick data to download.

```
[winros]
TickDataDays=14
ReceiverTimeOffset=300
InternetConnection=1
InternetAddress=CM*.esignal.Com
  :
  :
```

**Notes:**

- Restart Wealth-Lab after making changes to the winros.ini file
- To accommodate the number of bars returned from Tick requests, be sure to increase the "Number of Bars to Load" in the Data Loading Control 33.
- Regardless of the "Number of Bars to Load", Wealth-Lab will always request the complete history of tick data for the period of days specified, possibly resulting in an excessive load on the ESignal Data Manager. Set the number of TickDataDays prudently.

### Problems with Real-time Feed

We have had reports from some users of problems receiving real-time data from eSignal, especially when using multiple instances (windows) of the eSignal charting application. If you have trouble obtaining real-time data from eSignal in Wealth-Lab Developer 4.0, try using no more than one eSignal application window.

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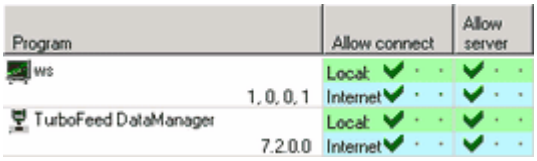
**Note (ZoneAlarm Users):**

Two server programs, ws (winsig.exe) and TurboFeedDataManager (winros.exe) require internet access for ESignal to properly function. You must configure ZoneAlarm for the latter to "Allow server", and, some installations may require that the ws program additionally be configured to Allow server.

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### 7.5.4 Tai-Pan Real-Time

Tai-Pan Real-Time is a real-time data service and charting package offered by Lenz & Partner, based in Germany, who offers coverage of European and Asian markets as well as US and Canadian. You must have the Tai-Pan Real-Time software installed in order to use Tai-Pan. Tai-Pan can be used to power Real-Time ChartScript Windows 126 and the Quote Manager 190. Tai-Pan users have a special option to **Show Special Vendor Symbol Lists** when using Real-time charts. See Colors/Style Options 246 for details.

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### 7.5.5 Medved QuoteTracker

Medved QuoteTracker is a utility program that can access live quotes from a variety of web-based sources. Wealth-Lab Developer 4.0 can use QuoteTracker as a real-time data source for Real-Time Charts and/or quotes. See the Medved QuoteTracker Support page on the Wealth-Lab.com site for the most current information and version of the QuoteTracker streaming data adapter for Wealth-Lab.

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### 7.5.6 Townsend Analytics

Wealth-Lab Developer 4.0 can interface to the real-time data feed provided by Townsend Analytics, makers of the REALTICK®. The interface is made possible through a COM Real-time Adapter, which is available in the Data Vendor Support Libraries section on the Wealth-Lab Downloads page. The adapter supports both the Real-time ChartScript 126 and Quote Manager 190 interfaces, and, tick-based charting is now supported. You can use the adapter for creating and maintaining Intraday Historical DataSources 26. Please refer to the Adapter's User Guide for details.

You must be permissioned to receive data from TA_SRV® (a RealTick account) and have the TAL Toolkit ActiveX library (TALConvX) installed, which is found at the TAL Developer's Corner. After logging in, download and install **Runtime.exe** to your RealTick installation directory. Installing the ActiveX library will not affect your RealTick installation.

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### 7.5.7 Interactive Brokers

A Real-time Adapter, offered by Finantic is powered by real-time quote data from Interactive Brokers. *IBData* consists of two parts. The first is an ActiveX server program that connects to IB TWS. It constructs intraday bars from the quote data received by TWS. The second part is a DLL which is loaded by the Wealth-Lab Developer 4.0 Program. The DLL connects to the server program whenever Wealth-Lab requests intraday chart data.

For more information on features and pricing, visit the Finantic site.

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### 7.5.8 DTN IQFeed

IQFeed provides Real-Time, Tick-by-Tick Data on NYSE, NASDAQ, AMEX, Canadian Stock Exchanges and Futures Exchanges. Download the IQ Feed Real-time Adapter from the support page in the following link: http://www.wealth-lab.com/cgi-bin/WealthLab.DLL/getpage?page=IQFeed.htm.

The IQFeed adapter supports both the Real-time ChartScript 126 and Quote Manager 190 interfaces.

---

### 7.5.9 Real-Time Data Adapters

Wealth-Lab Developer 4.0 exposes interfaces for use by third-party software developers to build data adapters for real-time data feeds. Adapters are COM DLLs (Dynamic Link Libraries), which can be programmed in any development tool capable of creating COM DLLs, such as Delphi, Microsoft Visual Basic, C++ Builder, and Visual C++.

The information necessary to create a Real-Time Data Adapter can be found on Wealth-Lab's API Documentation page on the Wealth-Lab web site, or by clicking the following link:

Real-Time DataSource Adapter API

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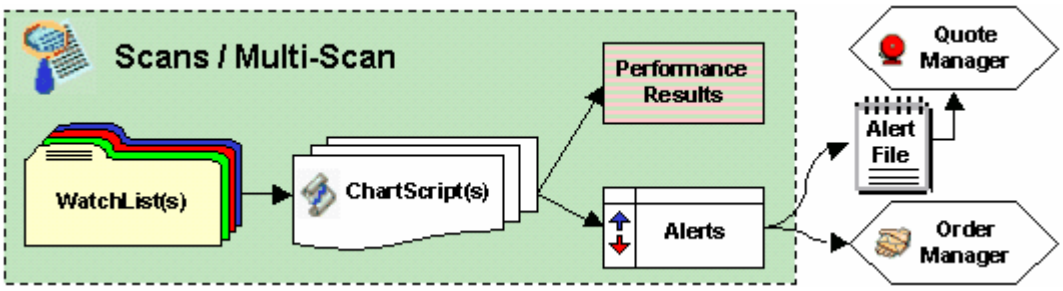
# 8 Scans

## 8.1 WatchList Scans Overview

The WatchList Scans tool runs end-of-day scans to generate trading system signals, and also provides a detailed report of trading system performance against a group of symbols. Wealth-Lab Developer 4.0 incorporates the power of *Multi-Scan* to give you the ability to run batch-scanning jobs over any combination of ChartScripts and WatchLists. The following diagram summarizes the Scans processes.




***WatchList Scans (end-of-day) concept diagram***

In essence, a scan applies a ChartScript to each symbol in one or more WatchLists with the main purpose of alerting you to place orders for the next market session. To monitor a list of issues and to be alerted in real time for trading system signals, see the Real-Time Scans 201 tool.

Scans Control 136
The Scan Control interface occupies the upper left area of the WatchList Scan Window. It is used to choose the ChartScript to be applied in the Scan, position sizing and data loading options, as well as the data scale.

Multi-Scan 138
For those that use multiple trading methodologies, step up to Multi-Scan to create a batch scanning process that will perform Scans for all selected ChartScript/WatchList combinations with a single click.

List Management 140
Single Scan or Multi-Scan, results are presented in the following tabular list views.

Alerts View 141
Performance View 143
Open Positions View 144
Custom Columns View 145
Errors View 146

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## 8.2 Scans Control

By clicking **Scans** in the main icon bar or alternatively **Tools|WatchList Scans (F2)** from the main menu, you can create multiple instances of the Scans tool. This can be useful to analyze results of a previous Scan while performing another. The *Scan Control* interface occupies the upper left area of the Scans window. It contains

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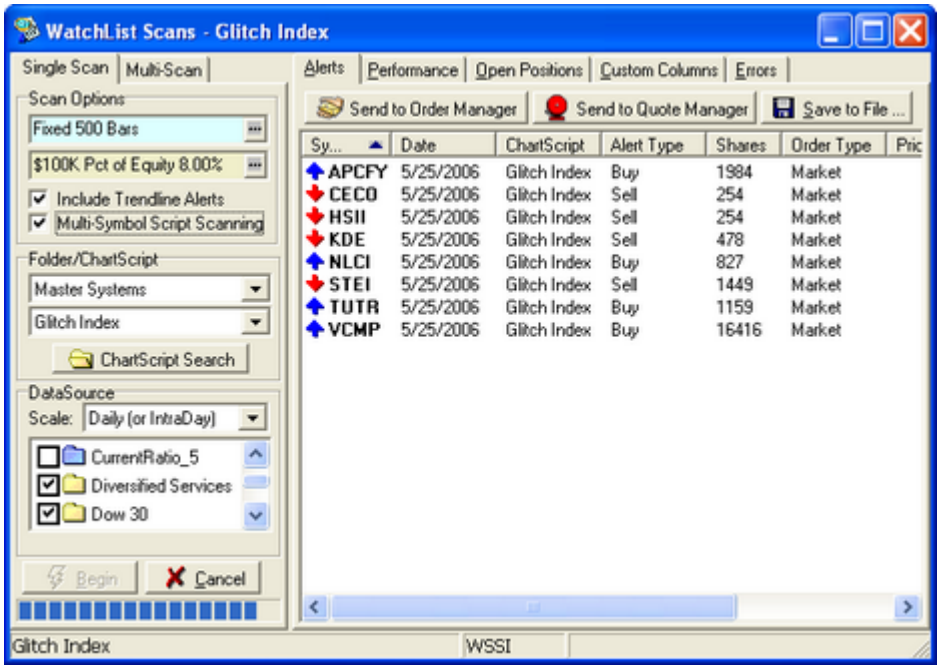
the **Begin** button that starts a Scan. You can cancel a Scan in progress by clicking the **Cancel** button.




***WatchList Scans main window with Alerts***

## Controlling Single Scans

### Scan Options

The by-now familiar light-blue Data Loading control[33] and the Position Sizing control[263] give you the ability to work with precisely the amount of data you wish and to do so using the sizing options for Raw Profit or Portfolio Simulation. Take into account, however, that Scans do not have the ability to perform a *complete* portfolio simulation. Instead, the money management options are used on a by-symbol basis and are reset for the next symbol in the Scan. If you require a true portfolio simulation, consider using the $imulator[155] and the features of its Alerts View[173]. See the FAQs[147] for more information.

When choosing your data loading options, note that the fewer bars that you use, the faster the scan can process. Be careful that you use enough bars to satisfy the indicators you're using. Many indicators, such as RSI and EMA, are calculated using their previous values. These indicators can require at least 100 bars of data to "stabilize" and produce consistent results.

**Tip:** A Scan using 1 year of data for a typical script will process on the order of 10 - 20 symbols per second. If it seems that a Scan is taking an excessive amount of time, it's possible that *On-Demand Data Updates* is enabled in the DataSources menu. Try updating your DataSources first in the DataSource Manager (Ctrl+M) and then run the Scan after disabling On-Demand Updates.

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**Include Trendline Alerts**

Tradable Trendlines 73 ( TTs) drawn in a chart window can be used to trigger Alerts in WatchList Scans by enabling this option. TTs may be drawn in either static or streaming mode and are valid in Scans for the same symbol and scale.

**Multi-Symbol Script Scanning**

Since Scans inherently loops through all the symbols in a WatchList(s), Wealth-Lab's default behavior is to interrupt the Scan process when a ChartScript executes trades on multiple symbols. Check this option to alter the default behavior and complete the entire Scan.

**Folder/ChartScript** *Does not apply to* Multi-Scan 138

The two drop down controls allow you to quickly locate a ChartScript from a specific folder. Use these to identify a single ChartScript with which to scan WatchList(s). You can also use the ChartScript Explorer 42 to locate the ChartScript by pressing the **ChartScript Search** button. To configure a batch-scanning job for multiple ChartScripts and WatchList combinations, refer to the Multi-Scan 138 topic.

**DataSource** *Does not apply to* Multi-Scan 138

The **Scale** control lets you choose between Daily (or Intraday), Weekly, or Monthly data when performing the Scan. For the purposes of the Scan, Wealth-Lab can convert a DataSource's data stored in a lower timeframe, such as intraday or daily, to a higher timeframe, weekly or monthly. The manner in which this functions is similar in nature to that of the Scale toolbar for the ChartScript window. A more complete discussion can be found in the Scale toolbar 50 topic.

**Note:** Scans that use intraday DataSources can process only in the base time frame of intraday DataSource(s).

**WatchList Selection** *Does not apply to* Multi-Scan 138

A list of all your DataSources and WatchLists is found in the lower left corner of the Scans window. Select one or more items to be included in the Scan by checking the boxes to the left of the item names.

### Multi-Scan Tab

Multi-Scan gives you the ability to run a batch scanning process for multiple ChartScript/WatchList(s) combinations. Learn how to create these combinations in the Multi-Scan 138 help topic.

---

## 8.3 Multi-Scan

For those that use multiple trading methodologies, you can use Multi-Scan to create a batch scanning process that will perform Scans for all selected ChartScript/WatchList/Scale combinations with a single click.

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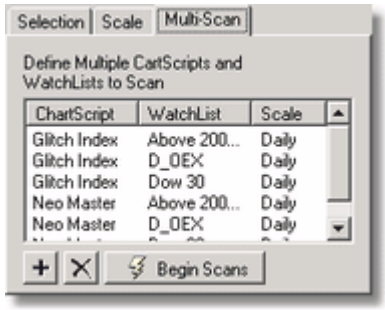
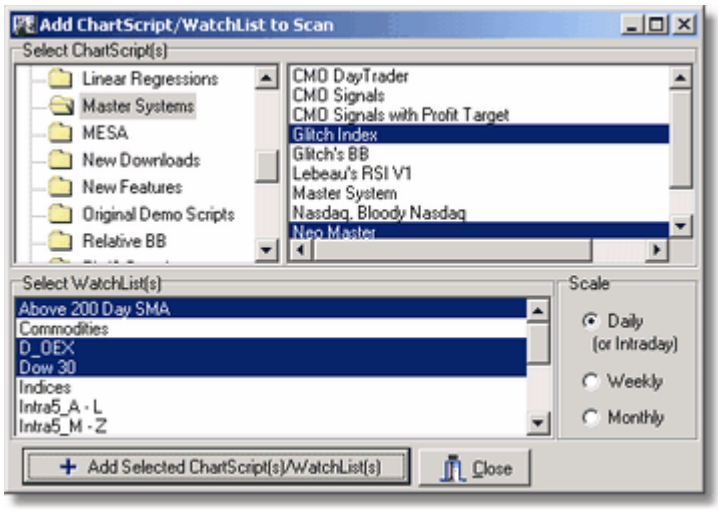



***Multi-Scan control with selections.***

Although Multi-Scan uses the data loading and position sizing option that are set on the Selection tab of the Scans Control 136, it has own configuration dialog that appears by clicking the + Add button. Using this dialog you can set as many ChartScript/WatchList/Scale combinations as you wish.




***Multi-Scan Add/Configuration dialog.***

Using the Shift and Ctrl key in combination with the mouse, you can make multiple selections from both lists. Clicking in a list without holding one of these keys will clear the previously-highlighted item(s) in the list. Each ChartScript selected will be paired with each WatchList highlighted in the list below. Choose Weekly or Monthly if you want to convert Daily or Intraday to these more compressed time frames for the Scan. When ready, click the **+Add Selected ChartScript(s)/WatchList(s)** button and verify the selections by observing the list in the Multi-Scan control tab. You can continue the add process by selecting ChartScripts from alternate folders as well.

Once configured, Wealth-Lab will remember the Multi-Scan configuration when the main Scans window is closed. In this way, you'll be ready to run the same Multi-Scan day after day without having to reselect the ChartScripts/WatchLists combinations. You can make changes to the list by using the + Add button as just described or with the Delete button in a typical manner.

### Begin Scans (Cancel)

Prior to initiating a Multi-Scan, be sure to select your data loading and position sizing options on the Selection tab. After beginning, you may cancel the Multi-Scan by reselecting this button.

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**Note on Portfolio Simulation**

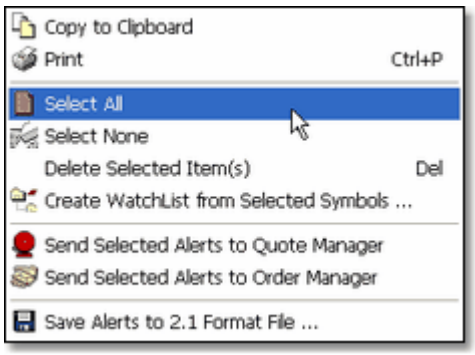
Scans do not have the ability to perform a *complete* portfolio simulation. Instead, the money management options are used on a *by-symbol basis* and are reset for the next symbol in the scan. If you require a true portfolio simulation, consider using the $imulator 155 and the features of its Alerts View 173.

## 8.4 List Management

The WatchList Scan results populate four different result list views, which are described in subsequent topics. You can sort these views by clicking on any column header. You can also open a ChartScript Window by double clicking on an item in one of the views.

Each of the views contains a column entitled *ChartScript*. Note that even for Scans that use a single ChartScript, it is possible for various ChartScript names to appear in this column if you have enabled Preferred ChartScripts to be used in WatchList Scans on the Preferred Values Options 250.

From any of the list views you can select multiple items for future actions by using the Shift and Ctrl keys on your keyboard in combination with the mouse in the familiar Windows manner. Right clicking in the list area brings up the pop up menu in the image below.




***Scans context menu***

### Copy to Clipboard

In Wealth-Lab, you're always just two clicks away from copying tabular data to the Windows clipboard for export to another program.

### Print

Launches a Print Preview window in which you can observe your results in a WYSIWYG format prior to printing. The entire list will be printed, not just selected items.

### Select All

Selects every item in the list to prepare for future actions, such as Copy, Delete, or Create WatchList.

### Select None

Deselects any item that has been selected.

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### Delete Selected Item(s)

You can ignore Alerts or clean up a long list for output by deleting items that you have identified for deletion in the lists.

### Create WatchList from Selected Symbols...

Instantly create a WatchList of the symbols contained in the selected rows. Clicking this option brings up a dialog in which you must type a unique name for a new WatchList.

### Send Selected Alerts to Quote Manager
### Send Selected Alerts to Order Manager

These actions allow for refined selection of Alerts to send to the Quote and/or Order Managers. Use the Shift and/or Ctrl keys in combination with left mouse clicks to choose the Alerts. Continue holding Shift or Ctrl when right-clicking for the context menu so that the selections are not cleared, or, be sure to right-click on any *selected Alert*. See Alert View Actions 141 for more information.

### Save Alerts to 2.1 File Format...

In Wealth-Lab Developer 4.0, Alerts are saved in a new, expanded, and unfortunately unintelligible-to-a-human format. If you utilize 3rd-party tools that require the old V2.1 text format, select this option to save your Alerts.

**Note:** Although the 2.1 File Format is compatible with Wealth-Lab Developer 4.0's Quote Manager 190, it does not support all data fields required for full integration with the Order Manager 222.

---

## 8.5 Alerts View

The Alerts List displays any trading system alerts that were generated by the ChartScript for any of the symbols in the selected WatchList(s). These are orders that need to be placed today for execution on the following trading day.

### How ChartScripts Trigger Alerts during a Scan

ChartScripts signal trading system Alerts when a buy, sell, short, or cover order is executed for the bar **after** the last bar of the chart. Note that the *Bar Number* of the last bar in a chart is always given by **`BarCount - 1`**. For example, the code below will always generate an Alert if run in the WatchList Scan tool:

```
var Bar: integer = BarCount - 1;
BuyAtMarket( Bar + 1, 'Next day' );
```

Since the bars of the chart are accessed from zero to **`BarCount`** - 1, issuing a buy signal at **`BarCount`** is really creating an alert for action on the following day. This is the most typical and basic architecture of a ChartScript. The main loop should begin on a bar early in the chart when all indicators are considered valid and stabilized, i.e., "seeded". The loop should end on the last available bar in the chart, and, most system requirements would require that a trading signal (Buy, Sell, Cover, or Short) be issued on the next future bar. If you don't program trading signals for a future bar, not only do you risk that your back-testing is compromised by using future data, i.e. "peeking", Alerts will not be triggered.

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## Alert View Actions

See List Management 140 for additional control via the right-click popup menu.

### Send To Order Manager

Following a Scan or Multi-Scan process that generates Alerts, the button **Send to Order Manager** will be enabled. Clicking it will route all orders in the list to the Order Manager's queue. You can use this feature to electronically place the trades with a supported broker. As described in the List Management 140 topic, you have the option to delete any of the Alert items prior to submitting them to the Order Manager.

### Send to Quote Manager

Following a Scan or Multi-Scan process that generates Alerts, the **Send to Quote Manager** button will be enabled. Clicking it will route all orders in the list to a new Quote Manager 190 window to monitor prices in real-time and order entry.

### Save [Alerts] to File...

The **Save to File** button opens a common dialog that gives you the opportunity to save the scan alerts to a text file. You can then load these alerts into the Quote Manager 190 tool for real-time price monitoring and order entry.

## Alerts View Fields

If a trading system generates an alert(s) for trading actions to be performed on the following trading day, the following fields will be shown.

**Symbol**
The Symbol for which an Alert has been generated. Since **WatchList Scans** is an end-of-day tool, Alerts generated "today" are to be placed prior to the market's open "tomorrow".

**Date [of Alert]**
This field reflects the *date of the bar* on which an Alert has been triggered. Generally, this is the date of the most recent market close, but may be different for some symbols if they were not traded or updated to reflect the market's last session.

**Note:** When using the Scale feature 136, weekly and monthly data are date stamped using the date of the first [daily] bar of the period. For example, a Weekly bar that includes Friday's daily bar from 2004/01/30 will be date stamped as 2004/01/26 (Monday) after scaling from Daily to Weekly. Therefore, this is the date that will be shown in the Scans tool's Alerts view 141.

**ChartScript**
The ChartScript is typically the one you have chosen for the Scan. However, a ChartScript other than the one selected may appear based on Preferred ChartScript 273 entries.

**Order**, **Shares**, **Type**, **Price**
The order type, number of shares or contracts, and limit or stop price. The Price field will be empty for Market orders.

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**Signal Name**
The string passed to the *SignalName* parameter in your trading signal (BuyAt, ShortAt, SellAt, CoverAt).

---

## 8.6 Performance View

The Performance view displays performance statistics for the trading system for each of the symbols in the selected WatchList(s). You can use this view to get an idea of how a trading system performs individually against a large group of symbols. Double-clicking an item will open a ChartScript window for the chosen symbol.

**Background color**

If an issue has generated the profit over the Scan period, then its background is green. Likewise, if a Position is "in the red", then its background color is also red. Recall that the number of bars, or date period, used to execute the trading system is controlled by the data loading control on the Selection tab.

---

### WatchList Scans Performance View Fields

**Date**
Date of the final bar loaded for the Scan symbol.

**ChartScript**
The ChartScript used for the symbol during the WatchList Scan. With the Preferred Values Manager 273, you can assigned ChartScripts to specific symbols to be used in Scans and $imulations.

**Profit**
The total profit generated by the trading system over the Scans period. Net Profit of a trade is equal to raw trading profit minus commissions and slippage, if enabled.

**BH Profit**
See how Wealth-Lab handles Buy & Hold positions by jumping to the $imulator's Equity Curve View 169 topic.

**Profit Per Bar** *Applies to:* Raw Profit mode
The total net profit of the trading system divided by the total number of bars of exposure.

**BH Profit per Bar** *Applies to:* Raw Profit mode
The total net profit of the Buy & Hold strategy divided by the total number of bars loaded for the Scan minus one. (A Buy & Hold position is entered on the second bar.)

**APR %** *Applies to:* Portfolio Simulation mode
The Net Profit percentage of the trading system divided by the number of annual periods included in the Scan.

**BH APR %** *Applies to:* Portfolio Simulation mode
The Net Profit percentage of the Buy & Hold strategy divided by the number of annual periods included in the Scan.

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**Trades**
The number of round-trip trades plus open trades for the symbol.

**Winning %**
A trade is marked a winner if its return after costs is greater than zero.

**Avg Bars Held**
The average of the number bars each trade was held for the symbol.

---

## 8.7 Open Positions View

The Open Positions view displays the currently open trading system Positions held by the ChartScript for the symbols in the selected WatchList(s). It also displays the total open Position size and profit, as well as any current stop loss or profit target levels for each Position. If an Open Position is "in the money", then its background is green. Likewise, if a Position is "in the red", then its background color is also red. Use this information if you wish to start trading a system retroactively.

As in the Performance view, you may double click on an open position line item to view it in a ChartScript window. So that the ChartScript window results match those of the Scans tool, be sure that the Data Loading and Position Sizing controls are configured identically between tools.

---

### Open Positions Summary

A summary of the following statistics are displayed in the frame above the list of open positions:

**Total Open Positions**
The number of open positions appearing in the list below.

**Open Position Size**
The current (end-of-day) cash size total of all open positions combined.

**Open Position Profit**
Consolidated total profit (or loss) from all open positions.

**Open Position Profit %**
The current percentage gain of all open positions in the Scan, based on the starting position size.

---

### Open Position List Fields

**Symbol**
The symbol of the security for which an open position exists. Open Positions are positions generated by the ChartScript sometime in the past and up to and including the current day of the Scan.

**Date**
Generally, this is the date of the most recent market close, but may be different for some symbols if they were not traded or updated to reflect the market's last session.

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**ChartScript**
The ChartScript is typically the one you have chosen for the Scan. However, a ChartScript other than the one selected may appear based on Preferred ChartScript 273 entries.

**Position, Shares**
The "polarity" of the open position, Long or Short, and the number of shares or contracts held.

**Entry Date, Entry Price**
The date (and time, if applicable) of the bar on which the position was taken. The entry price includes slippage 257, if activated. Note that if the ChartScript includes PortfolioSynch, the entry price is the actual price of entry per the Portfolio specified in the function.

**Current Price**
The most recent closing price for the symbol.

**Profit, Profit%**
The current total net profit minus trading costs for the open position on a closing basis. Profit % is based on the entry position size.

**Stop, Target**
Stop losses and Profit targets employed by the ChartScript are displayed in their respective field. If the ChartScript does not use stops or profit targets, then the corresponding field will be blank.

**Tip:** To plot stop losses and profit targets on the Chart, simply place the PlotStops function in the code.

**Bars Held**
The total number of bars for which the position has been open, starting with the position entry bar.

## 8.8 Custom Columns View

You can create your own columns and display custom values for each symbol in this view. Creating a custom column is done in the ChartScript code itself using the AddScanColumn or AddScanColumnStr functions. The example code below adds two new Scan Columns that display the most recent indicator values for each symbol. The information in the additional columns may be used for sorting purposes, for example.

**Remove Non-Alert Symbols**

Like in the Performance view, a line item appears for each symbol included in the end-of-day Scan. To quickly filter out symbols that did not generate an Alert, click this action button.

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**Example**

```
var Bar: integer;
var x: float;
Bar := BarCount - 1;
x := CMO( Bar, #Close, 14 );
AddScanColumn( 'CMO(14)', x );
x := RSI( Bar, #Close, 14 );
AddScanColumn( 'RSI(14)', x );

{ Tip: To see more decimal precision, use FormatFloat and
AddScanColumnStr }
AddScanColumnStr( 'RSI(14)+', FormatFloat( '0.0000', x ) );
```

## 8.9 Errors View

The Scan Errors View will display any errors encountered during a Scan. See the $imulator Errors View 174 topic for additional information.

## 8.10 Applying Scans in Trading

As discussed in Controlling Scans 136, performing a Scan is not the same as a $imulation. With Scans, each symbol is run independently of all others, just as if each were in its own ChartScript Window. Consequently, for each symbol, the entire Portfolio equity is available when sizing each Position. Contrast that to a Portfolio Simulation in the $imulator 155, where all symbols draw from using the same pool of money. So, unless you condition Scans for real trading, it's possible (and quite likely) that you end up with much more invested in open positions 144 than you have equity.

Consequently, if your goal is to use Scans for real trading, you'll need to do a few things to make the process realistic:

1. Modify your script to use PortfolioSynch.
2. Maintain your Portfolio with the Portfolio Manager 212 so that PortfolioSynch can synchronize your actual positions.
3. Prior to initiating the Scan, update the Starting Equity to the approximate account equity at the date on which you start the Scan period. This is not required for fixed-sizing methods, but only for Portfolio Simulation sizing methods that rely on equity.

What does all this do? First, if you have no open Positions in your Portfolio, scanning a ChartScript that employs PortfolioSynch will also show that you have zero Positions. The Scan will output all possible Alerts 141 for order entry on the next day. As you start opening Positions (and entering them in the Portfolio Manager), they will be synchronized with the Scan to show *actual open Positions* and not just the results of theoretical trades created by the ChartScript. Since your account is limited by equity in real life, you won't be able to enter trades that exceed your account's buying power.

The result is a Scan process that sizes Positions in the same manner as in a $imulator Portfolio Simulation, but with the additional ability to synchronize the Positions with a real Portfolio.

**Trading with Position Priority**

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See WatchList Scans FAQs[147]: *"If I use SetPositionPriority in my $imulations, how is it possible to use the same priority in real trading with EOD Scans?"*

---

## 8.11 WatchList Scans FAQs

***After double clicking an item in the Scans Performance view, a ChartScript Window opens with the same ChartScript but the results don't match. Why is that?***

Wealth-Lab maintains the last-used settings in each tool, consequently, you must ensure that Scans and the ChartScript Window are using the same settings for the Position Sizing[263] and Data Loading[33] controls.

---

***Why do I see Alerts and Open Positions for the same symbol on the same day?***

The difference is that one is the date of an Alert in the Alerts View[141], and the other is the Entry Date on which the trading system entered a position in the Open Positions View[144]. You can enter a position on 'Tuesday' and then get an Alert for the same symbol after Tuesday's market closing.

For example, assume that you run a Scan after the market close on Monday, 2003/22/09 that alerts you to place a *buy* at market order for 'ABCD'. After the market close on Tuesday, 2003/23/09, you update your DataSources and a Scan now shows that you have a Long open position for 'ABCD' with an Entry Date of Tuesday, 2003/23/09. It's quite possible that you may also see an Alert on Tuesday, 2003/23/09 to *sell* 'ABCD'. This order is to be placed in the market on Wednesday, 2003/24/09.

---

***I selected Portfolio Simulation mode in the Position Sizing control, but SetPositionPriority didn't filter my Alerts like I expected. Why?***

As described in Scans Control[136], the Scans tool does not have a true Portfolio Simulation mode. Rather, you have the ability to use Portfolio Simulation mode *position sizing* options. Also, since you cannot determine which trades will be executed until the following day, neither equity nor SetPositionPriority have effect on alert generation. You can however, sort and therefore prioritize the Alert list by passing the value used in SetPositionPriority as a string to the entry's *SignalName*.

---

***Why do I see different Alerts in Scans and the $imulator?***

Aside from the fact that **Scans** does not duplicate the $imulator's Porfolio $imulation mode, ChartScripts that use the PortfolioSynch function are processed differently in either tool. **Scans** will load a symbol's Trade History based on **PortfolioSynch**, whereas the $imulator ignores this function.

---

***If I use SetPositionPriority in my $imulations, how is it possible to use the same priority in real trading with EOD Scans?"***

Pass the value that you would add for SetPositionPriority to AddScanColumn or

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AddScanColumnStr for the final bar only, at the end of the script. For an example, see the ChartScript *Smitlener Streaks*. Following the Scan, go to the "Custom Columns" tab, click Remove Non-Alert Symbols, and sort on your scan column to trade the highest priority Alerts. Note that as in *Smitlener Streaks*, it's not necessary to negate the value of the RSI in AddScanColumn. When you sort the column, you'd simply pick the lowest value for the highest priority signal.

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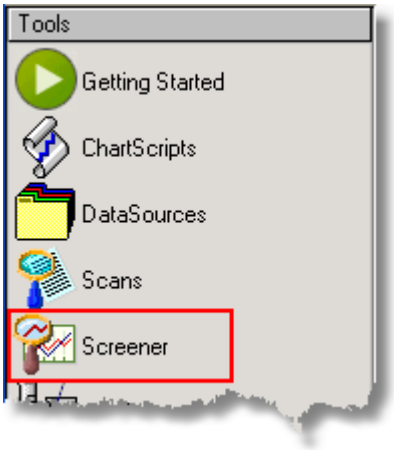
# 9 Screener

## 9.1 Screener Overview

Most tools in Wealth-Lab Developer 4.0 are built around the ChartScript, but with the Stock Screener tool *absolutely no programming is required*. The Stock Screener provides the ability to create a screen, scan a stock universe based on a set of conditions or filters, and then send the results (alerts) to the Order Manager for review/execution or save the results to a WatchList for further study. Screens can be saved, backed up, and restored if necessary. In a sense, the Screener is a combined "ChartScript Wizard-and-Scans" tool.

Although Screens are not complete trading systems, they can be converted into ChartScripts, which can be revised using the ChartScript Editor 81 for more sophisticated back-testing.




***Launch the Stock Screener from the main Icon toolbar, from the Tools menu, or by using the Ctrl+Alt+S shortcut.***

Creating and Editing Screens 149
Using the same database of conditions as the New ChartScript Wizard 91, the Screener's non-programming, drag-and-drop interface makes creating technical Screens a snap.

Running a Screen 152
Once the Screen's conditions are set, you need only to select the target WatchList(s) to run the Screen. You'll want to double check the trade type and position sizing though for sending Screen Alerts to the Order Manager for order entry.

Screener Results 153
Create WatchLists from the filtered list of symbols or send them directly to the Order Manager, ready for order entry. Note that the terms "Screen Results" and "Screen Alerts" may be used interchangeably.

---

## 9.2 Creating and Editing Screens

### Launching the Screener

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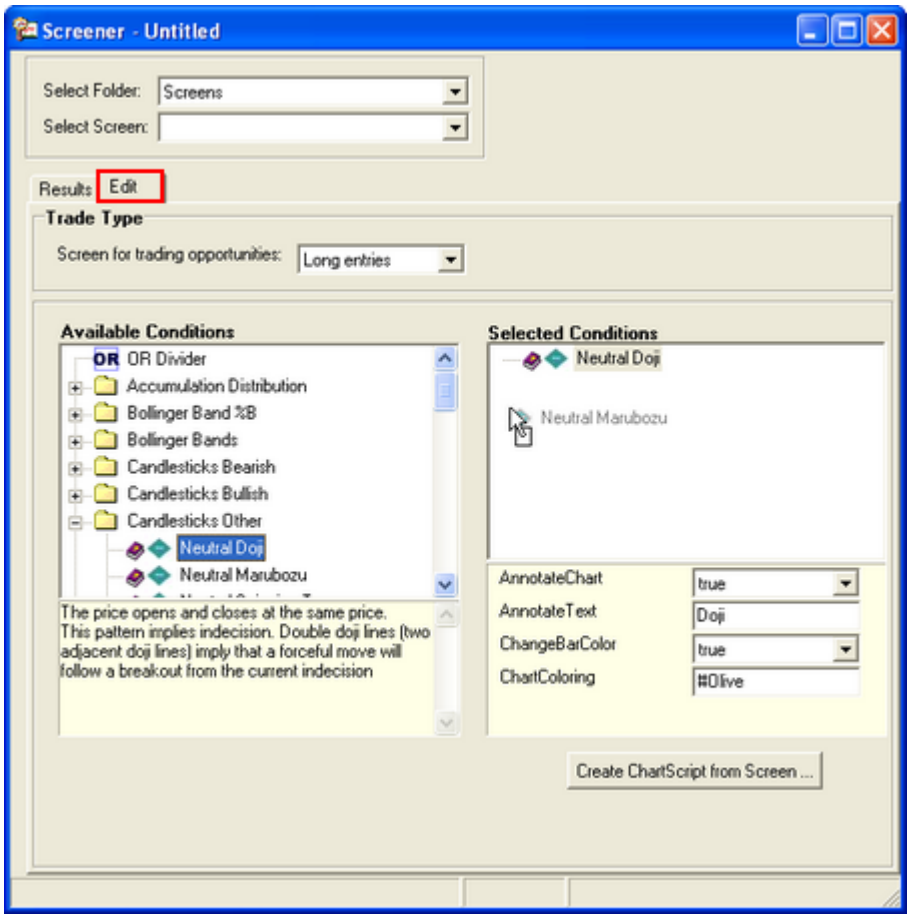
Launch the Screener by any of the following methods:

- Click Screener in the main Icon bar,
- Select Tools | Screener in from the main menu.
- Use the Keyboard Shortcut **Ctrl+Alt+S**

Allow a few seconds for the Screener to connect to the Rules database and locate saved Screens. When the Screener appears, you'll be starting with a fresh workspace in which you can select a saved Screen or start creating a new one. Note that you can have more than one Screener open simultaneously.

## Creating a Screen

After launching the Screener, click the **Edit** view. When the *Select Screen* drop down box is blank, it indicates that you are working with a new Screen, a clean slate.




***Stock Screener, Edit View of a new Screen.***

### Trade Type

Identify the type of trading opportunity for which the screen is destined by selecting either *Long entries* or *Short entries*. Wealth-Lab uses this information for the order type (Buy or Short) when sending Screener Results 153 to the Order Manager as well as when creating a ChartScript from the Screen. All orders are entered as market orders, which can be edited while in the Order Manager's queue (Auto-Pilot must be disabled).

### Selecting Conditions

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The Screener uses the same, familiar drag-and-drop interface as the New ChartScript Wizard 91. Simply drag or double click the desired conditions to add them to the Screen. All conditions are logically ANDed unless you separate them with the OR Divider. To remove a condition, drag it back to the left pane, or highlight it and strike the Delete key on the keyboard.

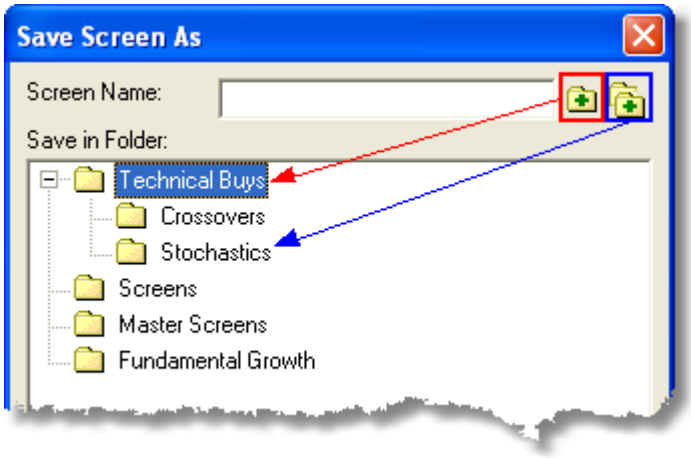
## Saving a Screen

After choosing the conditions and modifying their parameters, you can either save the Screen by choosing Save Screen (Ctrl+S), or Save Screen As (Ctrl+E) from the File menu, or by clicking the disk icons in the File toolbar. Upon saving a screen, (long) or (short) is appended to the name in the Select Screen control to remind you of the Trade Type that you selected for the screen.

### Screen Folders

Screens are stored in subfolders under the ..\Wealth-Lab Developer 4.0\Screens directory. Screens are *not* stored in the same database as ChartScripts, and you cannot use the ChartScript Explorer 42 to locate Screens. Instead, if required, close the Screener and use Windows Explorer to delete or move saved screens between folders.

For better organization of many Screens, you can create new top and sub-level Screen folders from the **Save Screen As** dialog. For renaming, moving, or deleting folders close the Screener and use Windows Explorer.




***Create new top-level and sub folders for Screens using the buttons indicated in the "Save Screen As" dialog.***

## Editing a Screen

Change the conditions or the parameters of a Screen using the Edit view, where the list of available conditions and current selections appear. Refer to the instructions in **Trade Type** and **Selecting Conditions** in Creating a Screen 149 above.

## Creating A ChartScript from a Screen

At some point, you may wish to view a Screen as a ChartScript for one or more of the following reasons:

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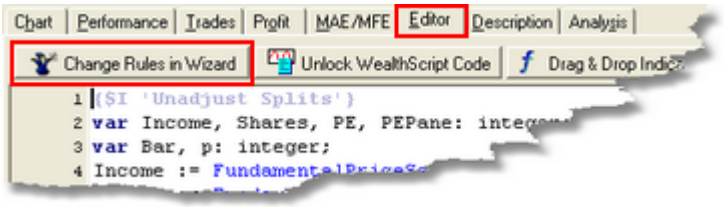
1. To view prices and selected indicators for a particular symbol in a chart window
2. To develop a trading strategy for sophisticated back-testing and analysis.

To provide this ability, the Screen must be converted into a ChartScript by clicking the **Create ChartScript from Screen...** button in the Edit view. When saved, a *copy* of the screen is duplicated using the name and ChartScript folder that you choose. When you open (Ctrl+O) the ChartScript in the ChartScript Window 45, the code will be locked by the New ChartScript Wizard 91, giving you the ability to edit the ChartScript via the ChartScript Wizard's drag-and-drop interface.

To put the Wizard to work, select the Editor view, and click the **Change Rules in Wizard** button. At minimum, you'll want to add an exit strategy, which gives the Wizard a chance to fully convert the ChartScript into a complete trading strategy for back-testing.




***After saving a Screen as a ChartScript, the code is locked for use by the ChartScript Wizard.***

## 9.3 Running a Screen

After creating Screen or selecting one that you've saved, click over to the **Results** tab to run the Screen. However, before clicking **Run Screen**, be sure to configure the **Criteria** items:

### Set Position Sizing

Choose sizing using the standard Position Sizing Control 263. Sizing is used to initialize Position sizes when sending Alerts to the Order Manager. You must set the position size *prior to* running the screen.

**Notes:**

- **Maximum Risk Pct** and **SetShare/PositionSize Value** sizing options are not available for the Screener's Portfolio Simulation sizing mode.
- Be aware that Round Lots in the Trading Costs/Control 257 options affects all sizing options, if enabled.

### Select Data Scale

The Data Loading control is not required for the Screener. You are required only to select the scale - Daily/Intraday, Weekly, or Monthly. As with the WatchList Scans tool 136, scaling Weekly or Monthly implies that you will be running your Screen after updating your DataSources at the end of the week/month and running the Screen at that time. Note that when scaling Daily data to Weekly or Monthly, Wealth-Lab uses the date stamp from the first day of the period. For example, the Alert Date will generally show Monday's date for Weekly data, even though the bar's OHLC/V data is composed of all data for the entire week.

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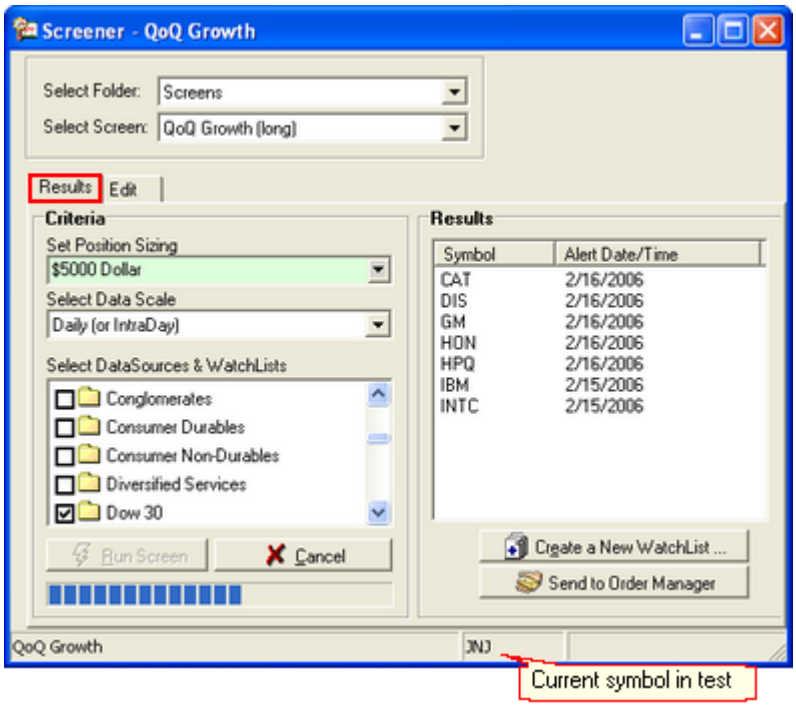
The most-recent data for each symbol is loaded automatically as follows:

- Max period of all indicators + 20 bars, 300 bars minimum.
- Fundamental Items: 600 bars minimum

### Select DataSources & WatchLists

Select one or more of your DataSources and WatchLists to be included in the Scan by checking the boxes to the left of the item names.

**Tip:** If you frequently run the same Screen(s) day after day, save the Workspace, **File|Save Workspace**, to store the configuration of your Screener window(s). Use **File|Open Workspace** to restore the configuration, including all selected WatchLists.




***Screen running showing progress and current symbol under test.***

### Run Screen

Simply click the Run Screen button to start the screen. As shown above, a progress bar appears and the current symbol under test will be displayed dynamically in the status bar. The sizing, scale, and target WatchLists *must be selected* prior to running the Screen. If you change any of the **Criteria**, you must re-run the Screen for new **Results**.

## 9.4 Screener Results

While a Screen is running, results (alerts) will appear in the Results list, one symbol at a time, as they "pass" through your filters. In the event that a Screen does not generate any results, a message will appear after testing all selected WatchLists: "The Screen produced no Results". Depending on your criteria, number and type of

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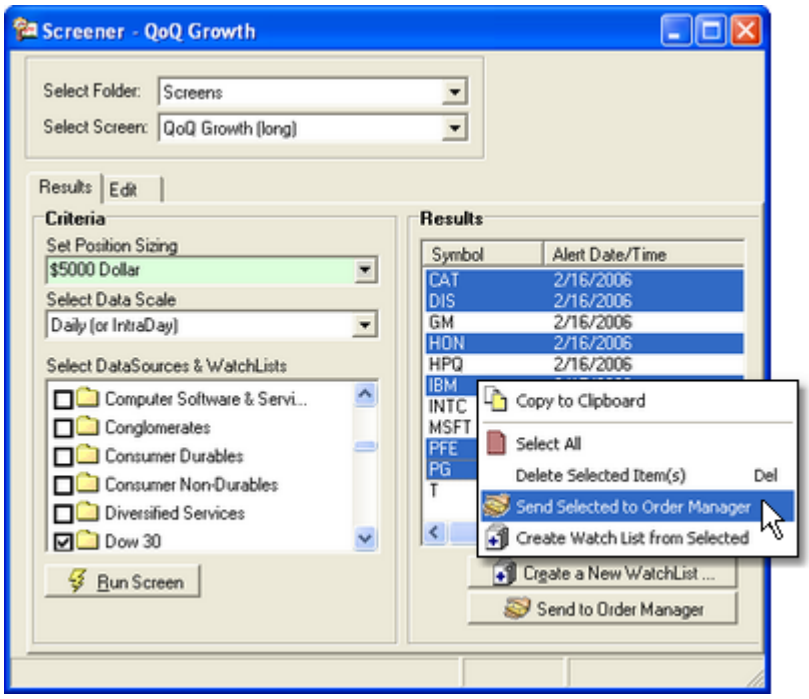
conditions selected, this may be a normal indication.




***Sending multi-select Screener results to Order Manager.***

### Create a New WatchList

This action prompts you for a new WatchList name and then creates a new WatchList comprised of all symbols in the Results. You can create a WatchList of a subset of the Results by selecting multiple symbols from the list (left click while holding Shift or Ctrl technique), right clicking on one of the selections, and finally selecting **Create WatchList from Selected** in the shortcut menu.

### Send to Order Manager

This action sends ***all*** Result symbols to the Order Manager 222 as long or short market orders, determined by the Trade Type 149. To send orders only for selected symbols, single or multi-select the desired symbols, right click on one of the selections, and click **Send Selected to Order Manager**.

**Warning!** If the Auto-Pilot is enabled, orders sent to the Order Manager will be placed immediately with your broker.

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# 10 $imulator

## 10.1 $imulator Overview

Once you develop and backtest a trading system on individual markets in the ChartScript Window 45, you can use Wealth-Lab's $imulator tool to test its performance on a complete portfolio. This reduces the chance of letting personal bias influence your perception of a system's effectiveness.

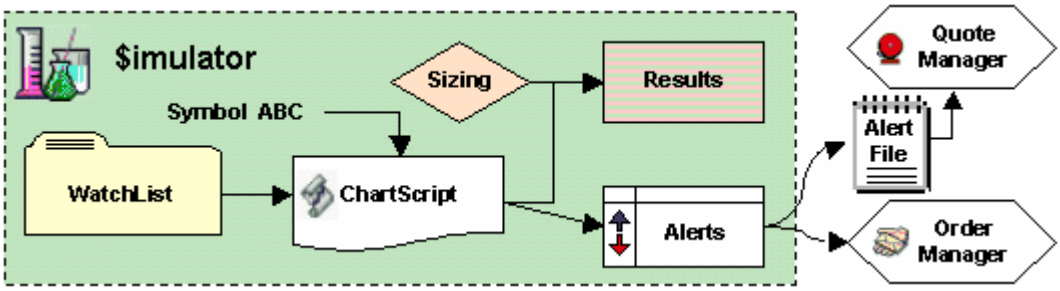
To open a $imulator Window do one of the following actions:

- Click on the **$imulator** icon in the main icon toolbar
- Select **Tools|$imulator (F3)** from the main menu

---

### How the $imulator Works

The $imulator executes the selected ChartScript on each of the symbols in the selected WatchList (you can also $imulate against a single symbol by clicking on it in the tree). This is done in a raw-profit mode to compile all of the possible trades into a single collection. It then aligns the trades by date and time, applies position sizing rules, and finally reports on the overall system results, which includes a portfolio equity curve based on the starting equity that you specify before running the $imulation.




***Wealth-Lab Developer 4.0 $imulator concept diagram***

A unique advantage of the Wealth-Lab $imulator tool is the ability to apply new position sizing algorithms to the list of trades held in memory without the need to re-run the entire $imulation. Following a $imulation, simply select another Position Sizing method or SimuScript, and then hit the **Apply** button.

#### ChartScripts containing a WatchList loop

When you select a WatchList for $imulation, the $imulator automatically loops through each issue in the WatchList. Although you can create your own WatchList loop in a ChartScript, the number of trades would be duplicated exponentially if the $imulator were to process the WatchList normally as well as the trades in a ChartScript's WatchList loop. Consequently, when the $imulator encounters a script that uses **`SetPrimarySeries`** and/or **`WatchListSymbol`**, it breaks out of processing the list of symbols. Generally speaking, scripts using WatchList loops should not be tested in the $imulator, nor should scripts that create trades in stocks other than the primary symbol after a call to **`SetPrimarySeries`**.

To assign specific ChartScripts to be used for certain symbols, refer to the topics for Preferred Values Options 250 and Preferred Values Manager 273.

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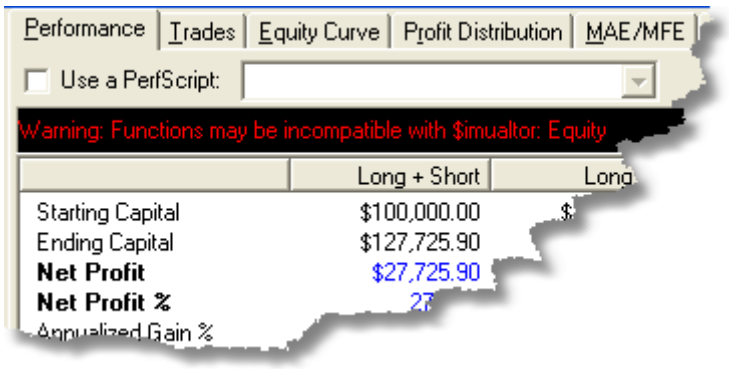
### ChartScripts containing functions not applicable in the $imulator

Because the $imulator executes trading systems in a raw-profit mode, a short list of cash and equity-related functions are not compatible with the Wealth-Lab $imulator tool when used in trading system rules. The $imulator will help remind you of these cases by prominently displaying a warning message in the Performance View of $imulations when the results may be invalid.




***$imulator Warning message for ChartScripts containing incompatible function(s).***

The warning message indicates that a ChartScript *has executed* a cash or equity-based function that is not compatible with $imulations. Note that it's possible for a ChartScript to use one of these "incompatible" functions for plotting in the ChartScript Window only and not for trading rules, e.g., using the {$I 'Profit Pane (Bottom)'} study is one such case. In these cases, simply ignore the warning.

For more information on compatibility for selected functions, please refer to the Knowledge Base article:
$imulator Processes and Compatibility with Selected Functions.

---

## Position Sizing Features

The most important feature of the $imulator is that you can apply different Position sizing rules to the resulting trades and quickly see the impact on your performance. The $imulator can even apply different Position sizing rules and display the result without having to re-run the complete $imulation, saving considerable testing time.

---

## How the $imulator Chooses Trades

During actual trading, you may not have sufficient cash to take on additional risk. Unless you specify otherwise in your $imulation options, Wealth-Lab is true-to-life in this and other operational aspects of its $imulations. Note, however, that when multiple entry signals occur on the same bar and sufficient cash exists for only a subset of the signals, the $imulator will *randomly choose* the securities traded - unless you direct the $imulator to do otherwise!

If you think about it for a moment, the whole idea is to trade systematically. With a WatchList consisting of 50 issues and 20 of them give you signals on the same day (bar), which do you choose if you don't have cash for every signal? Wealth-Lab $imulations help you plan for this case, and the solution is to utilize the **`SetPositionPriority`** function right in your ChartScript. A detailed article, Controlling which Trades the $imulator Takes, which describes this feature, can be found in Wealth-Lab's Knowledge Base.

**Warning!** You *must* employ **`SetPositionPriority`** in ChartScripts that use

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multiple order-entry types, such as AtMarket and AtLimit orders. Since the $imulator does not distinguish between the types, you should set a higher priority for AtMarket entries so that they are processed before AtLimit/AtStop orders on the same bar.

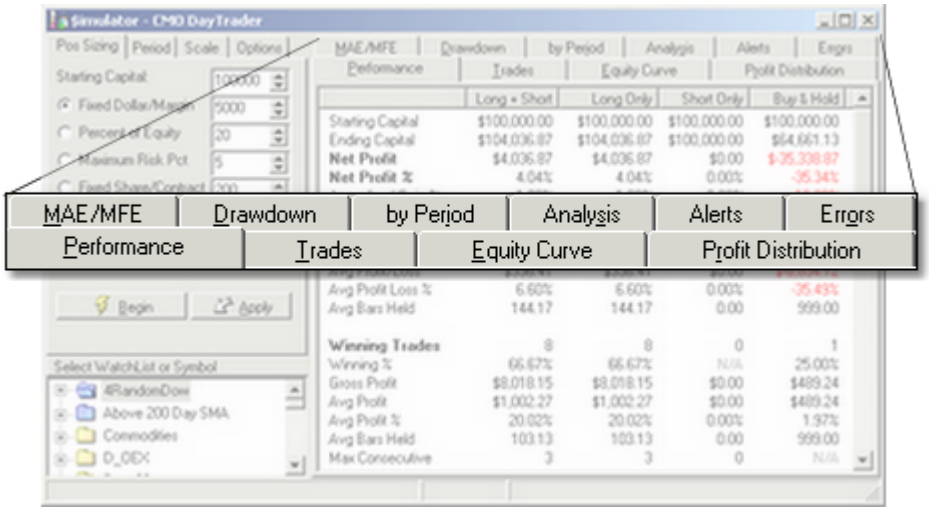
**Note:** Early versions of Wealth-Lab used **`SetPositionData`** instead of **`SetPositionPriority`** for the purpose of controlling trades during $imulations. Use the Migration Wizard to automatically change older ChartScripts to use the new function.

---

## $imulator Views

$imulator Interface 158

Control $imulations by configuring the controls in the upper left corner of the $imulator. Following a $imulation, many methods are available to you for getting data out of Wealth-Lab and into your favorite analysis program. You can also save a set of results for later review right in the $imulator! Click on a tab to jump to a detailed descriptions for each $imulator view.




***The Wealth-Lab $imulator tool. Performance View in background.***

The following topics contain detailed descriptions for each $imulator view.

Performance View 163
Trades View 167
Equity Curve View 169
Profit Distribution View 170
MAE/MFE View 171
Drawdown View 171
By Period View 172
Analysis Series View 173
Errors View 174

---

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## 10.2 $imulator Interface

### Selection Tab

#### Folder / ChartScript

Choose a default ChartScript with which to perform the $imulation by manipulating the Folder/ChartScript controls or by using the ChartScript Explorer button. Note that by using the Preferred Values Manager 273 and enabling the Preferred Values Options 250 for the $imulator, you can run $imulations that implement "preferred" ChartScripts that are assigned to specific symbols.

#### Scale

These options let you convert Daily (or Intraday) DataSources to Weekly or Monthly time scales for the $imulation. The manner in which this functions is similar in nature to that of the Scale toolbar for the ChartScript window. A more complete description can be found in the Scale toolbar 50 topic.

**Note:** For *intraday* $imulations, the $imulator tool can use only the base time frame of intraday DataSources.

Users of Wealth-Lab Developer 4.0 prior to version 3.0 will recall that an option to "Align all Price Series" was previously available. Now the default behavior, the $imulator aligns the data for all included symbols by date. If a date exists in some symbols and not in others, synthetic data bars are added to the series with missing bars. When a synthetic bar is added, it assumes the value from the previous bar (including indicators and any derived series).

---

### Position Sizing Tab

Controls the starting capital to use for the $imulation, and the position sizing options. Contains identical controls and functionality as the Common Position Sizing Control's 263 Portfolio Simulation view.

The Begin, Apply, and Cancel buttons appear on each of the $imulator interface tabs. See Running $imulations 158 below for information.

#### Raw Profit Mode

Not commonly associated with Wealth-Lab's $imulator is the ability to run a ChartScript over a WatchList of symbols in Raw Profit Mode. Like in the ChartScript window, all trading signals are executed independent of equity and results are reported as raw profit (or loss).

To use this feature, enter *0* for Starting Capital. Only the following position sizing methods are available for selection in Raw Profit mode: *Fixed Dollar/Margin*, *Fixed Share/Contract*, and *ChartScript Value*. Additionally, the Max Open Positions 158 option does not apply. Details of the performance metrics for Raw Profit mode can be found in the ChartScript Window's Performance 76 and Trades View 79 topics.

---

### Period Tab

Controls the historical period that the $imulation covers. Refer to the Common Data Loading Control 33 description for Static Data Loading Options 33. $imulations can be performed on Static DataSources only.

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### Lead Bars

Lead Bars specifies how many additional bars of data are required in order to fully calculate indicators used by the ChartScript. Consequently, the $imulator will run the system on a data set equal to the selected period *plus* the number of lead bars. Note, however, that any trade that occurs during the lead bar period will be discarded.

With Lead Bars, you're able to show trades on the very first day selected for the $imulation period, after allowing a sufficient lead period to stabilize indicators. This provides a more precise comparison to Buy & Hold with metrics like "Exposure %" that are calculated beginning with the first bar of the $imulation period.

### Include Price Series without complete historical data

This option is applicable *only if* "Fixed Number" [Bars] is selected for Data Loading. Normally, the $imulator drops symbols that do not contain enough historical data to cover the complete period (*NumBars* + *LeadBars*). If you select this option, partial Price Series will be included in the $imulation. See the Errors View 174 for more information.

Regardless of the state of the "Include Price Series" option, $imulations that use date ranges ("All Data" or "Recent Years" options) will include all symbols provided that they have at least *some* data in the specified range. If a symbol does not have *any* data in range, then you will be notified in the errors view with the "[Symbol]: No Data Available" message.

### Discard Symbols that have no trades (saves memory)

Choosing this option removes a symbol's Price Series from memory if the $imulation generates no trades for a particular symbol(s). This makes more memory available and can speed up large $imulations since less data is required to align. You can minimize this effect using the Series Synchronization Checker 275 prior to running $imulations to determine if your histories have gaps or missing bars.

**Remarks:**

- Discarded symbols *are not included* in the Buy & Hold Equity 169 curve.
- $imulator Alerts do not appear for discarded symbols.

---

## Options Tab

### Max Open Positions

This option lets you control the maximum number of open positions that the $imulator will take.

### Limit Pos Size to % of Volume

This option controls the realism of some $imulated trades and, if selected, limits the number of shares to the specified percentage of the bar's volume.

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### Allow same bar AtClose Orders

Checking this option instructs the $imulator to make cash from trades exited by a **SellAtClose** or **CoverAtClose** signal available to **BuyAtClose** and **ShortAtClose** signals that occur on the same bar. If the option is not checked (default), cash generated from these signals will be available for use by all order types on the next bar.

### Allow same bar AtLimit/AtStop Orders

Checking this option instructs the $imulator to make cash available from trades exited by a **SellAtLimit**, **SellAtStop**, **CoverAtLimit**, or **CoverAtStop** signal on the same bar. The cash is made available to all entry signals *excluding* **BuyAtMarket** and **ShortAtMarket** orders. If the option is not checked (default), cash generated from these signals will be available for use by all order types on the next bar.

### Include "Day Trades" in Open Trades Graph

If this option is checked, trades that are closed on the same day that they were opened will count as "open trades" when the Open Trades are displayed on the Equity Curve. If this option is unchecked, these trades are not counted and will not appear on the Open Trades graph.

### Position Sizing Leeway

Allows the $imulator to take some trades even if there is not quite enough cash. This is useful when a sizing position for 100% of equity, but a gap in the next day prices would cause the trade to not be taken. This phenomenon can occur because the system is designed to simulate running scans at the end of a day and place the orders for the following day. Therefore, realistically, the number of shares for market orders must be calculated from a *basis price* prior to the market open. For AtMarket orders, the basis price is the closing price of the bar on which the signal was triggered.

Consequently, with an account of $10,000 and a basis price of $20, a position size of 500 shares would be calculated. If the security opens at $21, the $imulator would not place a market order (without Leeway) due to insufficient funds (500 x $21 = $10,500). However, if Leeway were set to 5% or higher, the $imulator would be able to execute the order.

For additional information, see the following Wealth-Lab article:
Using the $imulator Leeway Setting to avoid Dropped Trades

### Margin Factor

Enabling the **Margin Factor** option allows a $imulation to "borrow" cash for new purchases during a $imulation. This type of margin does not apply to futures and should be disabled when simulating futures trading. Contract margin for futures is set in the Futures Symbols Manager 271.

Wealth-Lab uses a simplified margin model that differs somewhat in comparison to the Regulation T (Reg. T) rules used by U.S. brokers. It works as follows. Assume *MF* represents the Margin Factor. When enabled, the amount of buying power for new purchases is calculated as follows:

```
BuyingPower = ( ( MF - 1 ) * Equity ) + Cash,
```

where *Equity* is the Portfolio Equity returned by the **Equity** function and *Cash* is the value returned by the **Cash** function.

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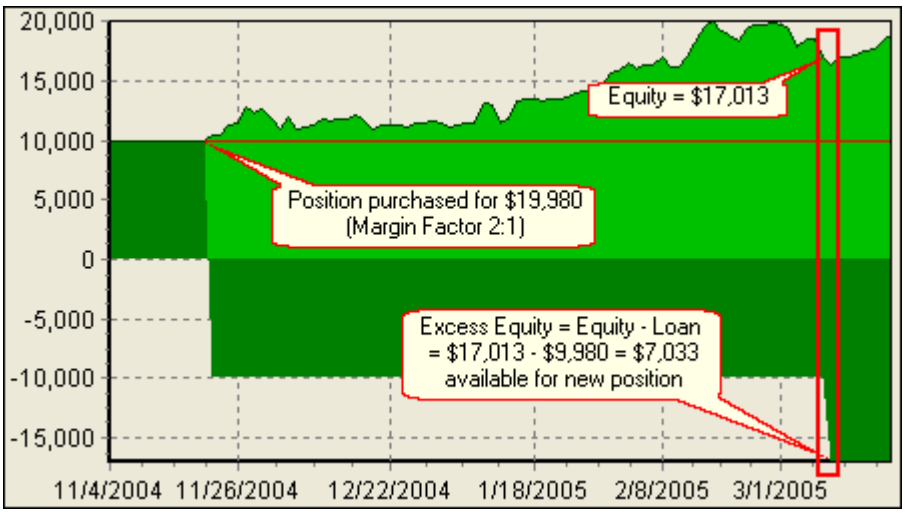
**Notes:**

1. When **Cash** returns a sub-zero value, then the value represents the amount on ***Loan***.
2. The WealthScript function, **Equity**, returns *total Portfolio Equity*, i.e., the equity curve value.
3. Buy & Hold 169 assumes the risk of full margin and pays the margin rate 257 of interest.

To illustrate, assume a *zero-commission, zero-interest*, 2:1 Margin Factor $imulation with $10,000 Starting Equity. Since Cash = $10,000, the $imulation is able to purchase up to $20,000 of equity maximum. Once a security is purchased on margin, cash drops to zero and the cash displayed below 0 is the *Loan amount*. (See Rates for $imulator 257 to set the Margin Loan Rate.) Later, as the equity in the Position fluctuates, so does the Portfolio's buying power. On the signal bar of the next purchase, the buying power can be determined by the second equation above:

*BuyingPower* = (( 2 - 1 ) * 17,013) - 9,980 = $7,033




***Equity curve illustrating how increasing equity increases margin buying power. Note that Cash (and Loan) is represented by the dark green areas, whereas [stock] equity is in light green.***

The following SimuScript shows how you can calculate and work with a percentage of margin Buying Power. In the $imulation for the 2 trades shown in the equity curve above, the constant *PCTBP* was set to 1.0.

## SimuScript Example

```
const MF = 2;       // Must specify Margin Factor here to match
$imulator option
const PCTBP = 0.20; // Percentage of Buying Power

var Bar: integer = BarCount - 1;
var BuyPwr: float = ( MF - 1 ) * Equity( Bar ) + Cash( Bar );
var Shrs: integer = Trunc( PCTBP * BuyPwr / PositionBasisPrice(
#Current ) );
SetPositionSizeShares( Shrs );
```

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## Running $imulations

### WatchList Selection

Select the WatchList that you want to use for the $imulation by clicking on it in the tree. Alternately, you can $imulate with a single symbol only by expanding the WatchList and clicking on the desired symbol.

### Begin

Click the **Begin** button to start the $imulation. While the $imulation is in progress you can click the **Cancel** button to stop the $imulation.

### Apply [Position Sizing Rules] or Cancel

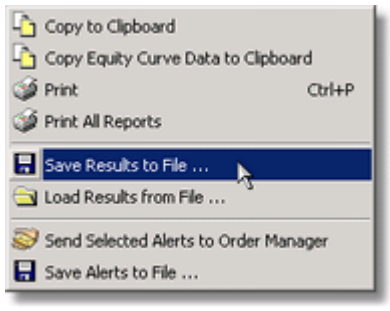
Once the $imulation is completed the results are populated in the various performance views. The $imulator stores all of the trading data in memory so that different rules can be applied to the result set. Consequently, you can try out different position sizing options by making your changes in the Position Sizing tab and clicking the **Apply** button. The $imulator will recalculate all of the performance results without having to re-run the complete $imulation.

Changes to commissions, round lots, and rates made in the Options Dialog|Trading Costs/Control 257 tab and new configuration settings from the $imulator's Options tab are also applied.

**Note:** The **Apply** button acts on changes made on the Position Sizing and Option tabs only! If you change the $imulator Period, Scale, or DataSource, then you must re-run a complete $imulation by pressing **Begin**.

## Saving/Exporting $imulation Results

Activate the pop-up menu shown below by right clicking in any of the $imulation views (excluding the Errors view) to enable exporting the view's data or graphs or to save the entire $imulation's results.




### Copy to Clipboard

You can copy the data or graphs presented in any $imulation view to the Windows clipboard and then paste them into other programs such as Microsoft Excel. Tabular data will be preserved in a [tab] delimited format. Charts and graphs are copied exactly as the images appear in Wealth-Lab.

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### Copy Equity Curve Data to Clipboard

Use this option to copy the $imulation Equity curve along with its contributions from long and short positions. The data are separated by tab characters and also include additional fields such as the Date/Time, Buy & Hold Equity, Linear Regression of Account Equity, and Cash.

### Print

Displays the Print Preview for the current view. The action is equivalent to selecting **File|Print (Ctrl+P)** from the main menu.

### Print All Reports

Send all performance reports directly to your printer (without previewing) using this single action.

### Save Results to File...

This action will save a set of $imulation results in a specially-formatted file with a ".sim" extension to the location you specify for later review. See Notes below.

### Load Results from File...

Choose this action to restore $imulation results from a prior session. Open the $imulator **[F3]** selecting any ChartScript, right click on a view and select this option. Then, navigate to find the name of a "sim" file that you had previously saved using the **Save Results to File** option.

**Notes:**

1. To save all $imulator trade results, "Maximum Items 255" must be set to zero (and then Execute or Apply sizing to repopulate the Trades View 167).
2. You *cannot* **Apply** different position sizing rules from a stored $imulation (the Apply button is disabled). Consequently, you may elect to save several $imulation Results files after applying alternate sizing methods.
3. Results from large $imulations can take several minutes to load.

### Send Selected Alerts to Order Manager

See Alerts View 173

### Save Alerts to File...

See Alerts View 173

---

## 10.3 Performance View

The $imulator Performance View provides a summary of the trading system's performance over the selected WatchList or symbol. A list of performance metrics is presented along the left. Each performance metric is reported for *All Trading (Long and Short)*, *Long Only*, *Short Only*, and *Buy & Hold* strategy. Negative values are shown in red and non-numeric values such as "N/A" (not available or applicable) and "INF" (infinity) in gray.

**Note:** 'Long Only' and 'Short Only' hypothetically reflect the results as if you traded the strategy *only* long or short. For example, assume that your system

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trades only long positions and you apply a 5% rate of interest 257 for cash to a 1-year $imulation with $100,000 starting equity. The 'Long+Short' column show the metrics for *all trading*, which in this case will match the 'Long Only' column. Since the system does not trade any short positions, you should expect to see that you were paid 5% interest for 1 year in the 'Short Only' column. Consequently, the 'Short Only' part of this strategy (stay in cash) earned a Net Profit of $5,000.

For instructions on using PerfScripts to customize the performance report, consult the WealthScript Language Guide. For notes on Buy & Hold performance, see Buy & Hold Equity 169 in the Equity Curve View 169 topic.

**Starting Capital**
The amount of starting capital selected for the $imulation.

**Ending Capital**
The amount of capital (including open Positions) at the end of the $imulation.

**Net Profit**
The total profit generated by the trading system over the period of the $imulation. Open positions are included in the net profit figure, and the profit (loss) is based on the most recent closing price. Net Profit of a trade is equal to raw profit minus commissions and slippage, if enabled.

**Net Profit %**
Total Net Profit expressed as a percentage of Starting Capital.

**Annualized Gain % (Annual Percentage Return, APR)**
Annualized Gain % is the Compounded Annual Growth Rate, or CAGR. CAGR provides a smoothed average rate of return as if the starting equity were compounded annually. In Wealth-Lab Developer 4.0, this is also referred to as APR, or Annual Percentage Return.

$$CAGR = \left(\frac{FV}{PV}\right)^{\frac{1}{n}} - 1 \quad ,$$

where *n* is the number of annual periods, and, *FV* and *PV* represent the future and present values of an investment, respectively.

**Exposure %**
The total market exposure of the trading system. Exposure is calculated on a bar by bar basis. The Exposure metric measures the actual area of the portfolio equity that was exposed to the market.

**Number of Trades**
The total number of round-trip trades plus open positions. For Buy & Hold, this will equal the number of symbols in the WatchList that was selected for $imulation.

**Avg Profit/Loss**
The average profit/loss per trade.

**Avg Profit/Loss %**
The average percentage profit/loss per trade.

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**Avg Bars Held**
The average number of bars held per trade.

**Winning Trades/Losing Trades Breakdown**
The performance summary next breaks the trades down into winners and losers (a trade is marked a winner if its return after costs is above zero), and presents the same metrics as above, plus the following:

**Gross Profit / Gross Loss**
The total profit generated by the winning trades, and the total loss generated by the losing trades, minus commissions and slippage. Open trades are not included in gross profit/loss.

**Max Consecutive**
The maximum number of consecutive winners and losers generated.

**The Bottom Line**
The bottom of the performance view lists a number of general system performance stats:

**Max Drawdown**
Max Drawdown is the largest peak to valley *dollar decline* in the system's Equity Curve. Wealth-Lab reports Drawdown on a closing price basis.

**Max Drawdown %**
Max Drawdown is the largest peak to valley *percentage decline* in the system's Equity Curve on a closing price basis.

**Max Drawdown Date**
Date on which the **Max [Dollar] Drawdown** was realized. The date on which the **Max Drawdown %** occurred is not necessarily the same, as is especially the case for highly-profitable $imulations. Using PerfScripts, you can find and display the Max Drawdown % date, if desired.

**Wealth-Lab Score**
The Wealth-Lab Score metric is one of the measures used to rank systems on the Wealth-Lab.com web site. The goal of the Wealth-Lab Score is to arrive at a single metric that encompasses profitability, exposure (efficiency) and risk. Wealth-Lab Score is annualized, consequently $imulation results that span time periods of different lengths may be compared.

In Wealth-Lab Developer 4.0, the Wealth-Lab Score is calculated by first finding the Annualized Risk Adjusted Return, which is simply the Annual Percentage Return, or APR, divided by percent Exposure. For profitable systems, the RAR is adjusted by multiplying the sum of 1 plus the Max Drawdown Percent (a negative number). Consequently, profitable but risky systems, which typically have periods with large drawdowns, will have a lower score than an equally profitable system that assumes less risk. In summary, the formula for Wealth-Lab Score is:

$$xRAR = \frac{APR}{Exposure},$$

where xRAR is the annualized RAR. If *xRAR is greater than 0 (profitable) then*

$$WLScore = \text{xRAR} \times ( 1 + MaxDrawDownPct )$$

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For example, with an APR of 8.0, an Exposure of 25%, and a Max Drawdown of -15.0%, the Wealth-Lab Score is:

```
( 8.0 / 0.25 ) * ( 1 - 0.15 ) = 32 * 0.85 = 27.20
```

Non-profitable systems result in a negative Wealth-Lab Score. The formula, which changes for negative RAR, more heavily penalizes non-profitable systems for their inability to overcome drawdown. Consequently, i*f xRAR is less than 0 (not profitable) then*

$$WLScore = \text{xRAR} \times ( 1 + \text{Abs}( MaxDrawDownPct ) )$$

Taking the same example with an APR of -8.0, we obtain a Wealth-Lab Score as follows:

```
( -8.0 / 0.25 ) * ( 1 + 0.15 ) = -32 * 1.15 = -36.80
```

**Profit Factor**
Profit Factor is the system's Gross Profit divided by Gross Loss. Look for systems that have a Profit Factor of 2 or higher.

**Recovery Factor**
Recovery Factor is equal to the absolute value of Net Profit divided by Max Drawdown. Recovery Factor should typically be larger than 1. A healthy Recovery Factor is an indication that a system can overcome a drawdown.

**Payoff Ratio**
Payoff Ratio is the system's average percentage profit per trade divided by the average percentage loss per trade. Unless the system has a particularly high Win/Loss ratio, we look for high Payoff Ratios.

**Sharpe Ratio of Trades**
The Sharpe Ratio is a way to measure the risk-adjusted return of an investment. Its ratio measures how much of an investment's return can be attributed to chance. A Sharpe Ratio value of above 1.0 is considered good, while a value above 2.0 is typically considered outstanding.

The Sharpe Ratio of trades is calculated by obtaining the average percentage return of the trades generated by the system, as well as the standard deviation of returns. The average return and average standard deviation are annualized by using the average number of days held per trade as a baseline. The final result is found by dividing the annualized average return by the annualized standard deviation of returns.

**Note:** The Sharpe Ratio calculation assumes a zero risk-free rate of return.

**Ulcer Index**
The Ulcer Index measures a portfolio's overall volatility. It is calculated by summing the squared draw downs, and then taking the square root of the quotient of this sum divided by the period. A lower Ulcer Index indicates less volatility and draw down, indicating that the system might be easier to tolerate in real-world trading.

**Wealth-Lab Error Term**
The Wealth-Lab Error Term measures the volatility of the equity curve. It is calculated by averaging the absolute value of all percentage distances along the equity curve from its linear regression line.

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**Wealth-Lab Reward Ratio**
WL Reward Ratio is the Annual Percentage Return (APR) divided by the WL Error Term.

**Luck Coefficient**
The Luck Coefficient, or LC, shows how the largest trade compares to the average trade and is calculated by dividing the percentage profit of the largest winning trade by the average percentage profit of all winning trades. The larger the LC value, the greater portion of the system results are attributed to the largest winning trade, or, luck.

**Pessimistic Rate of Return**
The Pessimistic RoR is a statistical adjustment of the wins to losses ratio for the purpose of estimating the worst-expected return from previous results. It is calculated as follows:

$$Pessimistic\ ROR = \frac{AvgWinPct \times \left(Wn - \sqrt{Wn}\right)}{Abs\left(AvgLossPct \times \left(Ln - \sqrt{Ln}\right)\right)},$$

where,

*Wn* = Number of Wins,
*Ln* = Number of Losers,
*AvgWinPct* = Average Win %,
*AvgLossPct* = Average Loss %

**Equity Drop Ratio**
Equity Drop Ratio (EDR) is the system's potential for loss expressed as a probability by computing the standard deviation of all drops in the equity curve measured from each equity low to the previous equity high and dividing the result into the annualized return. Only equity drops that are greater than or equal to the Equity Drop Ratio Threshold 255, whose value is set in the System Setting Options 255, are considered in the calculation.

This measure offers three useful characteristics which Risk Adjust Return does not consider and which are generally viewed as desirable features of systems:

1. higher profits are favored,
2. the order of profits and losses will result in higher and lower net equity drops so that small short-term fluctuations are treated as being preferable to large short-term fluctuations, and,
3. large gains are not penalized since only the equity drops are used to measure the potential risk

## 10.4 Trades View

The Trades view contains a list of all trades generated by the $imulation. The trade list contains a number of details for each trade. You can sort the trade list by any of its columns by clicking on the column header. Click the column header again to sort the list in the opposite direction. Double click on the right border of a column header to resize the column to the minimum width necessary to display its values. Double click on a trade in the list to launch a ChartScript Window 45 pointed to the selected trade.

**Note:** You can speed up a $imulation's post processing by limiting the number of Trades loaded in this view. For more information see General Settings 255 in

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the System Settings Options 255 topic.

**Position**
Long or Short. The Position column is also flagged with the same Position icons in the Chart view. The symbols for closed Positions are filled in, while the symbols for open Positions are hollow.

**Symbol**
Contains the symbol that the Position was taken in.

**Shares (or Contracts)**
The number of shares or contracts in the Position.

**Entry/Exit Date**
The dates that the Position was opened and closed. A time will also be displayed for $imulations on DataSources containing intraday data.

**Entry/Exit Price**
The price at which the Position was opened and closed.

**% Change**
The percentage profit of the trade, less commissions and slippage.

**Net Profit**
The total net profit generated by the trade. This subtracts any Commission or Slippage values set in Trading Costs/Control 257 tab of the Options Dialog.

**Bars Held**
The number of bars that the trade was held.

**Profit per Bar**
The trade's total profit divided by bars held. Profit per Bar measures the efficiency of the trade.

**Entry Signal/Exit Signal**
The names of the Entry and Exit signals that were supplied by the entry/exit functions in your WealthScript code. You can give signals different names to track the performance of different types of entry and exit strategies in the same script.

**Cum Profit**
The cumulative profit from trade to trade. This column is recalculated whenever you sort the trade list.

**MAE %**
The Maximum Adverse Excursion percentage of the trade. MAE is the largest intraday loss that the trade has suffered during its lifetime.

**MFE %**
The Maximum Favorable Excursion percentage of the trade. MFE measures the highest intraday profit that the trade gained within its lifetime.

**ChartScript**
The name of the ChartScript used for the trade. A ChartScript other than the one opened for the $imulation may be used for some symbols if you have Preferred ChartScripts configured for them in the Preferred Values Manager 273.

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**Custom Columns**
You can use the AnalyzeSeries function in your WealthScript code to add custom columns to the trade list. See the topic on Analysis Series in the WealthScript Function Reference for details.

## 10.5 Equity Curve View

The $imulator Equity Curve view shows the detailed equity curve of the $imulation over the historical period. The Equity Curve graph contains the following components:

### Account Equity

Account Equity is portrayed as the solid green area of the graph. Equity changes over time as trading-system Positions gain or lose value. The Account Equity Area itself is divided into a Cash Position (dark green) and a Market Position (light green). Dividing the Equity into Cash and Market levels lets you see at a glance the history of your system's market exposure.

### Buy & Hold Equity

The Buy & Hold Equity is represented as a blue line. The line is calculated by taking an equally-sized Position in each symbol of the WatchList at the start of the $imulation period, and holding the Positions until the end of the period. The $imulator uses real-world rules for even the Buy & Hold Positions. It bases the size of the Positions on the closing value of the first bar of data, and opens the Positions at the opening price of the next bar. Because of this you'll notice that the $imulator's Buy & Hold Exposure level is usually never exactly 100%, but is typically within 1% of 100% (no margin assumed).

The $imulator does not close Buy & Hold positions. The outstanding profit is based on closing price of the last bar, but no exit commission is applied.

**Notes:**

1. When using the Discard Symbols 158 option, only symbols that generated trades for the $imulation are considered for Buy & Hold.
2. For large WatchLists, the effect of the opening-trade commission can have a large effect on Buy & Hold Equity. Assuming $20-per-trade commissions, a 500-symbol WatchList will drop the B&H Equity curve by $10,000.
3. When selected, the Margin Factor 158, and interest/loan rates 257 are applied to the Buy & Hold Equity $imulation. Buy & Hold exposure can be well over 100% when applying margin.
4. Buy & Hold sizing never uses Round Lots 257.

### Long and Short Equity Lines

The Long and Short Equity lines (dark blue and dark red lines) show that Account Equity for the long and short sides of the system, respectively.

### Intraday High/Low

The bar by bar intraday equity high is displayed as a thin green line, and the bar by bar intraday low as a thin red line.

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### Linear Regression Line

The Linear Regression Line is magenta in color, and is calculated by performing a linear regression of the Account Equity. The Regression Line is used to compute the Standard Error and Risk Reward Ratio metric.

### Open Trades

Enabling this option displays the number of open trades for each bar in the Equity Curve graph. The Open Trades are displayed in a solid maroon graph. The Open Trades graph uses the right-hand chart axis. Toggle the Open Trades graph by checking/unchecking the check box at the top of the Equity Curve graph.

### Exploring the Equity Curve

You can zoom into any area of the Equity Curve by dragging a box (*upper left to lower right)* around the area with your mouse. While zoomed in, use the right mouse button (click and drag) to navigate within the enlarged Equity Curve graph. To return the Equity Curve to its normal size and position, draw a reverse box with the left mouse button by starting at the lower right corner and dragging to the upper left corner. Additionally, by right clicking and dragging, you can manually center the graph.

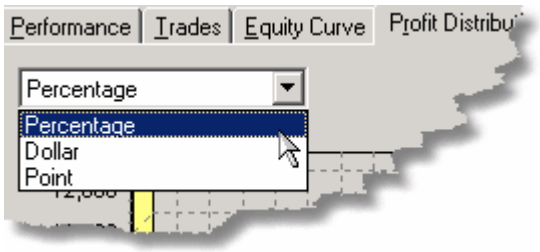
**Tip:** With **Log Scale** selected, right click and drag the chart directly downward to display more detail at the top of the equity curve.

---

## 10.6 Profit Distribution View

The Profit Distribution histogram provides a good overall illustration of your system's dynamics. The graph illustrates the profit distribution of all of the trades that were generated by the $imulation in percentage (default), dollar, or point representations. Profits include all trading costs.

Net profits of the trades are divided into a number of evenly-distributed bins. Each bar on the graph contains a number of trades whose profit falls within the upper bounds of the bin. For example, imagine that the bins are spaced apart by 5% each. The bin labeled 10% contains 20 trades. This means that 20 trades had a net profit between 5 and 10%.




***Use the drop down selection to choose between three data representations.***

### Exploring the Graph

You can zoom into any area of the profit graph by dragging a box around the area with your mouse. To return the graph to its normal size, draw a reverse box with your mouse by starting at the lower right corner and dragging to the upper left corner.

---

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## 10.7 MAE/MFE View

MAE stands for Maximum Adverse Excursion, and represents the largest intraday loss that a trade suffered within its lifetime. MFE is Maximum Favorable Excursion, and is the largest intraday profit that a trade achieved during its life. The graphs show you MAE/MFE breakdowns for all of the closed trades generated by the $imulation. As in the Profit Distribution view[170], you have the choice of displaying your data in percentage (default), dollar, or point representations. Only *closed* trades are represented in the MAE and MFE graphs.

### MAE Graph

The MAE graph displays a breakdown for **all** closed trades, and another for **winning** closed trades only. Use this in combination with the Profit Distribution[170] to help set appropriate stop loss levels. The Profit graph will show you the potential losses that could be capped by setting a stop loss, and the MAE graph will show you how many potential winning trades would be converted to losers if the stop loss was placed.

### MFE Graph

The MFE graph displays two breakdowns also. It shows MFE for **all** closed trades, and also for **losing** closed trades only. Use this in combination with the Profit Distribution[170] graph to help determine effective profit target levels. The Profit graph will tell you how much profit you're likely to lose by capping it with a profit target. The MFE graph can show you how many losing trades could have been converted to winners by establishing a profit target at a certain level.

### Exploring the Graph

You can zoom into any area of the profit graph by dragging a box around the area with your mouse. To return the graph to its normal size, draw a reverse box with your mouse by starting at the lower right corner and dragging to the upper left corner. Additionally, by right clicking and dragging, you can manually center the graph.

---

## 10.8 Drawdown View

The $imulator Drawdown tabs present two different ways of analyzing equity Drawdown.

### Underwater Equity Curve (Drawdown)

The Underwater Equity Curve displays equity Drawdown on a walk-forward basis. (This means that the percentage of drawdown is with respect to maximum equity achieved up to that point in time.) The depth of the current Drawdown is displayed on a bar by bar basis, covering the complete period of the historical simulation. You can quickly identify the periods of deepest and longest Drawdown.

### Bars since Last Equity High

This graph displays the number of bars since a new equity high was achieved. This can give you a good idea of how long you'll be waiting to recover from Drawdowns in your account.

---

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## 10.9 By Period View

The $imulator "by Period" tab lets you evaluate the results of a system on a **Daily**, **Weekly**, **Monthly**, **Quarterly**, or **Annual** basis. Select the desired period from the drop down control. For large $imulations, be patient after selecting the period. It could take several seconds to a minute or two for Wealth-Lab to compile the by period returns.

By Period returns are simply the equity of the last day of the period minus the equity of the last day of the previous period. Consequently, the return value is calculated by the change in the equity curve, not by the sum of exits in the specified period.

**Notes:**

1. By Period returns are not available after running a $imulation in Raw Profit Mode 158.
2. To view all By Period Entry and Exit tallies, you must set first Maximum Items 255 to zero (and then Execute or Apply sizing to repopulate the Trades View 167).

You can elect to omit the first and/or last periods from the Analysis. You might do this if you only have partial data covering a period. For example, if you are testing a system's annual performance in February you have less than 2 complete month's worth of results for the final year. The incomplete results might throw off the Sharpe Ratio and other calculations, so you can choose to eliminate the last period from your Analysis.

### Average Return

The average percentage return for the specified period. For example, if you select Monthly, the percentage return by month is calculated and the average value is reported here.

### Std Deviation of Returns

The standard deviation of the individual percentage returns.

### Sharpe Ratio

Sharpe Ratio measures how much of an investment's gains can be attributed to the trading system and how much to chance. A value above 1 is considered good, and a value above 2 is typically considered outstanding. Please refer to its description in the Performance View 163 topic.

### Best/Worst Return

These values represent the best and worst returns recorded during the simulation period on a by-period basis.

### Total Periods

This represents the total number of periods (months, years, etc) used in the analysis.

### Profitable Periods

The total number of profitable periods, and the percentage of periods that were profitable, are reported here.

### Max Consecutive

The maximum number of consecutive profitable and unprofitable periods are reported here.

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**Graphs** (click on the tabs)

**Raw Returns**

This graph displays the individual percentage returns on a by-period basis.

**Distribution of Returns**

This graph displays a distribution of percentage returns on a by-period basis.

**Detailed List of Returns**

The list of returns contains the starting date of the period, the dollar return and the percentage return. It also displays the maximum percentage drawdown on a walk-forward basis, the total market exposure, and the number of trades (entry and exit counted separately) that occurred during each period.

---

## 10.10 Analysis Series View

The $imulator Analysis Series view displays the results of any custom Analysis Series that you specified in your ChartScript. See the Analysis Series 87 topic for ChartScript Windows 45 for a detailed explanation of Analysis Series.

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## 10.11 Alerts View

$imulations can generate Alerts in the same manner in which end-of-day Scans operate. The advantage of using the $imulator for Alerts is that you can obtain precise position sizing, including trade filtering over a complete portfolio. The trade-offs, however, are that a $imulation can be applied to only a single WatchList at a time and typically involve longer processing times due to data alignment and other internal processes.

Once a $imulation has completed and has generated Alerts, by using the Ctrl and Shift keys in combination with the mouse in the typical fashion, you may select Alerts and load their orders directly into the Order Manager 222 queue. To aid in selecting specific Alerts, you can sort them by clicking on any of the column headings.
After making your selection(s), right click any one of the highlighted items and choose "Send Selected Alerts to Order Manager" from the pop up menu. This essentially provides the same capability as the WatchList Scans 136 tool for submitting orders to the Order Manager. If not already open, the Order Manager will be displayed automatically with the selected orders shown in its queue.

**Notes:**

- Since you cannot determine which trades will be executed until the following day (bar), neither equity nor SetPositionPriority have effect on alert generation. All Alerts generated by the system will appear in the list. You can however, sort and therefore prioritize the Alert list by passing the value used in SetPositionPriority as a string to the entry's *SignalName*.
- With the Discard Symbols 158 option selected, the $imulator will ***not*** display Alerts for symbols that did not generate any trades for the $imulation period.

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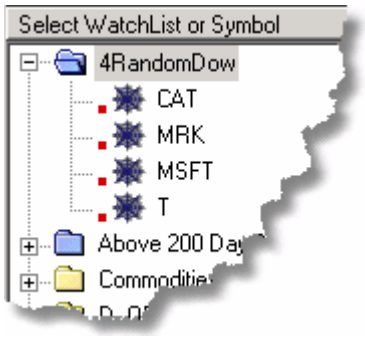
## 10.12 Errors View

The $imulator Errors View will display any errors encountered during a $imulation. It's best to ensure that a ChartScript runs error-free before applying it for use in a portfolio $imulation. Nevertheless, you may encounter unforeseen errors when running the script on different symbols, over a larger (or smaller) period, using different scales, etc. Typical types of errors that may be encountered are as follows:

*SimuScript Errors* — It's best to ensure a SimuScript can run trouble-free with a single security before performing a large $imulation. In Wealth-Lab Developer 4.0, you can test your SimuScripts during a $imulation with a single symbol from the ChartScript Window or using the $imulator by selecting one symbol only.

*Insufficient Data* — Occurs for DataSource symbols that do not contain a sufficient amount of data for the number of *Fixed Bars* selected in the data loading control. An additional indication of this condition is a red mark next to the symbol in the WatchList tree view as shown below.




***Red marks next to symbols in the DataSource tree indicate insufficient data for the $imulator run.***

*No Data Available* — Indicates that the DataSource symbol does not contain data within the date range specified in the data loading control.

*ChartScript Errors* — Clearly a ChartScript should be thoroughly evaluated before using it in a $imulation environment. However, it's possible to encounter errors not anticipated during a $imulation with multiple symbols, or using a different scale or range of data than previously tested.

**See Also:** Common ChartScript Errors 101

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## 10.13 $imulation FAQs

***How can the $imulator emulate a true portfolio simulation if it processes trades from each symbol individually?***

When the $imulator completes compiling the trades list, it chooses trades on a bar-by-bar basis while maintaining a chronological equity curve. When multiple trade opportunities exist on the same bar and insufficient cash is available for each one, the $imulator will *randomly pick* the trades. For more information and how to influence this behavior, please read How the $imulator Chooses Trades 155 in the $imulator Overview 155 topic.

If you prefer, you can also set up your own simulation loop right in the ChartScript window. The Wealth-Lab article Interacting Dynamically with Portfolio Level Equity shows you how. Note, however, that in doing this you cannot take advantage of the $imulator's ability to quickly apply different position sizing algorithms to a set of trading results without having to run the complete simulation again.

---

***How can I make the $imulator pick the worst trades in a cash-limited situation?***

As described above, the $imulator will randomly choose trades if you do not have enough cash for all trades that occur on the same bar. By calling SetPositionPriority, however, you can force the $imulator to choose the worst-performing trades by adding the following code at the end of your ChartScript.

```
var pp: integer;
for pp := 0 to PositionCount - 1 do
  SetPositionPriority( pp, -1 * PositionProfitPct( pp ) );
```

This works because the $imulator collects all trades from all symbols in a single list and processes Positions with the *highest priority* first. By negating the profit percentage, the trades with the lower percentage profit will have the highest priority.

---

***How does the $imulator handle cash received from open short positions?***

Although you do receive cash in real-life trading, for purposes of the $imulation a "short" is considered just another position. For example, if you have $10,000 in cash you could take only 10 short positions of $1,000 each, and cash available for additional trades would be zero.

---

***How does the $imulator handle margin, margin interest, and interest on capital gains?***

Please see the discussion for Margin Factor 158.

---

***How can I speed up $imulations?***

$imulations depend greatly on the number of bars loaded for the $imulation period, the complexity of the ChartScript, and other factors that cannot be controlled manually. However, if you're interested in only the overall Performance results, by limiting the number of trades loaded in the Trades list you can save a significant amount of time for a large $imulation that has generated thousands of trades. See

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System Settings Options 255.

Also, WealthScript - like other scripting languages - is interpreted, which makes it slower to execute than a compiled language. The Wealth-Lab Developer 4.0 Add-On API provides the capability to program your functions, indicators, and trading systems as in-proc servers (DLLs) in a COM-compatible language such as Java or C++ via the *IWealthLabAddOn3* interface.

---

***Why is Equity Drop Ratio always zero?***

It's likely that you have set the Equity Drop Ratio Threshold to a value too high or zero (see Performance Metrics in System Settings Options 255). A small value, like 2%, should provide consistent results for $imulations.

---

***Why are the results incorrect for some symbols in my $imulation?***

Check the Preferred Values Manager (Ctrl+Alt+P) for Preferred ChartScripts and/or Preferred #OptVars. The $imulator's Trades View identifies the ChartScript used for each trade. (Use the Performance View in the Scans tool for this same purpose.) See Preferred Values Options 250 for more information.

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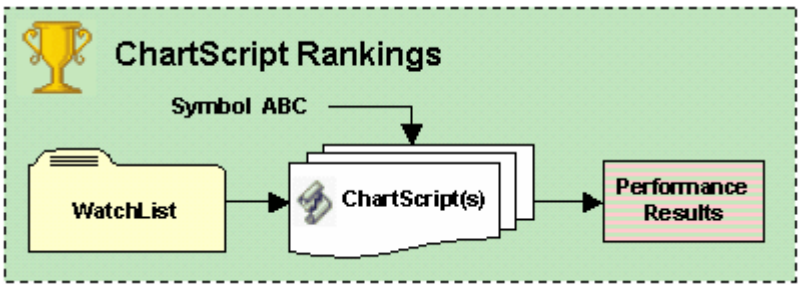
# 11 ChartScript Rankings

## 11.1 ChartScript Rankings Overview

The ChartScript Ranking tool lets you see which ChartScript performed best for a single symbol or over an entire WatchList. You can include all ChartScripts in the rankings, or only ChartScripts in a specific folder. Keep in mind that you can create shortcuts to ChartScripts in the ChartScript Explorer 42. (A discussion of this procedure can be found in the ChartScript List 42 subtopic). Using this feature you can maintain special folders that contain certain ChartScripts that you want to rank. You have the option to rank based on the daily, weekly, or monthly time scale.




***ChartScript Rankings concept diagram***

### Preferred Values and Rankings

Preferred #OptVars can be selectively used in the ChartScript Rankings process by enabling the appropriate "Use Preferred #OptVars in" check box in the Preferred Values Options 250. Although symbols in a WatchList may be assigned to Preferred ChartScripts for use in the $imulator and WatchList Scans tools, the assignment does *not* apply to the ChartScript Rankings tool.

**See Also:** Preferred Values Manager 273

ChartScript Rankings Control 177
Rank all ChartScripts in the database in one shot or choose a specific folder of ChartScripts for rankings. As with other tools, you can control the amount of data, position sizing, and scale of the simulations performed for the ranking process.

Results View 185
Using this principal view of the WatchList Rankings tool, you can easily make comparisons of how a ChartScript performs on various WatchLists. Click the column headings to sort the results, export them, and/or assign the ChartScript as the Preferred ChartScript to the symbols in a WatchList.

Errors View 189
If a selected WatchList fails to appear in the Results view, the Errors view will give you the necessary information to correct the problem so that you can re-run the Rankings process.

---

## 11.2 ChartScript Rankings Control

Performing a ChartScript Ranking couldn't be easier. Simply configure the controls on the Selection tab, change the Scale if desired, and choose either a WatchList or a

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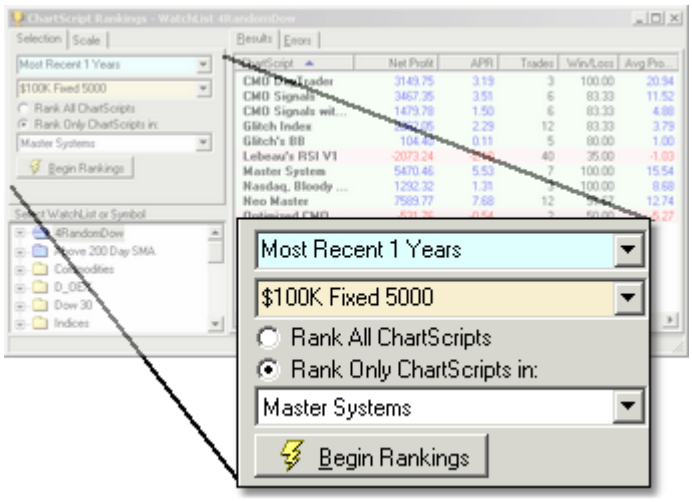
single symbol on which to perform the Ranking.

### Selection tab

The familiar light-blue Data Loading control 33 and the Position Sizing control 263 give you the ability to work with precisely the amount of data you wish, and to do so in either Raw Profit mode or with a true Portfolio Simulation. Raw Profit mode compiles the results like a $imulation with starting capital set to zero (the $imulator's Raw Profit mode 158). After configuring these controls, simply choose the appropriate radio button for "Rank All" or "Rank Only", and in case of the latter, select the folder that contains the ChartScripts to rank, as shown below.

**Tip:** Using the ChartScript Explorer, you can create a special folder of ChartScript shortcuts for rankings. See creating shortcuts 42 in the ChartScript Explorer topic for more information.




### Scale tab

The Scale tab lets you choose between daily (or intraday), weekly, or monthly data when performing the Ranking. For this purpose, Wealth-Lab can convert a DataSource's data stored in a lower timeframe, such as intraday or daily, to a higher timeframe, weekly or monthly. The manner in which this functions is similar in nature to that of the Scale toolbar for the ChartScript window. A more complete discussion can be found in the Scale toolbar 50 topic.

**Note:** For *intraday* Rankings, the Rankings tool can use only the base time frame of intraday DataSources.

### Select WatchList or Symbol

The last task prior to starting the Ranking process is to choose either a WatchList or a single symbol from the tree view list. If Ranking against a WatchList, then the results for each symbol therein will be combined into a single result for each ChartScript included in Ranking.

## 11.3 Results View

When the Ranking is complete, the results list contains an entry for each ChartScript that was ranked. ChartScripts that do not contain a trading signal (BuyAt, ShortAt, etc.) will not appear in the final ranked list. The list contains various system

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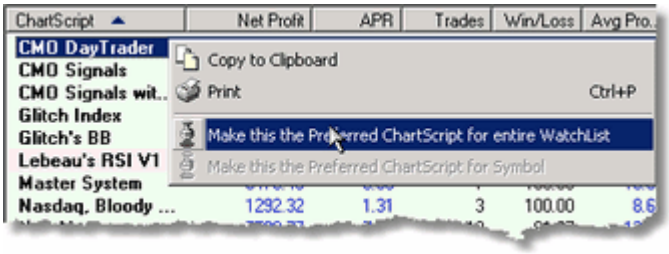
performance metrics such as profit, Profit per Bar, and Win/Loss ratio. You can order the list by clicking on any of the column headers. Double click on an item in the list to launch a ChartScript Window for that ChartScript.

**Note:** In Portfolio Simulation mode, Rankings will provide the same results as the $imulator for the same Period, Scale, and WatchList *provided that* the $imulator Period-tab option "Include Price Series that do not have complete historical data" is checked, and, no other options are selected on the $imulator's Options tab.

Right-clicking on a line item brings up a pop up menu with "*Make Preferred*" selections.




**Make the Preferred ChartScript for entire WatchList**

Makes an entry in the Preferred Values Manager for *each symbol* in the selected WatchList by assigning the highlighted ChartScript as the Preferred. The option is disabled for ChartScript Rankings performed on a single symbol.

**Make the Preferred ChartScript for Symbol**

Makes an entry in the Preferred Values Manager for the symbol selected during the Ranking process by assigning the highlighted ChartScript as the Preferred. The option is disabled for ChartScript Rankings performed on an entire WatchList.

## Ranking Metrics

Depending on the money management mode used for the Rankings, an appropriate set of metrics will be displayed. The table below summarizes the possibilities.

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| Metric | Raw Profit Only | Portfolio Simulation |
|---|---|---|
| Profit or Net Profit | ✓ | ✓ |
| Profit per Bar | ✓ | |
| APR | | ✓ |
| Trades | ✓ | ✓ |
| Win/Loss | ✓ | ✓ |
| Avg. Profit % | ✓ | ✓ |
| Avg. Bars Held | ✓ | ✓ |
| Max DrawDown | ✓ | |
| Max DrawDown % | | ✓ |
| WL Score | | ✓ |
| Profit Factor | ✓ | ✓ |
| Payoff Ratio | ✓ | ✓ |
| Sharpe Ratio | ✓ | ✓ |
| Ulcer Index | ✓ | ✓ |
| WL Error Term | ✓ | ✓ |
| WL Reward Ratio | ✓ | ✓ |
| Pess. Rate of Return | ✓ | ✓ |
| Equity Drop Ratio | | ✓ |

Definitions for items specific to position sizing in Raw Profit mode can be found in the ChartScript's Performance View 76 topic. Likewise, definitions for items specific to sizing in Portfolio Simulation mode can be found in the $imulator's Performance View 163 topic.

**Profit or Net Profit**

The total Net Profit generated by the system after subtracting commissions. The WatchList Ranking tool adds the profits of individual system runs for all symbols in the WatchList. Because different WatchLists can have a different number of symbols, comparing results by Profit isn't as effective as comparing by Profit per Bar (below).

**Profit per Bar** *Applies to:* Raw Profit Only

Net Profit per Bar. This is calculated by dividing the total Profit generated by the total number of bars in which Positions were held. Multiple WatchLists can be compared effectively by using Profit per Bar.

**APR** *Applies to:* Portfolio Simulation

APR, or Annualized Percentage Return, is the Compounded Annual Growth Rate (CAGR). CAGR provides a smoothed average rate of return as if the starting equity were compounded annually for the period observed in the data used in the Ranking.

$$CAGR = \left(\frac{FV}{PV}\right)^{\frac{1}{n}} - 1 \quad ,$$

where *n* is the number of annual periods, and, *FV* and *PV* represent the future and

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present values of an investment, respectively. This is also referred to as Annualized Gain % in the $imulator.

**Trades**

The total number of Positions taken by the ChartScript for all symbols in the WatchList. Includes open positions, which are evaluated using the closing price of the last bar for the Rankings analysis.

**Win/Loss**

A trade is marked a winner if its return after costs is above zero. Winning % is simply the number of winning trades divided by the total number of trades, expressed as a percentage.

**Avg Profit %**

The average percentage profit (loss) for all trades.

**Avg Bars Held**

The average number of bars held per trade.

**Max Drawdown** *Applies to:* Raw Profit Only

The maximum Drawdown is the largest dollar loss that was experienced throughout the historical testing period. This is calculated by summing the Max Drawdown of the individual symbol runs, so comparing by raw Max Drawdown isn't as effective as comparing by Recovery Factor (below).

**Max Drawdown %** *Applies to:* Portfolio Simulation

Max Drawdown % is the largest peak to valley decline, expressed as a percentage, in the system's equity curve during the simulation period.

**WL Score** *Applies to:* Portfolio Simulation

In Wealth-Lab Developer 4.0, the WL Score is calculated by first finding the Annualized Risk Adjusted Return, which is simply the Annual Percentage Return, or APR, divided by percent Exposure. For profitable systems, the RAR is adjusted by multiplying the sum of 1 plus the Max Drawdown Percent (a negative number). For further details, see the explanation for Wealth-Lab Score 163 in the $imulator's Performance view topic.

**Profit Factor**

The Gross Profit of the system's winning trades divided by the Gross Loss of the losing trades. Calculated by dividing the total Gross Profit of all symbols by the total Gross Loss.

**Recovery Factor**

The absolute value of Net Profit divided by Max Drawdown. Recovery Factor measures how well a system is able to rebound after a loss. Multiple WatchLists can be effectively compared by Recovery Factor even when containing a different number of symbols.

**Payoff Ratio**

Payoff Ratio is the absolute value of the system's average percentage profit per trade divided by the average percentage loss per trade. Unless the system has a particularly high Win/Loss ratio, we look for high Payoff Ratios.

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### Sharpe Ratio

The Sharpe Ratio measures the risk-adjusted return of an investment. A Sharpe Ratio value of above 1.0 is considered good, while a value above 2.0 is typically considered outstanding. For further details, see Sharpe Ratio of Trades 163 in the $imulator's Performance view topic.

### Ulcer Index

The Ulcer Index measures a portfolio's overall volatility. It is calculated by summing the squared draw downs, and then taking the square root of this sum. A lower Ulcer Index indicates less volatility and draw down, indicating that the system might be easier to tolerate in real-world trading.

### WL Error Term

The Wealth-Lab Error Term measures the volatility of the equity curve. It is calculated by averaging the absolute value of all percentage distances along the equity curve from its linear regression line.

### WL Reward Ratio

WL Reward Ratio is the Annual Percentage Return (APR) divided by the WL Error Term.

### Pess. Rate of Return

The Pessimistic RoR is a statistical adjustment of the wins to losses ratio for the purpose of estimating the worst-expected return from previous results. For further details, see the Pessimistic Rate of Return 163 calculation in the $imulator's Performance view topic.

### Equity Drop Ratio *Applies to:* Portfolio Simulation

Equity Drop Ratio (EDR) is the system's potential for loss expressed as a probability by computing the standard deviation of all drops in the equity curve measured from each equity low to the previous equity high and dividing the result into the annualized return. Only equity drops that are greater than or equal to the Equity Drop Ratio Threshold 255, whose value is set in the System Setting Options 255, are considered in the calculation. For further details, see the Equity Drop Ratio 163 remarks in the $imulator's Performance view topic.

---

## 11.4 Errors View

A red dot appearing next to a ChartScript name in the Results view, indicates that an error has occurred during the processing of that script. You can investigate the details of the error by clicking on the Errors View. The Errors View indicates any and all types of ChartScript compilation and runtime errors encountered during the Rankings process.

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***The red dot in the Results View is a visual cue that errors occurred during processing.***

## 11.5 ChartScript Ranking FAQs

***After double clicking an item in the Result view, a ChartScript Window opens with the same ChartScript but the results don't match. Why is that?***

Wealth-Lab maintains the last-used settings in each tool, consequently, you must ensure that ChartScript Rankings and the ChartScript Window are both using the same settings for the Position Sizing 263 and Data Loading 33 controls.

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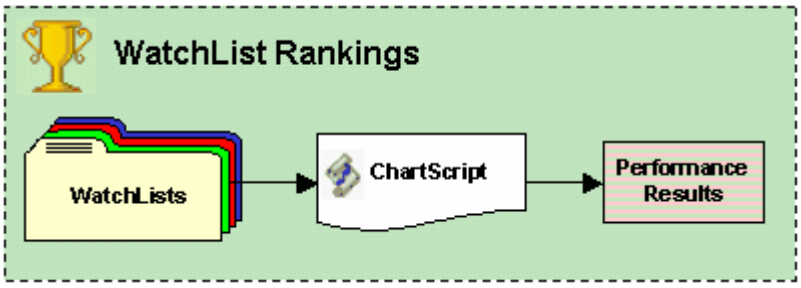
# 12 WatchList Rankings

## 12.1 WatchList Rankings Overview

The WatchList Rankings tool lets you see which WatchLists performed best on a single ChartScript. You can select one or more WatchLists from the list to Rank. Select multiple WatchLists for comparison by placing a check mark in the box next to the WatchList's name. Additionally, you can open multiple WatchList Rankings windows that can be used to compare results from a different set of initial conditions - a different simulation period or position sizing, for example.




***WatchList Rankings concept diagram***

### Preferred Values and Rankings

Preferred #OptVars can be selectively used in the WatchList Rankings tool by enabling the appropriate "Use Preferred #OptVars in" check box in the Preferred Values Options 250. Although symbols in a WatchList may be assigned to Preferred ChartScripts for use in the $imulator and WatchList Scans tools, the assignment does *not* apply to the Rankings tool.

**See Also:** Preferred Values Manager 273

Results View 185
Using this principal view of the WatchList Rankings tool, you can easily make comparisons of how a ChartScript performs on various WatchLists. Click the column headings to sort the results, export them, and/or assign the ChartScript as the Preferred ChartScript to the symbols in a WatchList.

Errors View 189
If a selected WatchList fails to appear in the Results view, the Errors view will give you the necessary information to correct the problem so that you can re-run the Rankings process.

---

## 12.2 WatchList Rankings Control

Performing a WatchList Ranking couldn't be easier. Simply configure the controls on the Selection tab, change the Scale if desired, and choose one or more WatchLists on which to perform the Ranking. Of course, more than one WatchList will be required to make a comparison.

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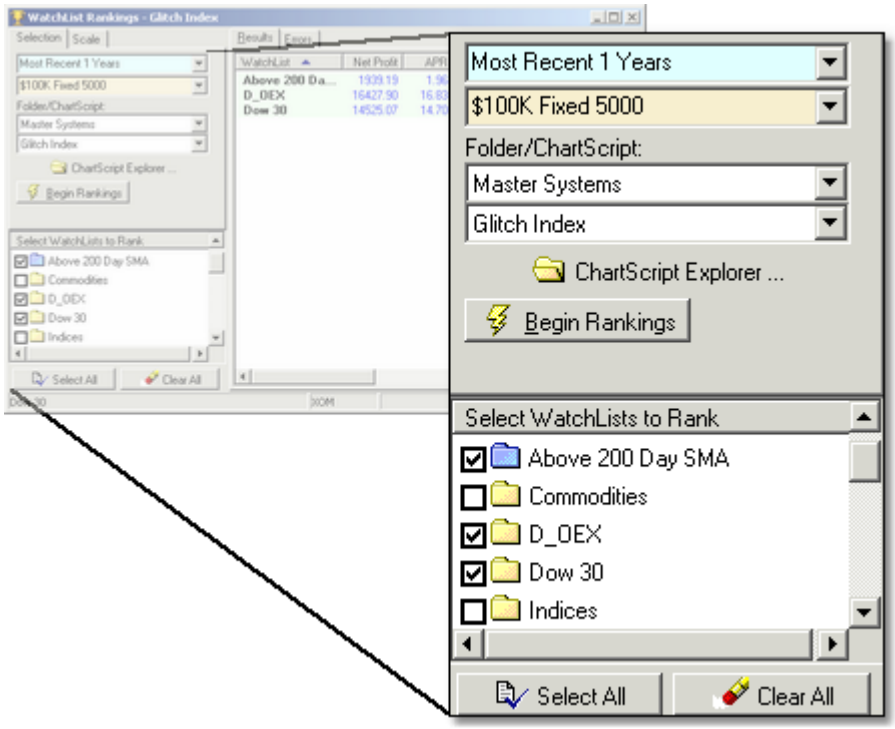


### Selection tab

The familiar light-blue Data Loading control[33] and the Position Sizing control[263] give you the ability to work with precisely the amount of data you wish, and to do so in either raw profit mode or in a portfolio simulation. After configuring these controls, choose the ChartScript with which to perform the Ranking. You can do this by manipulating the Folder/ChartScript controls or by using the "ChartScript Explorer" button.

### Scale tab

The Scale tab lets you choose between daily (or intraday), weekly, or monthly data when performing the Ranking. For this purpose, Wealth-Lab can convert a DataSource's data stored in a lower timeframe, such as intraday or daily, to a higher timeframe, weekly or monthly. The manner in which this functions is similar in nature to that of the Scale toolbar for the ChartScript window. A more complete discussion can be found in the Scale toolbar[50] topic.

**Note:** For *intraday* Rankings, the Rankings tool can use only the base time frame of intraday DataSources.

### Select WatchLists to Rank

The last task prior to starting the Ranking process is to choose at least one (usually more) WatchLists by placing check marks next to them in the tree view list. Use the **Select All** and **Clear All** buttons to aid in this process if necessary.

## 12.3 Results View

When the Ranking is complete, the results list contains an entry for each selected WatchList. Should a selected WatchList not appear in the list, be sure to check to the Errors view, where the problem will be identified.

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**Notes:** In Portfolio Simulation mode, WatchList Rankings will provide the same results as the $imulator for the same Period, Scale, and WatchList *provided that* the $imulator Period-tab option "Include Price Series that do not have complete historical data" is checked, and, no other options are selected on the $imulator's Options tab.

You can sort the list by clicking on any of the column headers. Double click on an item in the list to launch a ChartScript Window for the ChartScript used to perform the Rankings. Right click on a WatchList item in the Results list to bring up a pop up menu containing the option " *Make this the Preferred ChartScript for entire WatchList*". Selecting this item will make the ChartScript that was used for the WatchList Rankings the Preferred ChartScript for every symbol in the WatchList. See the Preferred Values Manager 273 topic for more information.

WatchList Ranking results are based on all closed and open positions. Like in the $imulator, open positions are evaluated using the closing price of the final bar for analysis purposes, however in this case, the commission is *not* deducted for this "closing trade".

---

## Ranking Metrics

Depending on the money management mode used for the Rankings, an appropriate set of metrics will be displayed. The table below summarizes the possibilities.

| Metric | Raw Profit Only | Portfolio Simulation |
|---|---|---|
| Profit or Net Profit | ✓ | ✓ |
| Profit per Bar | ✓ | |
| APR | | ✓ |
| Trades | ✓ | ✓ |
| Win/Loss | ✓ | ✓ |
| Avg. Profit % | ✓ | ✓ |
| Avg. Bars Held | ✓ | ✓ |
| Max DrawDown | ✓ | |
| Max DrawDown % | | ✓ |
| WL Score | | ✓ |
| Profit Factor | ✓ | ✓ |
| Payoff Ratio | ✓ | ✓ |
| Sharpe Ratio | ✓ | ✓ |
| Ulcer Index | ✓ | ✓ |
| WL Error Term | ✓ | ✓ |
| WL Reward Ratio | ✓ | ✓ |
| Pess. Rate of Return | ✓ | ✓ |
| Equity Drop Ratio | | ✓ |

Definitions for items specific to position sizing in Raw Profit mode can be found in the ChartScript's Performance View 76 topic. Likewise, definitions for items specific to sizing in Portfolio Simulation mode can be found in the $imulator's Performance View 163 topic.

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**Profit or Net Profit**

The total Net Profit generated by the system after subtracting commissions. The WatchList Ranking tool adds the profits of individual system runs for all symbols in the WatchList. Because different WatchLists can have a different number of symbols, comparing results by Profit isn't as effective as comparing by Profit per Bar (below).

**Profit per Bar** *Applies to:* Raw Profit Only

Net Profit per Bar. This is calculated by dividing the total Profit generated by the total number of bars in which Positions were held. Multiple WatchLists can be compared effectively by using Profit per Bar.

**APR** *Applies to:* Portfolio Simulation

APR, or Annualized Percentage Return, is the Net Profit % divided by the number of annual periods observed in the data used in the Ranking. This is also referred to as Annualized Gain % in the $imulator.

**Trades**

The total number of Positions taken by the ChartScript for all symbols in the WatchList. Includes open positions, which are evaluated using the closing price of the last bar for the Rankings analysis.

**Winning %**

A trade is marked a winner if its return after costs is above zero. Winning % is simply the number of winning trades divided by the total number of trades, expressed as a percentage.

**Avg Profit %**

The average percentage profit (loss) for all trades.

**Avg Bars Held**

The average number of bars held per trade.

**Max Drawdown** *Applies to:* Raw Profit Only

The maximum Drawdown is the largest dollar loss that was experienced throughout the historical testing period. This is calculated by summing the Max Drawdown of the individual symbol runs, so comparing by raw Max Drawdown isn't as effective as comparing by Recovery Factor (below).

**Max Drawdown %** *Applies to:* Portfolio Simulation

Max Drawdown % is the largest peak to valley decline, expressed as a percentage, in the system's equity curve during the simulation period.

**WL Score** *Applies to:* Portfolio Simulation

In Wealth-Lab Developer 4.0, the WL Score is calculated by first finding the Annualized Risk Adjusted Return, which is simply the Annual Percentage Return, or APR, divided by percent Exposure. For profitable systems, the RAR is adjusted by multiplying the sum of 1 plus the Max Drawdown Percent (a negative number). For further details, see the explanation for Wealth-Lab Score 163 in the $imulator's Performance view topic.

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**Profit Factor**

The Gross Profit of the system's winning trades divided by the Gross Loss of the losing trades. Calculated by dividing the total Gross Profit of all symbols by the total Gross Loss.

**Recovery Factor**

The absolute value of Net Profit divided by Max Drawdown. Recovery Factor measures how well a system is able to rebound after a loss. Multiple WatchLists can be effectively compared by Recovery Factor even when containing a different number of symbols.

**Payoff Ratio**

Payoff Ratio is the absolute value of the system's average profit per trade divided by the average loss per trade. Unless the system has a particularly high Win/Loss ratio, we look for high Payoff Ratios.

**Sharpe Ratio**

The Sharpe Ratio measures the risk-adjusted return of an investment. A Sharpe Ratio value of above 1.0 is considered good, while a value above 2.0 is typically considered outstanding. For further details, see Sharpe Ratio of Trades 163 in the $imulator's Performance view topic.

**Ulcer Index**

The Ulcer Index measures a portfolio's overall volatility. It is calculated by summing the squared draw downs, and then taking the square root of this sum. A lower Ulcer Index indicates less volatility and draw down, indicating that the system might be easier to tolerate in real-world trading.

**WL Error Term**

The Wealth-Lab Error Term measures the volatility of the equity curve. It is calculated by averaging the absolute value of all percentage distances along the equity curve from its linear regression line.

**WL Reward Ratio**

WL Reward Ratio is the Annual Percentage Return (APR) divided by the WL Error Term.

**Pess. Rate of Return**

The Pessimistic RoR is a statistical adjustment of the wins to losses ratio for the purpose of estimating the worst-expected return from previous results. For further details, see the Pessimistic Rate of Return 163 calculation in the $imulator's Performance view topic.

**Equity Drop Ratio** *Applies to:* Portfolio Simulation

Equity Drop Ratio (EDR) is the system's potential for loss expressed as a probability by computing the standard deviation of all drops in the equity curve measured from each equity low to the previous equity high and dividing the result into the annualized return. Only equity drops that are greater than or equal to the Equity Drop Ratio Threshold 255, whose value is set in the System Setting Options 255, are considered in the calculation. For further details, see the Equity Drop Ratio 163 remarks in the $imulator's Performance view topic.

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## 12.4 Errors View

A red dot appearing next to a WatchList name in the Results view indicates that an error has occurred during the processing of that WatchList. You can investigate the details of the error by clicking on the Errors View. The Errors View indicates any and all types of ChartScript compilation and runtime errors as well as DataSource errors (Insufficient Data, etc.) encountered during the Rankings process.

**See also:** ChartScript Rankings Errors View 182

## 12.5 WatchList Rankings FAQs

***After double clicking an item in the Result view, a ChartScript Window opens with the selected ChartScript but the results don't match Rankings. Why is that?***

Unless a WatchList contains one symbol only, the results are *unlikely* to match since WatchList Rankings essentially performs a complete Portfolio $imulation. If the WatchList does contain only one symbol, note that Wealth-Lab maintains the last-used settings in each tool, consequently, you must ensure that WatchList Rankings and the ChartScript Window are both using the same settings for the Position Sizing 263 and Data Loading 33 controls.

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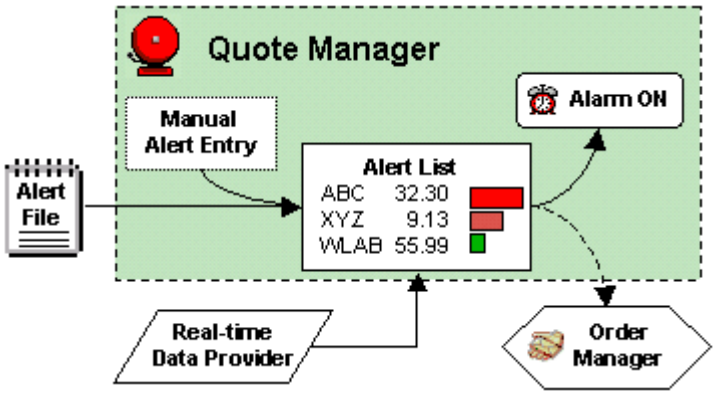
# 13 Quote Manager

## 13.1 Quote Manager Overview

The Quote Manager tool monitors real-time quotes and signals a visual and/or audio alert when prices reach your target level for *limit and stop* orders. Furthermore, triggered alerts can be optionally routed directly to Wealth-Lab Developer 4.0's Order Manager 222, and, you can configure EMail options 249 to alert you with a message!




***Quote Manager concept diagram***

Quote Manager Window 191
The Quote Manager window consists of a configuration pane at the top for selecting a real-time quotes provider, activation, loading alerts, and other options. Below it is a list used to monitor an order's proximity to its target price followed by the list of alerts that have been triggered. The following topics describe the Quote Manager's components in more detail.

Alert Management 193
You can add alerts manually by clicking the **Add Alert** button, or load a set of alerts from a file created by the Scans or $imulator tools by clicking **Load Alerts from File**.

Quote Manager Options 194
These options provide additional control of how and when alerts are triggered as well as optional order routing to the Order Manager.

Alert Lists 196
The Alert Symbol List is used to monitor an order's proximity to its target price, and, the Triggered Alerts List is comprised of orders that have hit their targets, if any.

Employing the Quote Manager 199
How you choose to use the Quote Manager is a matter of trading style, but we've got some ideas for you.

Quote Data Providers 200
Wealth-Lab Developer 4.0 natively supports quotes from QCharts, eSignal, QuoteTracker, as well as free quotes from participating ECNs via Yahoo!. Additionally, a 3rd-party data provider can provide data to the Quote Manager via the Real-Time Data Adapter API.

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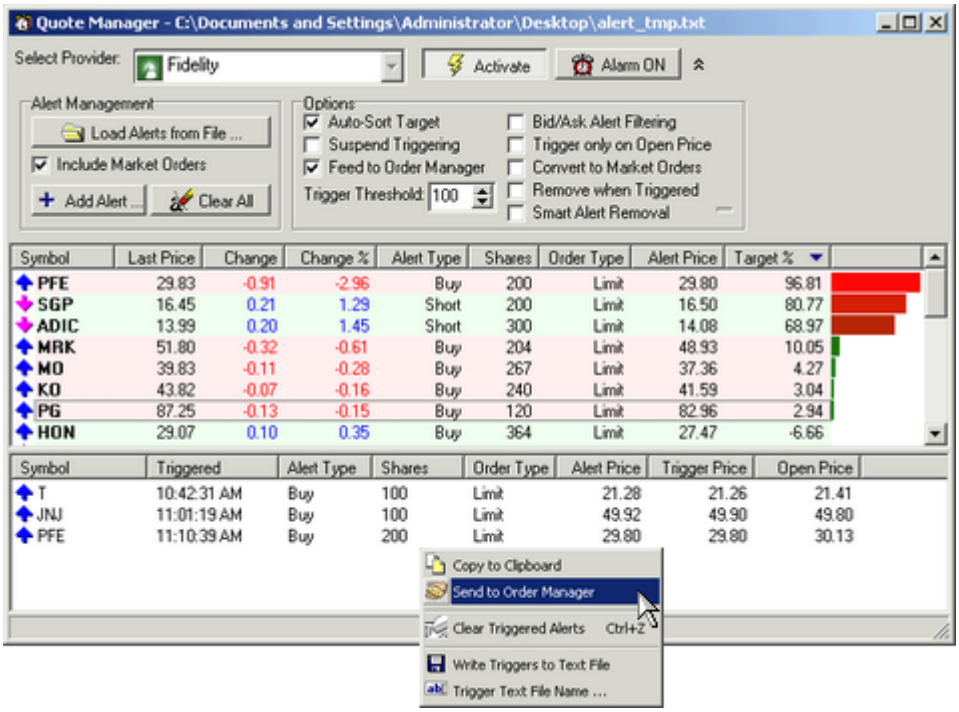
## 13.2 Quote Manager Window

The Quote Manager window consists of a configuration pane at the top for selecting a real-time quotes provider, activation, loading alerts, and other options. Below it is a list used to monitor an order's proximity to its target price followed by the list of alerts that have been triggered. Multiple Quote Manager windows may be opened, which can be advantageous for organizational needs of simultaneously trading in more than one market, for example.




***Quote Manager - Activated with 3 Triggered Alerts; showing right-clickpop-up menu for Triggered Alerts frame.***

An Alerts file can be generated by exporting an alert list from the WatchList Scans or $imulator tools. This makes it easy to trade ChartScripts that operate by placing stop and/or limit orders for each symbol in the WatchList. You can run an end of day scan to generate all of the stop/limit order alerts, then load the alerts into the Alert Manager. Turn on the Alert Manager at the market open and let it monitor prices for you in the background.

**Activate** [the Quote Manager]

Before activating the Quote Manager (QM), select your real-time data provider from the drop down list. After selecting your DataSource, turn on the QM by clicking the **Activate** button. Upon activation, the QM will process the alerts and delete duplicates.

Generally, you will want to **Activate** just seconds prior to market's opening bell. Otherwise, depending on the data provider, you risk that pre-market activity inadvertently triggers Alerts.

See also: **Suspend Triggering** in Quote Manager Options 194.

**Activate at** (button not shown in image)

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For automated activation, click **Activate at** button. You can set up the Quote Manager to auto activate at 9:31 AM, for example. You must leave the Quote Manager window open. Current time is determined by your ***computer's system clock***. If you enter a time earlier than the current time, the Quote Manager will activate immediately.

Activation is scheduled when the button is in a 'depressed' state. To cancel the activation, simply click the button again to raise it. While the Quote Manager is activated the **Activate at** button is disabled.

**Note:** QCharts, RealTick, etc. If you must enter a user name/password for your real-time data feed, it will be required to do so at the activation time. This can be circumvented by opening a real-time chart first, which establishes the connection and performs the logon.

### Alarm ON

When one or more Alerts reach their Trigger Threshold 194 level, the button **Alarm ON** will assume a "depressed/on" state. If the sound option 251 for an "Alert Triggered from Quote Manager" is enabled, the programmed sound will be played in an endless loop at approximately 5 to 10 second intervals. To prepare for the next alert trigger and to reset the sound, you must acknowledge the **Alarm ON** button by clicking it, which will change its state to "raised", or "reset".

### Show / Hide frame

If the Alert Management and Options frames are not showing, click the show frame button. Alternatively, once you have configured the Quote Manager, you can hide the frames to focus just on the alerts and their quotes.

### Alert Types

Each alert consist of a symbol, a number of shares, an alert price, an alert type and an Order type. For example, you can set up an alert to Buy 100 shares of XYZ at limit price $40. As soon as the Quote Manager receives a quote for XYZ at or below $40 your alert will trigger. On the other hand, if you create an alert to Buy 100 XYZ at stop price $20, the alert will trigger if prices hit $20 or higher.

### Sorting Alerts

You can sort the alerts by clicking on any of the column headings. The last two columns of the Quote Manager show you how close the current price is to reaching the trigger level. You can sort by these columns to bring to the top the symbols that are closest to hitting their target levels.

See also: **Auto-Sort Target** in Quote Manager Options 194.

### Triggered Alerts

Whenever an alert is triggered it is added to the list at the bottom of the window, along with the time and price that it was triggered. Additionally, triggered alerts turn on the audio alarm, which sounds approximately every five seconds. To turn off the alarm and reset it for the next trigger, click the **Alarm ON** button so that it appears in a "raised" button state. If not using the Feed to Order Manager 194 option, you can right click in the Triggered Alerts frame to "Send [Triggered Alerts] to the Order Manager".

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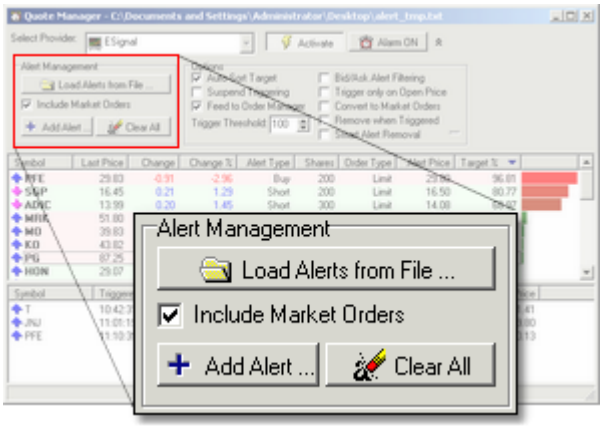
### Email Alerts

You can also configure the Quote Manager to send you an email whenever an alert is triggered. This is accomplished in the Options Dialog 244 on the EMail Alerts 249 tab.

---

## 13.3 Alert Management

With the buttons in the Alert Management frame you can load a list of Alerts generated from other tools, manually create alerts, or quickly clear all alerts to start with a fresh Alert Manager. Remember that you can simultaneously open multiple Quote Manager windows.




**Quote Manager Alert Management control frame**

### Load Alerts from File ...

When Alerts are exported to a file as the result of a WatchList Scan or $imulation, a specially-formatted text file containing all the necessary trade information is created. By clicking this button, you can import these lists into the Quote Manager's Alert symbol list. Alerts are always added to the existing list, so you can load alerts from multiple files into the same Quote Manager window.

**Note:** **AtClose** orders are not supported by the Quote Manager, and will not be loaded.

You can also load Alerts from a text file having Wealth-Lab Developer 2.1's Alert file format. The text record format uses a semi-colon field separator as follows:

*Symbol*;*PositionType*;*Shares*;*OrderType*;*AlertPrice*

where case sensitivity is preserved for *Symbol* (only), and valid field values are shown below.

| | |
|---|---|
| *Symbol* | Alphanumeric sequence of characters, excluding semi-colons |
| *PositionType* | Buy, Sell, Short, or Cover |
| *Shares* | An integer value. Floating-point values are interpreted as zero |
| *OrderType* | Limit or Stop |
| *AlertPrice* | A floating-point number |

**Example**

```
ABC;Buy;500;Limit;32.49
SP H4;Buy;2;Limit;1302.25
```

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**Note:** Although the 2.1 File Format is compatible with Wealth-Lab Developer 4.0's Quote Manager[190], we discourage its use since it does not support all data fields required for full integration with the Order Manager[222].

### Include Market Orders

Check this option to include market orders with limit and stop order alerts when Loading Alerts from File. Generally, you enter market orders with a broker prior to the opening bell. However, if you choose to load market orders, upon activation the Quote Manager will immediately send them to the Order Manager[222] if Feed to Order Manager[194] is checked.

### Add Alert

Provides the ability to manually create stop and limit orders to monitor in the Quote Manager. Clicking the **Add Alert** button launches a dialog in which you can enter a symbol, order price, number of shares, an Alert Type (Buy, Sell, Short, or Cover), and an Order Type (Limit or Stop). Note that some data providers do not provide the "Last Price" until the next trade. This can result in a large delay before display Alert information for less active securities.

**See Also:** General-Purpose Quotations[199]

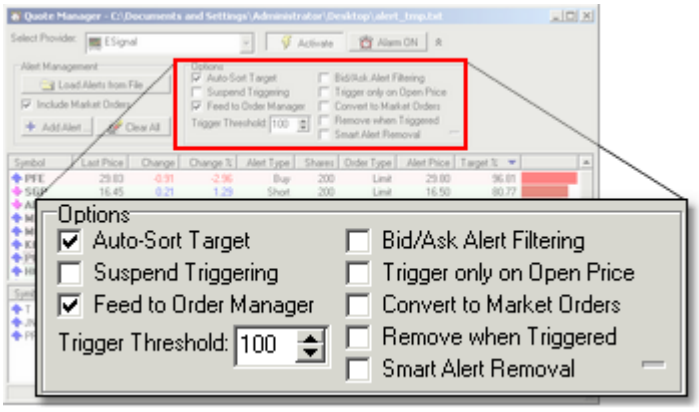
### Clear All

Activating this button will Clear All Alerts from the Quote Manager's alert symbol list. Triggered alerts are not affected and may be clear separately by right clicking in the triggered alert list area and selecting "Clear Triggered Alerts".

---

## 13.4 Quote Manager Options

The check boxes in the Quote Manager's options frame provide additional control of how and when alerts are triggered as well as optional order routing to the Order Manager.




***Quote Manager Options frame***

### Auto-Sort Target

If this option is turned on and while the Quote Manager is activated, the Alerts list will be sorted automatically by Target % approximately every 5 seconds to ensure that the most imminent alerts are displayed at the top. Prices that are closest to (or beyond) their target level will automatically move higher in the alert list.

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### Suspend Triggering (of Alerts)

If this option is turned on, alerts will not be triggered, even if the Alert Manager is activated and prices reach their target level. This option is useful if you want to pre-load the symbols in the Alert Manager, activate it, and then un-suspend the alert triggering right at the market open. When the "Suspend" is deselected, another trade must occur to actually trigger an alert - even if the target had been reached prior to the deselection.

### Feed to Order Manager (*Enables option: Convert to Market Order*)

Activating this option will cause newly-triggered alerts to be routed automatically to the Order Manager's queue. Selecting this option will *not* feed previously-triggered orders to the Order Manager.

**Warning!** If you have enabled the Order Manager to operate in Auto-Pilot mode 232, selecting **Feed to Order Manager** will result in the automatic submission of the order to your broker in the least amount of time possible.

### Trigger Threshold

Set the threshold in percent at which you want Alerts to be triggered. The default setting is 100, and the valid range is from 1 to 200, inclusive. When the Target % value matches or exceeds the Trigger Threshold, the Alert will be triggered. A setting *below* 100% will trigger stop and limit orders before the market actually reaches the alert price, which may be required in fast-moving markets or to place a short limit order while a stock is still in an up tick.

**Note:** Trigger Threshold is locked (disabled) from changes while Activate is selected.

### Bid/Ask Alert Filtering

If this option is turned on the Alert Manager will not trigger an alert if the alert price is outside of the current bid/ask range. This can prevent some alerts from being triggered due to bad ticks or trades outside of best market.

### Trigger only on Open Price

Selecting this option instructs the Quote Manager to trigger an alert *only* if the security's opening price meets the trigger level. For this feature to be effective, your real-time data provider must be capable of obtaining and passing the opening price via the Quotes interface. Note that the native implementation of Yahoo! quotes does *not* support this feature.

### Convert to Market Order

For more assurance that your order will be executed at the time that the alert is triggered, especially for fast markets, you can convert your stop and limit orders to *market* orders. With **Convert to Market Order** checked, your stop and limit orders will be changed to *market* orders at the time the alert is triggered and sent to the Order Manager.

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As with any market order, you are subject to slippage in the execution price. Furthermore, sparsely-traded (illiquid) securities can have large spreads, therefore you may end up paying a premium price by converting to a market order. Use this option carefully.

**Notes:**

- The option **Convert to Market Order** is enabled for selection only when **Feed to Order Manager** is checked.
- Short market orders are not delayed by Interactive Brokers. The IB execution system will automatically adjust the price to an up tick if necessary. At the time of this writing, Interactive Brokers does not offer "bullets".

#### Remove when Triggered

You have the choice to continue monitoring a security's quotes after its Alert has been triggered. If you prefer to immediately remove a triggered Alert from the list in the upper frame, checked the **Remove when Triggered** option. Also, you can manually remove Alerts by selecting them and striking the Del key or choosing the **Remove Selected Alert(s)** options from the right-click pop up menu.

#### Smart Alert Removal

If this option is checked, it affects the Quote Manager in 2 ways. First, as soon as the QM is Activated, or the *Smart Remove Now* button is pressed, all the alerts are processed and "duplicates" are deleted. If there is a market order to enter or exit a symbol, matching limit and stop orders (and duplicate market orders) are deleted. Multiple limit and stop orders are also pared down to a single limit/stop order for each order type. For example, if AAPL is trading above two BuyAtLimit orders, one at $10 and one at $12, the one at $10 is deleted because the $12 buy is more likely to be hit.

Second, once an alert is triggered, other alerts for that symbol/order type are removed. For example, if a limit order to go long AAPL and a stop order to go short AAPL are both in the alert list, as soon as *one of these* orders is triggered the other is deleted from the Alert list.

**Note:** The *Smart Remove Now* button is disabled while the QM is Activated. If desired, click this button to perform the smart removal operation prior to activating the QM.

**See Also:** EMail Alerts 249 in the Options Dialog 244.

---

## 13.5 Alert Lists

### Alert Symbol List

The Alert Symbol list imparts all the real-time quote information necessary to determine the proximity of an Alert to its Alert price. It is possible to display the following information, although all real-time quote providers may not support every field. Unsupported fields will retain zero value.

**Note:** Profit Targets and Stop Loss orders on the *entry bar* cannot be generated for EOD scripts that use the Quote Manager.

### Alert Pop-up Menu

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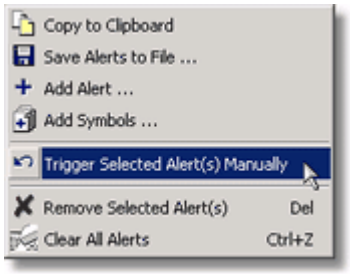


***Several options are available by right-clicking in the Alerts area***

### Copy to Clipboard

Take a snapshot of the current Alert values by copying to the Windows clipboard and pasting directly into Excel, for example.

### Save Alerts to File

Saving or re-saving the Alert list can be useful for many reasons. Assume that you're trading a weekly system and generate trading signals on Saturday for the next week. As Alerts are triggered and removed from the list, you can save the resultant list for the next day of trading so that triggered alerts will no longer interfere.

### Add Alert

This selection duplicates the Add Alert 193 action in the Alert Management frame.

### Add Symbols

See General Purpose Quotations 199

### Trigger Selected Alert(s) Manually

This action forces one or more selected Alerts to trigger immediately.

### Remove Selected Alerts(s)

Removes (clears) one or more selected Alerts from the list without triggering them.

### Clear All Alerts

Completely clears the list.

## Alert Fields

### Symbol

End of day, static DataSources have many origins, and although symbols are generally consistent between them, you must ensure that the symbol used for generating the alert is the same as that used by your real-time data provider.

### Last Price

Represents the last actual trade of the security. Note that pre-market trading activity may cause the last price from the previous session to be reported by some real-time providers. See Suspend Triggering 194 for more information.

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### Change / Change %

Represents the current change from the previous day's settlement price (Last Price - Previous Close). Change percent is with respect to the previous close.

### Alert Type

One of the four possible alert types generated by your ChartScript - Buy, Sell, Short, or Cover.

### Shares

The number of shares that were calculated for the position size.

### Order Type

Either Limit or Stop. Market order types should be placed at the beginning of the trading session and therefore are not imported to the Quote Manager.

### Alert Price

The Limit or Stop price determined by your ChartScript.

### Target %

Represents the percentage of the current price move towards the objective. For example, say the previous close was $10 and the alert is $11. If prices move to $10.50 then they have moved 50% of the total distance required to trigger the alert. Consequently, at $11 the prices are 100% of the target and over $11, you would see a value exceeding 100%.

### Indicator Bar

The bar color depends on the % proximity from bright green near 0%, to dark green near 25%, and then advancing from brown to maroon to red to bright red at 100% and above.

---

## Triggered Alerts List

Alerts reaching their Trigger Threshold 194 (or greater) targets are automatically entered in the lower frame of the Quote Manager window, however, they also remain in the previous list until manually deleted. You may wish to continue monitoring the real-time information in the Alerts Symbol List. The following additional information is available for triggered alerts.

### Triggered (Time)

The time at which the Alert was triggered in the Quote Manager. The format of the display is based on your computer's regional settings for time.

### Trigger Price

The trigger price is the price of the security at the time the alert was triggered. This may or may not be the alert price depending on price gaps and also the time at which you activated the Quote Manager.

### Open Price

Represents the price of the first trade, or opening price, of the current session. See **Trigger only on Open Price** in Quote Manager Options 194.

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The Triggered Alerts List has its own right-click pop-up menu that includes actions specific to triggered alerts. For example, if not using the automatic Feed to Order Manager 194 option, you can right click in the Triggered Alerts frame to **Send to the Order Manager**. Triggered alerts can also be exported in a semicolon-delimited file format by right clicking in the list area and choosing **Write Triggers to Text File**. Future triggers will automatically be saved to the file, consequently you can configure a file to receive triggered alerts prior to activating the Quote Manager. Similarly, by choosing the option **Trigger Text File Name**, you can direct new triggers to be sent to a different text file.

---

## 13.6 Employing the Quote Manager

How you choose to use the Quote Manager (QM) is a matter of trading style. Generally when trading end-of-day systems, you can enter your stop and limit orders at the same time as your market orders - at the beginning of the session. In this case, the QM may be useful to you to indicate which trades are being triggered and to monitor the progress of other open trades.

But the Quote Manager is really "worth its weight" in gold for bands traders who have a large WatchList but in reality only have the opportunity to enter a few trades per day. Assume you're sizing positions to 10% of equity. Imagine attempting to enter 100 (or several hundred) limit orders with a broker while trading an end-of-day "dip buyer" system. It's not likely that you are able. Instead, you'll use the QM to monitor an imported Scans Alert list, and, when a security approaches its corresponding Alert price, the QM will notify you that the time is opportune to place the stop or limit order.

Still, it's possible that your system needs a "human element" to reject trades after large gaps, for example, or, you may simply not want to show your order for all the world to see until the market comes to *your price*. The Quote and Order Managers make a potent combination to post your order at the precise moment in which a trade is marketable.

---

### General-Purpose Quotations

You may also use the Quote Manager to monitor real-time quotations for discretionary trading. To add a symbol(s) for general-purpose quote monitoring, simply right click within the Alert list area and choose **Add Symbols...** Enter one or more symbols separated by commas. Leading and trailing blank spaces are "trimmed" automatically. Note that symbols added in this manner are not Alerts and are identified by the $ cash icon to the left of the symbol in place of the buy/sell arrows.

---

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## 13.7 Quote Data Providers

### Native Support

The following data providers can be used to power the Quote Manager[190] and are included with your Wealth-Lab Developer 4.0 installation.

#### Yahoo!

The Alert Manager hits the Yahoo! real-time ECN quote page about once every 10 seconds. While Yahoo! provides these quotes for free, they only include quotes from a limited number of participating ECNs.

**Warning:** ECN quotes do not necessarily represent "best market".

**Note:** The native implementation of Yahoo! quotes does not support **Bid/Ask Alert Filtering** nor does it support **Trigger only on Open Price**.

#### QCharts

You must have a QCharts[132] account and configure Wealth-Lab Developer 4.0 to interface with QCharts before using this DataSource.

#### ESignal

You must have an ESignal[133] account and configure Wealth-Lab Developer 4.0 to interface with ESignal before using this DataSource.

#### Medved QuoteTracker

You must have Medved QuoteTracker running in order to use this DataSource. Additionally, there is a one-time configuration that you must perform on QuoteTracker in order for it to work. For details, see the Medved QuoteTracker Support page on the Wealth-Lab web.

**Note:** Bid/Ask Alert Filtering is not supported.

#### Tai-Pan Realtime

You must have Tai-Pan Real-Time[134] installed and have a valid Tai-Pan account to use this DataSource. See the topic Real-Time DataSources for a discussion of Tai-Pan Real-Time.

### Third-Party Support

Additionally, Wealth-Lab Developer 4.0 includes newly-added support for quotes via the Real-Time Data Adapter API. At the time of this writing, the following 3rd-party adapters have included support for the Quotes interface. You must have an account in good standing with the listed provider and install its real-time adapter for Wealth-Lab.

#### REALTICK®

See the Townsend Analytics[134] topic in the "Real-Time Vendors Supported" chapter.

#### DTN IQFeed

See the DTN IQFeed[135] topic in the "Real-Time Vendors Supported" chapter.

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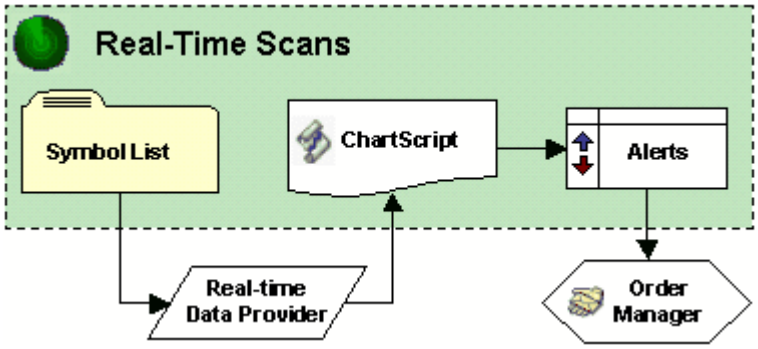
# 14 Real-Time Scans

## 14.1 Real-Time Scans Overview

What do you get when you pick a list of symbols, select a real-time data provider, and choose a ChartScript and scale? You asked for it, and Wealth-Lab listened: Real-time Scans 201 has arrived.

With Real-time Scans there's no need to open an intraday ChartScript window for each issue that you want to trade in real-time. As with other tools having alert-generating capability, you can route orders directly to the Order Manager for automated order entry. Wrapped into the familiar Scans interface, you'll be "off and scanning" before you know it!




***Real-Time Scans conceptual diagram.***

**Note:** **Real-Time Scans** operates in the same *pseudo-real-time* sense as the ChartScript window. Trading systems are executed only at the instant that a new complete bar interval is received. Scan results and indicators are based on the last complete bar interval only.

Setting up Real-Time Scans 201
Although the tool is quite complex, the RT Scans design makes it easy to begin scanning within seconds. RT Scans is so manageable in fact, that you're likely to forget to open the Order Manager for ATS; so in case you do, this is done automatically!

Scan Results View 204
With Scan Results, you have Alert logging along with the status of the real-time data used in the most-recent scan. Alerts can be optionally "fed" to the Order Manager. In addition, Wealth-Lab calculates your system's open and closed profit for each symbol.

Errors View 206
Make sure that you correct any errors that pop up in this view before considering RT Scans for trading.

---

## 14.2 Setting up Real-Time Scans

The **Real-Time Scans** tool is designed to trade systems (ChartScripts) that operate on *n*-minute intervals, i.e., minute-based intraday time frames. It provides the same trading capability and options of multiple Real-time ChartScript windows without

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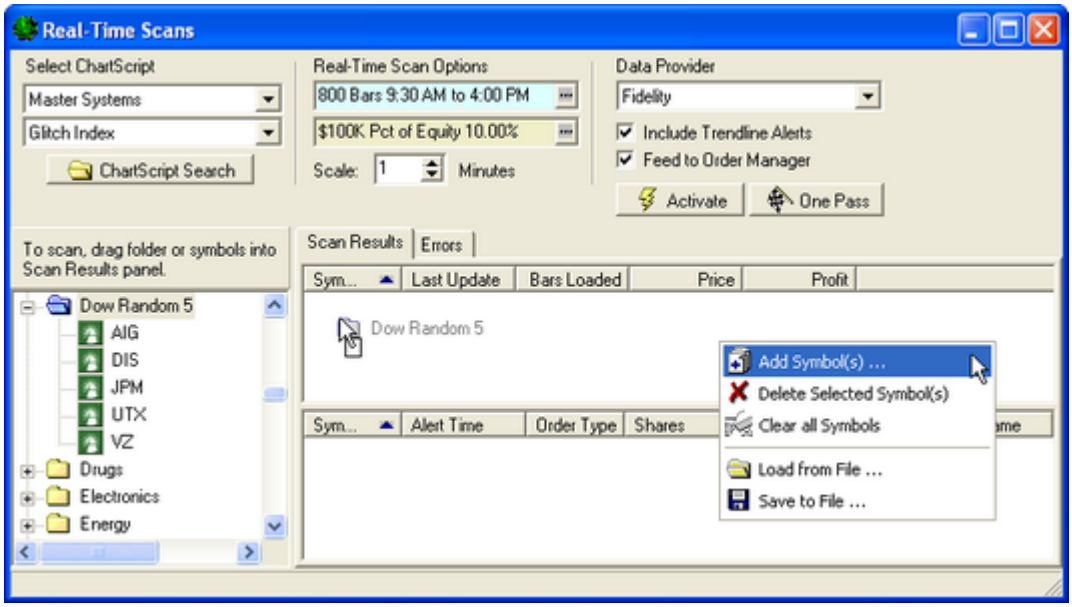
consuming the same amount of computer resources. Instead of opening 10 Real-time ChartScripts, you can enter 10 symbols in a single **RT Scans** window. Additionally, more than one **RT Scans** window may be opened, which can be advantageous for organizational needs of simultaneously trading in more than one market, for example.

Before proceeding with **RT Scans**, you'll need the following items:

- a Real-time data 132 provider integrated with Wealth-Lab Developer 4.0
- an internet connection (preferably high-bandwidth)
- a ChartScript compatible with intraday data
- *Optional:* an electronic broker supported by the Order Manager 222




***Adding symbols to Real-Time Scans window via drag & drop or from the right-click pop up menu***

---

## Select ChartScript

The Folder and ChartScript drop down controls provide a means to choose a ChartScript for RT Scans. If you need assistance locating a script, perform a **ChartScript Search** using the ChartScript Explorer's 42 search features.

---

## Real-Time Scan Options

### Data Range/Position Sizing

Specify the number of historical bars to load and data filtering options with the real-time version of the common Data Loading Control 33. Like the Real-Time ChartScript Window, RT Scans appends intraday bars to the history initially loaded.

Configure your Positions Sizing options 263 and whether or not you wish to run in a Portfolio Simulation mode or Raw Profit mode. Like a Real-time ChartScript window, the Portfolio Simulation is applicable only for the symbol being processed and *does not* represent an actual simulation of the entire symbol list.

### Overriding Futures Symbol Manager (FSM) Settings

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The Data Loading control defaults to a "stock mode" until it detects that a futures symbol has been loaded. Since you cannot make changes to the controls when RT Scans is activated or updating, it's necessary to perform a **One Pass** to reset the Data Loading control to a futures mode. This is only necessary if you need to make a change to the **Override FSM Settings** option of the Data control. Do this procedure with "Feed to Order Manager" deselected, and if unwanted Alerts are generated, clear them before Activating RT Scans.

**Note:** Although it's possible to work with a mixed bag of stocks and futures in the same RT Scans window, we recommend that that stocks and futures be run from separate RT Scan windows.

### Scale

RT Scans operate for *n*-minute intervals only. Tick and Second intervals are not currently supported.

---

## Activating Real-Time Scans

### Data Provider

Choose the provider of streaming data to power RT Scans.

### Include Trendline Alerts

Tradable Trendlines (TTs) drawn in an intraday chart window can be used to trigger Alerts in RT Scans by enabling this option. TTs may be drawn in either static or streaming mode and are valid in RT Scans for the same symbol and intraday interval.

**Warning!** It's possible that the same trendline generate more than one signal if the crossing condition occurs more than once.

### Feed to Order Manager

By enabling "Feed", Triggered Alerts appearing in the lower Scan Results frame will be routed directly to the Order Manager (OM). The OM opens automatically after the Data Loading update if "Feed" is selected and the OM is not previously initialized.

You can open multiple instances of RT Scans windows, and each one is initialized with the "Feed" button disabled. Consequently, a decisive action is required on your part to enable this feature for each new window. For more details, see the Feed to Order Manager discussion in the Features of Real-Time ChartScripts topic.

### Activate / De-ctivate

Once you have completed the steps above, initiate the RT Scans operation by clicking the **Activate** button. Upon activation, RT Scans will load the amount of historical data specified in the data control in update/refresh mode. Thereafter, new bars that become available are appended to the existing data. Just as in a real-time ChartScript window, Wealth-Lab executes the ChartScript automatically and as soon as possible after receiving a new-bar.

**Note:** While RT Scans is activated or updating, you cannot make configuration changes, such as adding to/deleting from the symbol list or adjusting the intraday interval. If a change is required, *deactivate* RT Scans.

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**One Pass**

This action gives you the ability to perform a single Scan in pseudo-real-time over the selected number of bars, up to and including the most-recent complete bar. Each time **One Pass** is clicked, data is refreshed from the data provider. Alerts occurring on the last interval will appear in the lower Scan Results frame for Triggered Alerts. **One Pass** is disabled when **Activate** is selected.

***Prior to activating RT Scans***, you should take the following steps.

- To work with the automated trading system, open the Order Manager and make a connection with your broker. Follow the Order Manager's instructions for using Auto-Pilot mode, if desired.
- Select a ChartScript to use for the RT Scan.
- Specify your historical Data Range and Position Sizing method.
- Choose an intraday interval in minutes.
- Add one or more WatchLists of symbols, or add symbols individually.
- Choose the Data Provider and other options

---

### Adding Symbols

Three methods are available for adding symbols:

- **Drag & drop** (WatchLists or symbols)
- **Load from File ...**
- **Add a Symbol**

You can drag & drop individual symbols or an entire WatchList from the DataSource tree to the Scan Results frame. Since data for all symbols will be retrieved by the selected provider, the DataSource from which the symbol is chosen is irrelevant. Repeat these operations until all desired symbols appear in the Scan Results frame.

Right clicking in the Scan Results frame launches the pop up menu (shown in the image above) from which you can select **Load from File ...** The file format is ASCII text and each symbol must appear on a separate line. Alternatively, you can create a text file of a RT Scans symbol list by selecting **Save to File...**

For quickly adding arbitrary symbols, choose **Add a Symbol** from the pop up menu. Note that a symbol can appear in the list only once, therefore duplicate symbols will be deleted automatically.

**Tip:** Once you have configured all the tools that you use daily, save your Workspace, **File|Save Workspace (Ctrl+Alt+H)**, to be able to quickly return Wealth-Lab to its current state. Restore your workspace by selecting **File|Open Workspace (Ctrl+Alt+G)** and choosing the name of the saved Workspace. Note that the states of the **Activate** and **Feed** buttons are not saved and always default *deselected* when a Workspace is opened.

---

## 14.3 Scan Results View

As new bar intervals become available they are added to the historical bars and the selected ChartScript is automatically executed on individual symbols, just as in a Real-time scan ChartScript window. ChartScripts that loop over WatchLists should not be

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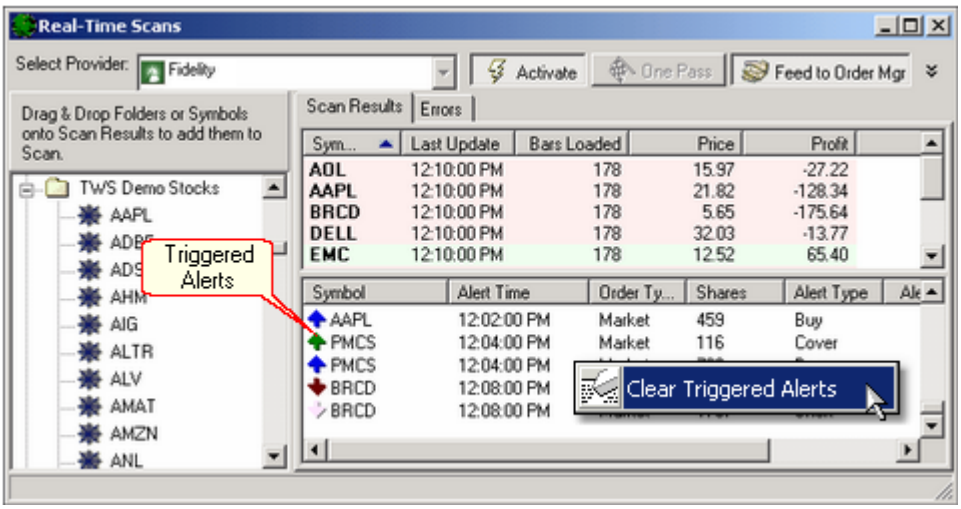
used in RT Scans. For other real-time considerations[131] see the Real-time ChartScripts topic.




**RT Scans Scan Results and Triggered Alerts**

### Scan Results status frame (upper)

The fields (columns) in the Scan Results status frame are described below. You can sort any field by its contents by clicking on the column headings.

**Symbol**
The security symbol selected for RT Scans. This symbol must be in the format required by your real-time data provider. Symbol mapping[223] entries must be made in **symlo.txt** if differences exists in symbol formats used by your real-time data provider and your broker.

**Last Update**
Time stamp of the final bar received by the real-time data provider and loaded for the symbol. Note that some data vendors mark intraday bars using the time from the beginning of the period. The format of the displayed time can be changed by editing your computer's Regional [Time] Options in the Windows Control Panel.

**Bars Loaded**
The number of bars that have been processed by the selected ChartScript. You can think of each symbol as a separate real-time chart. When a new interval is completed, its bar is added to the rest of the historical bars.

**Price**
The most recent closing price of the *last complete interval*. This price does not necessary reflect the most recent trade

**Profit**
The sum of open and closed profit for the symbol over the historical period loaded, Trading Costs[257] included.

**Custom Columns**
If you use AddScanColumn and/or AddScanColumnStr a ChartScript selected for RT Scans, the specified column will be added to the Scan Results.

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### Triggered Alerts frame (lower)

The lower Scan Results frame received Triggered Alerts from the RT Scans. The columns contain the Symbol, Alert Time, Order Type, number of Shares, Alert Type, Alert Price, and Signal Name. Wealth-Lab displays the basis price as the Alert Price for orders, including *BuyAtMarket* and *ShortAtMarket* orders.

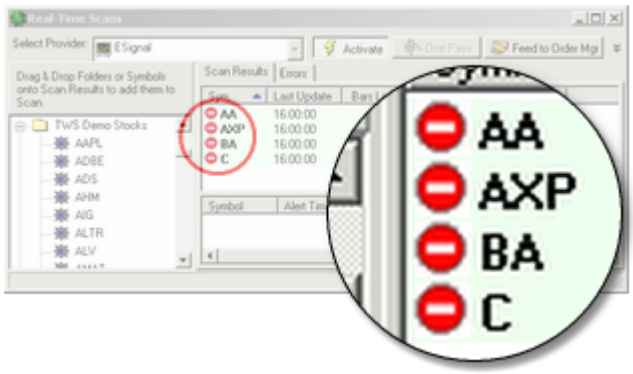
Alerts triggered by RT Scans are always added to the Triggered Alerts frame as they occur. If an identical Alert already exists (Symbol, Order type, shares, Alert type, price, and Signal Name), its Alert Time will be updated. This mechanization keeps the list of triggered alerts more manageable for scripts that hold a stop or limit order(s) open at the same price for multiple bars.

Triggered Alerts remain in this frame until you clear them. Remove individual Alerts by clicking on them and striking the **Del** key on the keyboard, or clear all Alerts quickly by right clicking and selecting **Clear Triggered Alerts** from the pop up menu.

---

## 14.4 Errors View

All ChartScript errors (compilation, run-time, etc.) that occur during RT Scans processing are output to the Errors view. Errors are indicated in the Scan Results view by ⛔ the "pass prohibited" marker next to the symbol. It is incumbent upon you to correct any scripting errors that occur during RT Scans.




***Errors flagged in Real-Time Scans. If you see this symbol, switch to the Errors View for details.***

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# 15 Evaluator

## 15.1 Evaluator Overview

The Evaluator tool can help you analyze the effectiveness of a technical indicator. The Evaluator goes through every bar of data in the selected WatchList or symbol and calculates the indicator value at each bar. It then determines the percentage profit return after a certain number of days, and displays a graph of the indicator value by future return.

**Note:** The percentage profit is given as if you were *buying* at the indicator value and *selling* after X number of days. This implies that from a short-sale point of view, a negative return is actually "positive".

---

### Evaluator Function

In Wealth-Lab Developer 4.0 you have two choices for entering the evaluation function in the **Function** entry field: 1) code the function manually as described below, or, 2) drag and drop an indicator from the Indicators tool bar. Dragging and dropping an indicator into the Function box will create an entry similar to the one below in Example 1. This is all you need to perform an evaluation of the indicator. Notice that the system assigns the Price Series that you want to evaluate to the special *Result* variable.

#### Example 1

```
Result := RSISeries( #Close, 14 );
```

But what if you're just experimenting with an idea in the ChartScript window and have not yet created a custom indicator? You can use complete multi-line scripts, as long as the final line of your code assigns a Price Series into the *Result* Variable.

Example 2 shows how you might go about this. You can first code, debug, and view the indicator in a regular ChartScript. When you have found something that looks worthy of an evaluation, simply paste the indicator's code into the Evaluator's **Function** entry field. Finally, add one more line of code that assigns the indicator's Price Series handle to the special *Result* variable.

#### Example 2

```
var Bar, Ser, serEMDiff, Period, EPane: integer;
var Delta, H, L: float;

Period := 10;
serEMDiff := SubtractSeries( EMPlusSeries( #Close, Period ),
                             EMMinusSeries( #Close, Period ) );
Ser := MultiplySeriesValue( serEMDiff, 1/Period );

{ Normalize indicator to +/- 100  }
Bar := BarCount - 1;
H := Highest( Bar, Ser, Bar );
L := Lowest( Bar, Ser, Bar );
if L > 0 then
  L := -1 * L;
Delta := H - L;
Ser := SubtractSeriesValue( Ser, (H + L)/2 );
Ser := MultiplySeriesValue( Ser, 200/Delta );
```

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```
EPane := CreatePane( 75, true, true );
PlotSeries( Ser, EPane, #Blue, #Thin );

{ After pasting the above script in the Evaluator's Function Entry
field,
  assign the indicator's Price Series handle to the special Result
variable }
Result := Ser;
```

You should stick to analyzing Price Series that fluctuate within fixed upper and lower bounds, such as RSI, CMO, Stochastics, and StochRSI. Indicators that don't fall within fixed bounds, such as SMA, MACD and OBV, will be less meaningful in the Evaluator. There could, however, be some value in evaluating indicators that return percentage values, such as ROC, even though they aren't confined to a fixed scale.

---

### Evaluator Scope

This section lets you control the period(s) that the Evaluator will use when calculating future profit return. You can set the Start, Stop and Step controls to cause the Evaluator to report on different combinations of future periods. For example, if you want to see what the return would be after 20 bars, just set Start and Stop to 20 and set Step to any value. If you want to check return after 10, 20 and 30 bars, set Start to 10, Stop to 30, and Step to 10.

---

### Evaluator Scale

These controls let you choose between examining Daily or Intraday DataSources in their native scales, or alternatively, you may convert them to Weekly, or Monthly scales for the purpose of the study.

---

### Performing the Evaluation

After you enter the desired settings, select the WatchList that you want to evaluate from the tree. To Evaluate only a single symbol, expand the WatchList and select the desired symbol. Click the **Begin Evaluation** button when ready to proceed.

The Evaluator will load each of your selected symbol(s) and examine each bar of data. It will determine the value of your Evaluator Function at each bar of data, and calculate the percentage return after the number of bars that you specified.

For additional information, see the following Wealth-Lab article:
Using the Evaluator Tool to Validate Indicators

---

## 15.2 Evaluator Results

### Function Profile

The Evaluator's primary output is in the form of a Function Profile graph. The graph displays the range of your Evaluator Function values along the bottom axis. For RSI, this would range from roughly 0 to 100. The left axis displays the average percentage profit return after the number of bars that you set up in the Evaluator Scope. There will be one line graph for each Period that was specified.

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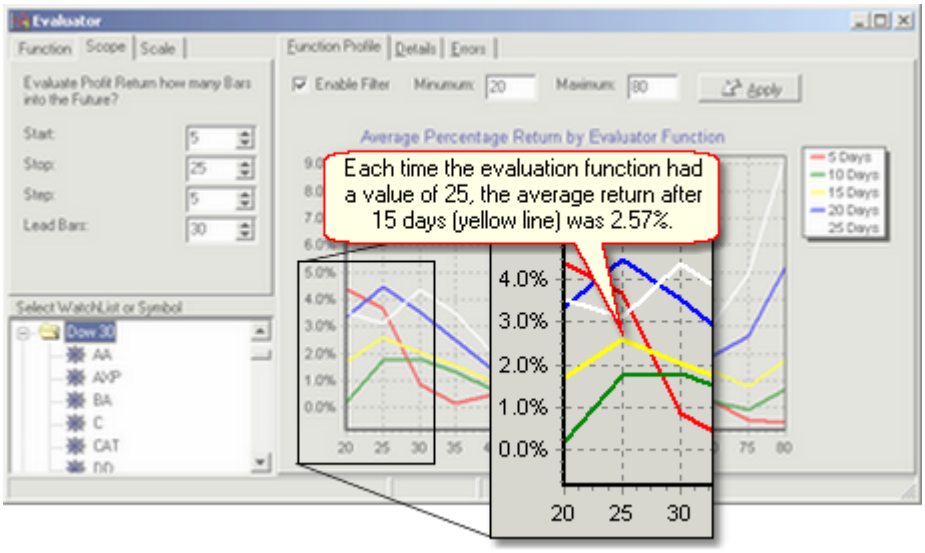


***Evaluation of the RSI function over the Dow 30 WatchList. The 5 colored lines represent the return 5, 10, 15, 20, and 25 days (bars) after the function obtained a particular value, which is displayed along the graph's x-axis.***

If you were evaluating RSI, for example, you'd probably expect to see the graph exhibit higher average values for the lower RSI values (indicating oversold conditions) and lower average profit for higher RSI values (overbought levels).

---

## Filtering the Data

Often times the Evaluator Function will contain a few values at the very extreme upper and lower ends of the range. Usually there are only a handful of actual observations within these ranges, so their values aren't statistically significant, and they can throw off the function profile graph. You can use the Filter option to filter the range of values and exclude these outliers. For example, you can filter the RSI values to between the more normal range of 30 to 70. Check the "Enable Filter" check box to turn the filter on. After making changes to the Minimum and Maximum filter values, be sure to click the **Apply** button.

**Note:** When you have applied "Enable Filter", the Detail View results are also filtered.

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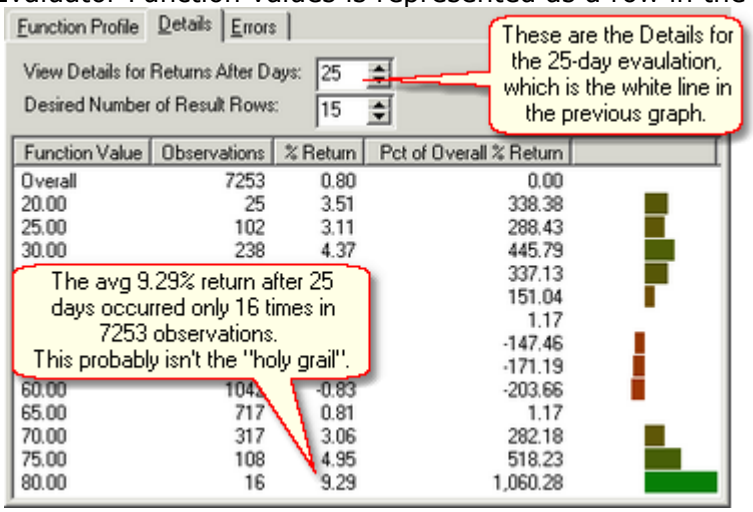
## Details View

Switch to the Details View to examine the numbers behind the function profile graph. Each range of Evaluator Function values is represented as a row in the list.




| Function Value | Observations | % Return | Pct of Overall % Return |
|---|---|---|---|
| Overall | 7253 | 0.80 | 0.00 |
| 20.00 | 25 | 3.51 | 338.38 |
| 25.00 | 102 | 3.11 | 288.43 |
| 30.00 | 238 | 4.37 | 445.79 |
| | | | 337.13 |
| | | | 151.04 |
| | | | 1.17 |
| | | | -147.46 |
| | | | -171.19 |
| 60.00 | 104 | -0.83 | -203.66 |
| 65.00 | 717 | 0.81 | 1.17 |
| 70.00 | 317 | 3.06 | 282.18 |
| 75.00 | 108 | 4.95 | 518.23 |
| 80.00 | 16 | 9.29 | 1,060.28 |

***Evaluator Tool's Details View***

**View Details for Returns After Days**
The first spin control changes the return Period that the list displays. The Period selected will correspond to a single colored line in the Function Profile graph.

**Desired Number of Result Rows**
The second spin control changes the number of rows, or "bins" in which the results are grouped. Selecting more rows will provide more detail, although inspecting too many rows will cause a loss of generality in the evaluation.

**Function Value**
The first row contains the values for the complete data set that was evaluated. More-graduated results can be obtained by increasing the number of result rows (see above).

**Observations**
The *Overall* number of observations represents the total number of observations from all bars (minus lead bars) in all of the symbols that were processed. For each *Function Value*, the observation count is the number of times the function was "observed" to be *equal* or *less than* the value while being *greater than* the previous value in the column. As noted previously, Filtering the Data 208 will almost always decrease the number of observations since values that fall outside of the filter will not be included in the detailed results.

**% Return**
The % Return displays the overall average profit percentage after the specified Period. This value is the baseline against which individual Evaluator Function values are measured.

Each subsequent row of data contains the values for a range of Evaluator Function values. For example, a filtered RSI might contain the value 20 as the first row. This row represents all of the bars of data where the RSI value was >19 and <= 20. You can see the total number of Observations (bars) where this condition occurred, as well as the average profit return.

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**Pct of Overall % Return**
The next column displays how much this return was above or below the overall return for all Observations. A small colored bar in the next column graphically depicts the same value. Large green bars indicate values where the average return was substantially higher than the overall overage. Conversely, large red bars show values where the average return was less than the overall average.

## Errors View

Should an error occur during processing of the evaluator function it will be displayed in the Errors View. Inspect and correct any coding errors in the Evaluation function and restart the process.

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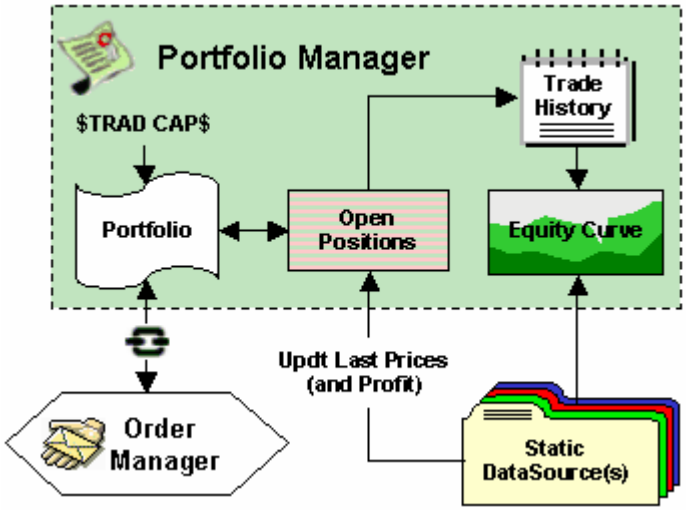
# 16 Portfolio Manager

## 16.1 Portfolio Manager Overview

Designed to keep detailed trade histories of multiple portfolios, Wealth-Lab Developer 4.0's Portfolio Manager automatically tracks trades placed through the Order Manager 222. The Portfolio and Order Managers work together to keep your Portfolio's equity holdings synchronized with those in your brokerage account. Additionally, the Portfolio Manager keeps an entire trade history, which when combined with historical price data from your static DataSources, you can observe a true-to-life progressive equity curve of your account.




***Conceptual diagram of the Portfolio Manager and external processes***

Open the Portfolio Manager by clicking its icon in main icon toolbar, selecting it from the Tools menu, or by using the keyboard shortcut **Ctrl+Alt+T**.

Creating a Portfolio 213
With the Order Manager's assistance, your Portfolio will mimic the transactions in your brokerage account, but you'll first need to enter your current holdings.

Paper Portfolio Actions 213

Positions View 217
A Portfolio's current cash and equity holdings can be found in the Positions View. If necessary, manually add and/or close positions so that your Portfolio exactly matches the holdings in your brokerage account.

Local Trade History View 218
The Trade History is a historical record of your Portfolio's cash deposit(s), account adjustments and trading activity. These records are used in the formation of the Equity Curve as well as for trade synchronization.

Equity Curve View 220
Combines actual trade data with that of your static DataSources. Use this view to observe the evolution of your equity holdings. This is not a simulation!

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## 16.2 Creating a Portfolio

It's necessary to create a Portfolio if you plan to use the Order Manager 222 to electronically submit trades to your broker that are generated by ChartScripts or for otherwise synchronizing actual historical trading positions with a script for use in EOD Scans, for example. Orders executed through the Order Manager will be entered automatically in the Linked Portfolio within the Portfolio Manager. If not using trading automation, you can still use a *Paper Portfolio* to enter and track Positions. If you wish to get a jump on things, you can start right now by manually entering your current holdings in the Positions View 217. See Paper Portfolio Actions 213 for more information.

---

## 16.3 Paper Portfolio Actions

### New Portfolio

To create a Portfolio, click the **New Portfolio** action. A dialog will appear in which you must enter a unique name for the Portfolio and a *Trading Capital Amount*. If you plan to synchronize your current account holdings, you should enter the ***Net Liquidation Value*** of the account, i.e., cash + current equity value, for Trading Capital Amount. Once entered, edit the date of the "cash deposit" by double-clicking it in the Positions View. Once you complete this action, the new Portfolio will be available for selection in the drop down control. If you are holding active positions in a brokerage account, add them to the Portfolio in the Positions View 217.

***Procedure to create a New Portfolio of brokerage positions***
(Complete with the Open Positions View 217 of the Portfolio Manager.)

1. Update your Static DataSources using the DataSource Manager 28 or other downloader program.
2. Open the Portfolio Manager and click **New Portfolio**.
3. Enter a Name, and an Initial Cash Value. Make this value *approximately* the full value (equity + cash) of your account on the day that you wish to enter your first trade. Click OK.
4. Double click the **$Avail Trade Cap** Position to edit it. Change the Entry Date to any day prior to the day of the first trade that you will enter next. Click OK.
5. Add/Remove ALL Trading Positions for the date period of interest.
6. Edit (double click) any open Positions that you intend to auto trade 222. Ensure all field properties are correct for the manner in which you will trade the position - ChartScript Name/Scale/Alert Date/Entry Date/etc. See Editing a Position 213 for details.
7. Click Update Last Close 213.
8. Find the current Net Liquidation value of your brokerage account. Click Balance 213 and enter this value for "New Balance".

**Note:** As with the Order Manager, you can open a single Portfolio Manager window only. Switch between Portfolios by choosing the name in the "Select a Portfolio" drop down box. Although you can create multiple distinct Portfolios, it is possible to link only one of them to the Order Manager at one time.

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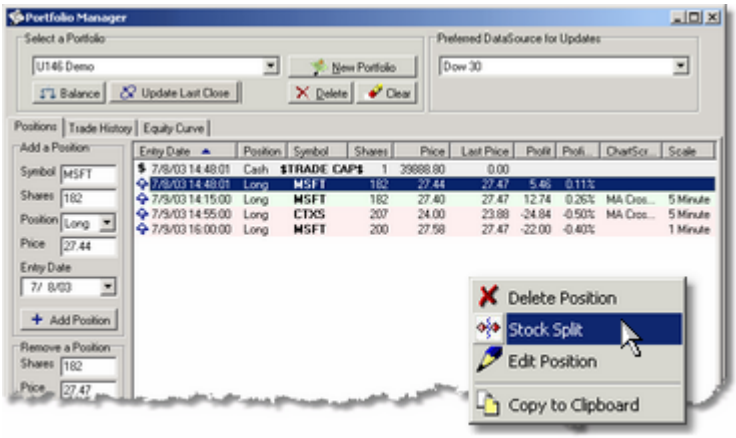


***Position View with right click pop up menu.***

### Delete (Portfolio)

Click this action to permanently remove a portfolio that is no longer useful to you. You will be prompted to confirm the deletion.

### Clear (Portfolio)

Deletes all Positions and Trade History. This action is handy for clearing out a test Portfolio and starting fresh. The initial $Avail Trade Cap deposit remains unaffected.

### Balance

Use the Balance action to make account adjustments such as cash deposits, withdrawals, dividend payments, etc. When changing the balance, the Portfolio's current *total value*, cash + equity, is initially shown. (For reference, the Portfolio Value is always shown in the status bar along the bottom of the Portfolio Manager's window.) If this value does not match the actual value of your brokerage account, simply enter the total dollar value, or *Net Liquidation Value*, of your account.

When ready, click the ✔ button to complete the adjustment, or the ✘ button to cancel the operation. The Portfolio's new available Trading Capital level will be shown in the Positions list, and, the **$Avail Trade Cap** adjustment will be reflected in the Trade History View 218.

**Note:** Before attempting to Balance your Portfolio, you should first update your static DataSources (using the DataSource Manager, for example) **and** perform the *Update Last Close* action.

### Update Last Close

This action updates the *Last Close* for all open positions in the Positions View 217 with their most-recent closing price from your static DataSources. The particular DataSource that is used is determined by the logic described below in Preferred DataSource for Updates 213. After completing this action, the dollar Profit and Profit % will be updated for all open securities in the Positions View 217.

**Note:** You should perform this action after your static DataSources have been updated after the market close. "Last Close" is never read from a real-time DataSource.

### Preferred DataSource for Updates

You can establish a Preferred DataSource to use when performing Update Last Close 213 and when updating the Portfolio Manager's

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Equity Curve 220.Data for symbols will first be drawn from the specified DataSource. For example, if you have TC2000 or QuotesPlus you can select one of these DataSources. Because these providers can accept ad-hoc symbols the Equity Curve data can be populated exclusively from these sources, even if the specific symbol does not exist in the DataSource. Thereafter, the update logic is as follows:

1. If data is not found in the Preferred DataSource, all Daily DataSources are checked for the symbol.
2. If the data still is not found, minute-based DataSources are checked. If found, the intraday bars are compressed to daily and used to populate the Equity Curve.
3. If the data does not exist in a minute-based DataSource, the PM attempts to download it from Yahoo! Finance.

**Tip:** For best performance, create a DataSource that contains the symbols that you trade and assign it as the Preferred DataSource for Updates.

## Add a Position

Similar to a financial application, first use the Portfolio Manager to balance your account holdings. For each position that you are holding in your brokerage or paper account, create a like position using the **Add Position** action.

**Important:** Once you have added a position that you wish to trade using end-of-day Scans or in real time via the Order Manager, you ***must*** Edit Position 213 properties to associate the position with the ChartScript, scale, etc. These details are required to synchronize existing positions with the trading script in Scans or Real-time ChartScript tools.

### Add Position

Begin by entering the symbol and the number of shares (or contracts). Select the Position's status as "Long" or "Short", enter the execution price, and choose the date on which you opened the Position. Finally, click **Add Position**.

**Remarks:**

1. The local time of the Add operation initializes the Time fields for Entry and Alert Date/Time in the Position details.
2. Currently, adding positions does not subtract commission costs. To square your Paper Portfolio after all positions have been added, make an adjustment using the Balance 213 feature.
3. For futures symbols, $Avail Trade Cap will be reduced by the contract margin entry in the Futures Symbols Manager 271.

## Remove a Position

Removing a Position from a paper Portfolio is necessary to clear trades that were entered manually, or perhaps to close Positions that have become worthless or expired. Also, stocks that undergo a symbol change should be removed and "re-added" (see above) using the current symbol.

**See also:** Splitting a Position 213

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### Close Position

To manually exit a position, first click on the item in the list, which will automatically fill the "Shares" field with the number of shares (or contracts) for the full position. Finally, select the Exit Date and click **Close Position.** Closing a Position *creates* a new entry in the Trade History 218.

**Note:** To exit a partial position, you may decrease the number of shares, however, Wealth-Lab does not currently synchronize positions for partial fills that occur over multiple days. For the latter situation, you should account for the partial size while trade manually and remove the entire position on a specific (single) date.

### Delete

If you have made an error manually adding a Position, you may use this action to remove a trade from the list. Simply select the list item and click **Delete**. Repeat once for each erroneous entry. This action also removes the entry from the Trade History 218.

**Note:** You may need to expand the Portfolio Manager window to see this button. Do *not* try to use the **Delete** button in the "Select a Portfolio" frame to remove a position!

## Splitting a Position

For stocks that split, use the Portfolio Manager's stock-split utility. When actively trading a stock undergoing a split, this action should be performed after the market close just prior to the *Ex-split date*. Right click on the list item that requires splitting, and select **Stock Split**. In the Stock Split dialog, choose the last date *before* the stock split ex date, insert the split factor, and click **OK**.

This action is not reversible and affects all Portfolios in which the symbol appears. Consequently, if you hold stock ABCD short in one Portfolio and long in another, you need to perform the split action only once in either Portfolio.

If you're generating trading alerts using the end-of-day WatchList Scans 136 tool, then you **must also split the [updated] stock data in your static DataSources** prior to running the Scan. This is important so that the position size is calculated properly for the next trading day, the *Ex-split date*. You can do this using the Split utility in the DataSource Manager's Data Editor 29 for both Web DataSources 18 and Intraday Historical DataSources 26. Other DataSource types must be split using the application that created them.

**Note:** Using the PortfolioSynch function in your script will synchronize positions opened by the ChartScript/Scale combination in the specified Portfolio. Consequently the Position Size when exiting a trade will never be more than the number of shares/contracts held in the Portfolio.

**See Also:** Splitting a historical position 218

---

## Editing a Position

It may be necessary to change a Position's details in a Portfolio - especially for positions entered manually. To do so, right click on the item and select **Edit Position** from the pop up menu. You can also bring up the Position Detail dialog by double clicking the position. You have the capability to change the following

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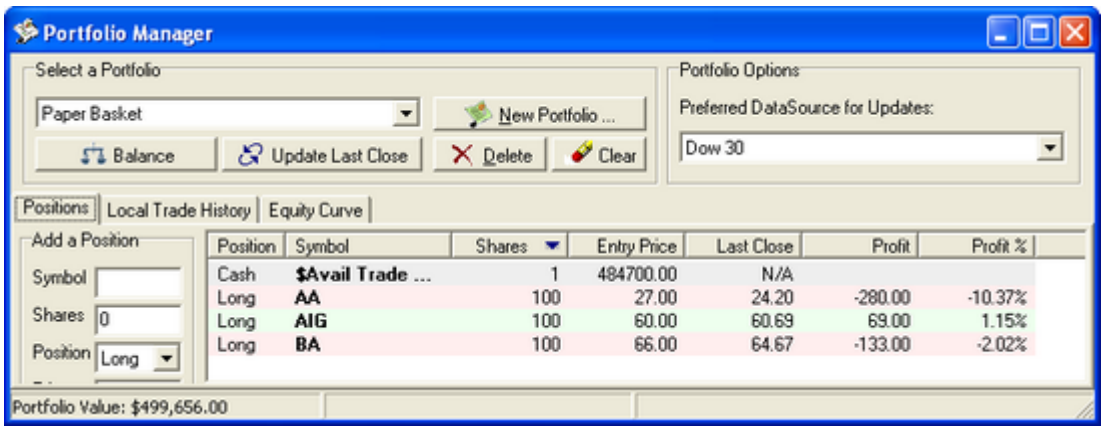
properties:

- Entry Date/Time
- Alert Date/Time (usually the Date/Time from the Bar prior to Entry)
- Position type (Long/Short)
- Symbol
- Number of Shares
- Entry Price
- ChartScript
- Scale

The Position Edit feature is required if you entered a "paper" position and need to associate it with a ChartScript/Scale so that the position can be synchronized with the trading system for Scans or for real-time intraday trading. See Synching Manually-Entered Trades in the Wealth-Lab Knowledge Base for more information.

## 16.4 Positions View

The Positions View has a list containing the current $Avail Trade Cap cash position and equity holdings of the selected Portfolio. So that your Portfolio exactly matches the holdings in your brokerage account, you can manually add and remove positions.




***Portfolio Manager Positions View***

### Current (Open) Positions List

The Positions view contains a list of your brokerage account's equity holdings. As with other lists in Wealth-Lab, you may click on any column heading to sort the list. After the first use of the Update Last Close 213 feature, list items will have a green or red background, based on being "in the black" or "in the red", respectively.

#### $Avail Trade Cap

The **$Avail Trade Cap** item's Price value reflects the current amount of Trading Capital (cash) available for trading in the Portfolio and is updated each time a new Position is added. The value of short positions is deducted from available cash as is contract margin for Futures Symbols 271. This is consistent with the manner in which Wealth-Lab treats available cash for trading in other tools.

Note that the Portfolio Manager does not currently account for commissions during trading. Use the Balance 213 utility in a Paper Porfolio to keep it $Avail Trade Cap

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synchronized with the cash level of an account, if required.

**Entry Date**
The local date and time at which the Position was entered into the list. Due to order-entry and execution delays, the time will always be slightly prior to the time of the actual trade execution for intraday orders.

For the $Avail Trade Cap item, the Entry Date is the date on which the Portfolio was newly created or on which the first transaction was entered, whichever occurred earlier. The time for manually-added Positions in a Paper Portfolio is irrelevant, though you should edit 213 the Position if you wish to exit via an automated script.

**Position**
*Long* or *Short* for securities, and *Cash* for the **$Avail Trade Cap** list item.

**Symbol**
The security's symbol.

**Shares**
The number of shares, or contracts in case of a futures symbol, that have been secured for the Position.

**Entry Price**
Trade entry price.

**Last Close**
**Last Close** is refreshed after performing the Update Last Close 213 action. The most-recent closing price is retrieved from local static DataSources.

**Profit**
The absolute dollar profit for the Position. The list item's background will be green for winning Positions and red for losing Positions.

**Profit %**
The percentage profit with respect to the entry price.

---

## 16.5 Local Trade History View

The Portfolio Manager keeps a historical record of each individual Portfolio's cash deposit(s), account adjustments and trading activity. Combined with the data retrieved from your local static DataSources, these records are used to form the Equity Curve.

If necessary you can make deletions from the Trade History by right clicking an item and selecting **Delete** from the pop-up menu. Note that open positions that are deleted in the Trade History will *not* be removed from the Positions View 217. This design is meant to safeguard open positions that you may be actively trading. See Remove a Position 213 in the Paper Portfolio Actions topic for additional information.

As with other lists in Wealth-Lab Developer 4.0, you may click on any column heading to sort the list. This is useful, for example, to match trades by Symbol.

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**Date**
The local date and time at which the order was filled and entered into the Trade History.

**Trade**
*Buy, Sell, Short, or Cover* for securities. For **$Avail Trade Cap** item this will be either *Deposit*, representing the initial cash deposit, or *Adjust*, which will be the resulting difference in cash equity from a Balance adjustment.

**Order**
*Market, Stop, or Limit* for securities. This field is blank for **$Avail Trade Cap** items.

**Symbol**
The security's symbol.

**Shares**
The number of shares, or contracts in case of a futures symbol, that were secured or sold for the Position.

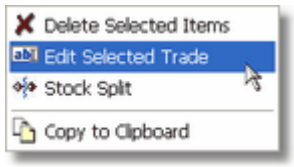
**Price**
Trade execution price.

**ChartScript and Scale**
The name of the ChartScript and selected Scale from which the signal was generated. Intraday scales can be any number of minutes. These fields will be blank for trades that were entered manually.

---

## Trade History Context Menu

Right clicking on a historical trade provides the following context menu actions.




***Trade History Context Menu***

### Delete Selected Items

Permanently removes the selected historical trades from the local trade history. Deleting an item from the Trade History does not affect the Positions View. If you wish to manually close an open position, delete or close it from the Positions view. This transaction will automatically be reflected in the Trade History view.

### Edit Selected Trade

Adjustments for symbol changes and splits (price and number of shares) can be made in the trade history by editing a trade's details.

### Stock Split

If a stock that you have traded (but no longer own) has split, you should enter the split adjustment in the Trade History View using the Portfolio Manager's stock-split utility. Splitting historical positions ensures that the Equity Curve provides an accurate representation throughout the life of the Portfolio. Right click on the list item that requires splitting, select **Stock Split**, insert the split factor and click **OK**.

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**Note:** It is not necessary to split the same stock in *both* the Trade History View and Positions View. See Splitting a Position 213 for more information.

## 16.6 Equity Curve View

The Equity Curve combines actual trade data from the Portfolio's Trade History 218 with that of your static DataSources to show you the *actual* evolution of your cash and equity holdings.

### Update Equity Curve

This action updates and displays the equity curve based on the selected Portfolio's trade history and Trading Capital Amount from the date of the initial deposit until the last date on which your static data has been updated.

**Note:** Some static DataSource providers back-adjust price data not only for stock splits but also for *cash dividends*. Consequently, *refreshing* one of these DataSources will change historical price data on which the Equity Curve is based. The result will be an inaccurate representation of your Portfolio's progressive equity.

To avoid the described behavior you can:

1) use data providers that do not back-adjust price data for cash dividends, or,
2) *Update* only (*do not Refresh*) these DataSources.

**See Also:** Preferred DataSource for Updates 213

#### Account Equity

Account Equity is portrayed as the solid green area of the graph. Equity changes over time as trading-system Positions gain or lose value. The Account Equity Area itself is divided into a Cash Position (dark green) and a Market Position (light green). Dividing the Equity into Cash and Market levels lets you see at a glance the history of your system's market exposure.

#### Exploring the Equity Curve

You can zoom into any area of the Equity Curve by dragging a box around the area with your mouse. While zoomed in, use the right mouse button (click and drag) to navigate within the enlarged Equity Curve graph. To return the Equity Curve to its normal size and position, draw a reverse box with the left mouse button by starting at the lower right corner and dragging to the upper left corner. Additionally, by right clicking and dragging, you can manually center the graph.

## 16.7 Portfolio Manager FAQs

***When I click "Update Last Close" or "Update Equity Curve" the latest market prices are not reflected?***

The Portfolio Manager uses the latest prices found in static DataSources to update the last close of open positions and the equity curve. Consequently, first update your static DataSources, and then repeat the appropriate Portfolio Manager Update operation. See Preferred DataSource for Update 213 for more information.

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***Does the Portfolio Manager account for trading commissions?***

No, not currently. Use the Balance 213 utility to keep Portfolio $Avail Trade Cap synchronized with the cash level of your paper account, if necessary.

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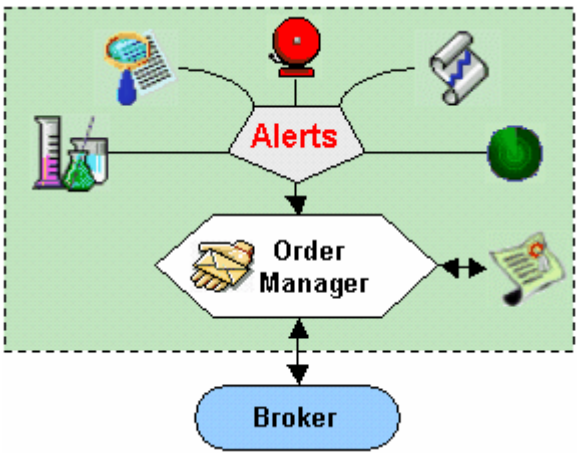
# 17 Order Manager

## 17.1 Order Manager Overview

Wealth-Lab Developer 4.0 bridges the gap from a back-testing and end-of-day platform to a fully-automated real-time trading station linked directly to your broker. The Order Manager acts as a central exchange in a complex integration environment. It receives information in the form of Alerts from various Wealth-Lab tools, creates a 2-way connection to a broker via the Broker Adapter API, and, in addition to logging trade executions in the Portfolio Manager, the Order Manager ensures that a position exists in a linked portfolio before submitting an order to exit.




***Wealth-Lab's design philosophy includes automatic order entry by any tool capable of generating an Alert.***

Open the Order Manager by clicking its icon in main icon toolbar, selecting it from the Tools menu, or by using the keyboard shortcut **Ctrl+R**. Additionally, the Order Manager automatically initializes (opens) whenever another tool "feeds" or sends an alert signal for order processing. In this case, order(s) will be queued until you have a chance to connect to your broker and submit the queued order(s).

Order Management Concepts 223
The Order Manager dynamically handles alerts from five different Wealth-Lab tools, user-interactive events, and integrates user options to make order submission decisions. This topic discusses the capabilities and minor limitations of the Automated Trading System (ATS).

Preparing for Automated Trading 229
Before taking your trading system from the Wealth-Lab $imulator to a dynamic environment, prepare carefully by reviewing this checklist.

Order Manager Options 232
In Wealth-Lab you have the option to select your own participating broker for automated trading. You can further choose to let the system trade without your intervention (Auto-Pilot mode). And, linking a portfolio not only allows for automatic trade logging, it protects you against exiting positions that you have not yet entered!

Manual Order Entry 234
While Wealth-Lab automates your scripted trading activities, don't miss those other opportunities that arise in the markets by quickly entering a trade manually.

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Order List & Management 236
The Order List provides dynamic status and logging for each order queued and/or processed. Executed orders with a Filled status are passed to the Linked Portfolio, which can be reviewed at any time in the Portfolio Manager 212.

Status Panel Information 240
The status panels along the bottom of the Order Manager provide real-time information and account details that are provided directly from your on-line broker.

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## 17.2 Order Management Concepts

The Order Manager dynamically handles alerts from five different Wealth-Lab tools, processes user-interactive events, and integrates user options to make order submission decisions. Once you are familiar with the manner in which the Order Manager functions and have made the necessary preparations 229, the Order Manager will significantly reduce your trading activity workload while providing you with the latest trading and brokerage account statuses.

---

### Order-Entry Summary

Anywhere an Alert can be triggered in Wealth-Lab, the order can be passed directly to the Order Manager. Tools that can receive real-time data incorporate a "Feed" option, which when selected, can continually feed new alerts to the Order Manager. In contrast, the tools that produce Alerts using static data *send* alerts only in the instant that the "Send" option is selected. The table below summarizes the possibilities.

| | | |
|---|---|---|
| ChartScript Window | • Alert pop-up: Send to Order Manager (right click)<br>• Real-time ChartScript Button: Feed to Order Manager 128 | |
| WatchList Scans | Alerts View | Send Alerts To Order Manager 141 |
| Real-time Scans | Button | Feed to Order Mgr |
| Quote Manager | • Option: Feed to Order Manager 194<br>• Triggered Alerts: Send to Order Manager (right click) | |
| $imulator | Alerts View 173 | Send Selected Alerts to Order Manager |
| Screener | • Send to Order Manager (Results button)<br>• Send Selected Alerts to Order Manager (right click) | |
| Order Manager | Feature | Manual Order Entry 234 |

If not already open, the Order Manager will automatically open whenever another tool *feeds* or *sends* an alert signal for order processing. The order(s) will be queued until you have a chance to connect to your broker and submit the queued order(s).

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## Broker Link

The Order Manager is designed to automate trading activity and thus reduce your workload. However, to take advantage of this tool, you must have an account with a brokerage that supports order-entry through an Application Programming Interface, or API. Wealth-Lab Developer 4.0's own broker implementation includes support for Interactive Brokers Trader Workstation Software, or simply *IB TWS*. Additionally, through the Broker Adapter API, Wealth-Lab Developer 4.0 provides the ability for third-party developers to create adaptations to other brokers who have an order-entry API.

You can configure the **IB TWS Broker Adapter** with the following options by creating [or editing existing] entries in the **symlo.txt** file, which can be found in the '...\Wealth-Lab Developer 4.0\WLDIB' folder. For more information about **symlo.txt**, see Symbol Mapping 223 further below in this topic.

**NBBOCONVERT** *Applies to: IB TWS*

Interactive Brokers TWS automatically cancels limit orders that are placed at 10% beyond the *National Best Bid or Offer* (NBBO). Imagine a dip buyer system that places a limit buy for the next market day. If the security gaps down sharply, IB TWS logic can cancel an order based on the 10% NBBO logic. The default behavior of Wealth-Lab's IB TWS Adapter is to detect the cancel (error) and then *resubmit* the order at market. You will briefly see the order status as *Canceled* in the Order Manager, and then change to *Active* and finally *Filled* as the market order proceeds.

You can override Wealth-Lab's IB TWS Adapter logic that resubmits canceled limit orders that were 10% beyond NBBO. To do so, open the **symlo.txt** file found in the '...\Wealth-Lab Developer 4.0\WLDIB' folder, and add (or edit) the NBBOCONVERT entry to read:

```
NBBOCONVERT=0
```

If the NBBOCONVERT entry is missing or set equal to any other value than 0 (default), the IB Adapter will resubmit 10% NBBO canceled limit orders as market orders.

**TriggerMethod** *Applies to: IB TWS*

You have the following options for specifying how stop orders are triggered. This is accomplished by the *TriggerMethod* entry in the **symlo.txt** file.

```
TriggerMethod=N,
```

Where *N*, has the following valid values and meanings per Interactive Brokers' published documentation (always refer to the Interactive Brokers web site for the latest documentation):

- **0** (default) The "double bid/ask" method will be used for orders for OTC stocks and U.S. options. All other orders will used the "last" method.
- **1** use "double bid/ask" method, where stop orders are triggered based on two consecutive bid or ask prices.
- **2** "last" method, where stop orders are triggered based on the last price.
- **3** "double-last" method, where stop orders are triggered based on last two prices.

**IgnoreRTH** *Applies to: IB TWS*

To allow IB's simulated stop order triggering outside of regular trading hours, you

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can set the *IgnoreRTH* flag to a value of 1. If the entry is missing or set to any other value, stop orders sent by the Order Manager will not be triggered in the after-hours market (default).

**Note:** This setting applies to stop orders on GLOBEX (and to Simulated Stop-Limit order on other exchanges) only. For more information, search on the IB site: *US Futures Stop Order and Stop-Limit Order Handling Rules.*

```
IgnoreRTH=1 (enables triggering of stop orders after regular trading hours)
```

**HostName** *Applies to: IB TWS*

You can also specify a hostname in the **symlo.txt** file to connect to a TWS running on a different computer.

```
HostName=ComputerName
```

**See Also:** Configuring Your Broker's Software 229 for details about configuring the IB TWS Broker Adapter for automated trading.

## Order Queue / Auto-Pilot

As the Order Manager receives alerts, they are placed in a queued state, giving you the chance to double-check the order prior to placing it with your broker. The various options that exist to submit queued orders are described in the Order List & Management 236 topic.

Alternatively, you may configure the Order Manager to submit orders as soon as the trading signals are generated without placing them in the queue. For more information, see Auto-Pilot mode 232 discussion.

### Order Loading

If an order that has been generated by a ChartScript (from any of the tools) is already active, the Order Manager will not load/duplicate the same order unless the stop or limit price changes. In that case it will cancel the old one, and when the cancellation has been confirmed, the Order Manager will submit the order at the new price. Auto-Pilot mode 232 must be activated for this to work.

## Modifying / Canceling an Order

You may cancel submitted orders from the Order Manager's interface as described in the Order List & Management 236 topic. Nevertheless, because orders are identified by the combination of 1) ChartScript name, 2) time scale, and 3) time placed, you cannot modify a queued or submitted orders from within the Order Manager. You can, however, modify an order submitted by the Order Manager using your broker's software. Orders entered through an API will indicate a status in your broker's trading application in a normal fashion just as if you had entered the order manually. Once an order that has been placed via Wealth-Lab's Order Manager is live, you can cancel it, make adjustments, and retransmit the order from your broker's software using the procedures to which you are already accustomed.

In IB TWS, for example, live orders received from the Order Manager will appear in the API tab view (at a minimum). Simply locate the order, modify it, and re-transmit the modified order using normal TWS procedures. When and if the order is executed, the [modified] price will be reflected on the ✓*Filled* line of the original order in the Order Manager. Note that the order's modified price won't be reflected in the Order

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Manager if you edit an order in TWS. However, the price at which the order is finally executed will be accurate. Similarly, you may also cancel a live order through your broker's software. In all cases, the latest order status will be reflected in the Order Manager's Order List 236.

---

**Partial Fills** *Applies to: Non-GTC Automated Orders*

Wealth-Lab is a *Position-based* platform, which in essence means that a partially-filled Position is treated the same as a fully-filled Position. The Order Manager, however, handles partial fills differently in real time depending on if the order is an *entry* (BuyAt/ShortAt) or an *exit* (SellAt/CoverAt).

**Partial Fills for Entry Orders**

For intraday trades, the Order Manager will always cancel the remaining shares at the end of the intraday interval. Likewise, the trading exchange will cancel any order at the close of the session. Note that it is not currently possible to ascertain (from within a ChartScript) whether or not a position has been fully filled or only partially filled without extraordinary programming measures. In no case is it possible to force a partially-filled *entry* order to remain open when using trade automation.

**Partial Fills for Exit Orders**

Exit orders will remain open on the exchange until the end of the trading session. Even if your ChartScript changes the stop or limit price of an exit order, Wealth-Lab's Order Manager will not impede or interrupt the original, partially-filled order by canceling it and then replacing it with new prices. If your automated stop/limit order is partially filled and you wish to immediately exit the trade at an improved price, you must cancel the order 225 and then exit the remaining shares manually.

**Synchronization and Partially-Filled Exits**

Wealth-Lab will properly synchronize with a fully-filled, uninterrupted order of partial fills that all occur on the same day. A challenge with synchronization occurs when, 1) you cancel a partially-filled exit order and then manually exit the remaining position, or 2) the remaining shares are exited on different days, i.e., multiple fills from alert bars with different time stamps. In these special cases, Wealth-Lab may continue to synchronize with the opening trade even though the position is closed. Please complete a request for support at www.wealth-lab.com if you need assistance in editing your local Trade History.

---

## Automated Trading System (ATS) Features and Limitations

### Additional automated features and logic of the Order Manager

- The Order Manager (OM) will never place a sell/cover (an exit order) if no matching position exists in the linked portfolio 232. In this case, the OM would cancel the order automatically and assign an "Error" status with the reason: *'Position not found in Linked Portfolio'*. To prevent this type of order entry error altogether, use PortfolioSynch in your ChartScript.
- Wealth-Lab *cancels* Active orders if an Alert does not exist for the same order(s) on the next bar. This is a fundamental feature of the Order Manager.
- Wealth-Lab *cancels* Active stop and limit orders only if 1) price changes, or if 2) the Alert(s) are not submitted again on the subsequent bar.

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- Trailing stops are supported in real-time. When a stop adjustment is required, existing stop orders are canceled and the new stop level is submitted when the cancel is confirmed. The same idea applies to limit orders that change price on subsequent bars.
- Bracket trading is supported when using Auto-Pilot Mode. Stop loss and profit limit orders can co-exist on the same bar. When one order is executed, the Order Manager cancels the other order automatically.
- Stop and reverse systems may be traded.
- Entry-bar stop loss and profit limit orders are supported optionally. See Automated Trading Options 245 for more information.

**Limitations**

- **`AtClose`** Orders are not supported by the Order Manager.
- The Order Manager supports only trading systems that make a *single trade entry per bar*. This means that a unique ChartScript/Symbol/Scale combination should not generate more than one order that would result in entering multiple positions on the same bar (e.g., BuyAtMarket and ShortAtMarket on the same bar). The following implications apply:
  1. Due to the current split logic that effectively creates multiple positions on the same entry bar, ChartScripts that *split positions* cannot be traded using automation (i.e., the SplitPosition function cannot be used).
  2. If the OM receives more than one alert from a script, a list of *compatible* orders will be derived as a result of similar logic of the Quote Manager's Smart Alert Removal 194 option to ensure a single trade entry order. For example, a BuyAtMarket order takes precedence over a BuyAtLimit order.
- The minimum time interval currently supported by the Order Manager ATS is 1-minute interval. Trading on second and tick intervals is not supported.

  PortfolioSynch is able to synchronize to positions in the *Local Trade History* only.
- Although the Order Manager does not limit the number of open orders, your broker may impose such a limitation. Check with your broker for details.

---

## Symbol Mapping

*Applies to:* Interactive Brokers (native implementation)

The **symlo.txt** file, located in the WLDIB subdirectory of Wealth-Lab's installation, is used by Wealth-Lab to map symbols used in Wealth-Lab to the symbols required by Interactive Brokers for trading. If the IB underlying symbol differs from the symbol used in Wealth-Lab, you must create a *mapping record* in **symlo.txt** so that the order can be placed properly. Using **symlo.txt** you also gain control over order routing, and you can even specify the exchange and currency in which an issue is traded.

**Note:** If a symbol is defined in the Futures Symbol Manager then it will be automatically be passed as a "Future" to IB, otherwise as a "Stock". Nevertheless, you will almost certainly be required to create records for each contract that you trade in **symlo.txt**.

IB TWS has two options for viewing symbols: *Underlying mode* (default) and *Symbol mode*, chosen from the TWS **View** menu. If the Wealth-Lab symbol does not match the IB TWS Underlying-mode symbol, then you must make an entry in symlo.txt. It's likely that you'll have to make an entry in symlo.txt if switching between Underlying and Symbol modes causes the symbol to change.

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### Example

| *Description* | *Symbol Mode* | *Underlying Mode* |
|---|---|---|
| **S&P E-mini futures** | **ESZ4** | **ES** |

The general format of a symlo.txt record (one line) is as follows:

```
WLTicker; IBsymbol; secType; exchange; expiry; strike; right; currency;
localSymbol
```

### Remarks

| | |
|---|---|
| *WLTicker* | Symbol clicked or typed in Wealth-Lab. e.g., ES Z4 (eSignal format) |
| *IBsymbol* | Symbol used in IB TWS, underlying mode. e.g., ES |

Many examples of properly-formatted entries can be found in the symbol.txt file included with your installation. It's a good idea to make a backup copy before making edits. Symlo.txt includes additional formatting information (as comment lines) in the first several lines of the file. You may find that the following remarks are also useful:

- Empty lines are ignored
- # indicates that the information on the line is a comment, and thus ignored
- A record need not contain every field, however you must include the semi-colon separator if you have missing fields between other field parameters. Example: `GBP.EUR;GBP;CASH;IDEAL;;;;EUR`
- All but the first two fields are optional, and the default *exchange* is SMART.
- A properly-formatted symbol entry can appear anywhere in the file. Logical groupings are recommended for easy reference and maintenance.
- Per IB TWS API documentation, you must route all U.S. stock and option orders through SMART order routing.

**Important!** The Order Manager must be restarted after making changes to symlo.txt.

### Example 1

Your streaming provider is eSignal. To trade the S&P e-mini, December 2004 contract on Globex, the following record in symlo.txt is required:

```
ES Z4;ES;FUT;GLOBEX;200412
```

### Example 2

Your streaming provider is QuoteTracker, fed by IB. To trade the S&P e-mini, December 2004 contract on Globex, the following record in symlo.txt is required:

```
GLOBEX:@ESZ4;ES;FUT;GLOBEX;200412
```

Though creating records in symlo.txt is most often required for futures symbols, it may also be required for *any* type of issue if more information is required to specify the precise contract, exchange, currency, etc. in IB TWS. For example, you may be trading a stock that is traded in both EUR and USD on SMART. Even though the stock's symbol may be identical between Wealth-Lab and TWS, you will need to create a record in **symlo.txt** that specifies the currency that you trade, for example:

```
BBA;BBA;STK;SMART;;;;USD
```

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## 17.3 Preparing for Automated Trading

Before making the leap from simulated to the more complex and dynamic environment of automated trading, follow this checklist to ensure that you have made the appropriate adjustments.

### Step 1. *Check ChartScript Compatibility*

- Do not use AtClose orders in combination with the Order Manager. If, for example, your ChartScript buys AtMarket but sells AtClose, you will not be able to exit long positions automatically at the close.

- ChartScripts destined for automated trading cannot generate Alerts that would result in the execution (entry) of more than one trade on the same bar. Multiple positions may be closed on the same bar if their entries occurred at different times. Be sure to read the sections on ATS Features and Limitations 223.

- The Order Manager does not have a concept of "Bars" - it converts alerts into orders immediately. Therefore, trading systems should not use *Bar + N*, where N > 1, to trigger an Alert. Always program trading systems to use *Bar + 1* in the main trading loop for trading signals, e.g.,

```
BuyAtMarket( Bar + 1, 'BuyAlert' );
```

### Step 2. *Set up a Portfolio*

If you haven't already done so, you should set up a Portfolio to which you will "link" your automated trading activities. Do this prior to opening the Order Manager. See the Portfolio Manager 212 chapter for additional details.

### Step 3. *Set Automated Execution Options*

Wealth-Lab Developer 4.0 has important settings pertaining to automated trading order entry. Configure your choices for Automated Execution 245 settings in the Options dialog now.

### Step 4. *Check Symbol Mapping*

If the IB underlying symbol differs from the symbol used in Wealth-Lab, you must create a "mapping" in **symlo.txt** so that the order can be placed properly. See the Symbol Mapping 223 topic in Order Management Concepts to learn more.

### Step 5. *Configure Your Broker's Software*

Wealth-Lab Developer 4.0's native broker implementation includes support for Interactive Brokers Trader Workstation Software, or simply *IB TWS*. Through the Broker Adapter API, Wealth-Lab Developer 4.0 allows third-party developers to support any broker that has an order-entry API. If you are using one of these broker adapters, follow the instructions for proper configuration with Wealth-Lab Developer 4.0.

#### Configuring IB TWS

Before attempting to connect with Wealth-Lab's Order Manager, you must first *download and install* the latest *TWS API components*. From the Interactive Brokers web site:

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1. Click **SYSTEMS | API/Connections | API Software** from the site's menu.
2. Download the appropriate API software for your operating system and follow the instructions. As of this writing, API 8.06 is the latest compatible production release.

Once you have installed the API software, open IB TWS and select **Configure|API|Enable ActiveX and Socket Clients** from the main menu. You need to do this only once as this selection will be saved.

**Note:** Attempting to connect to IB TWS without having first selected this option will result in a failure message describing the condition. After fixing the problem (as described above), you must close and restart the Order Manager to retry the connection.

See Broker Link 223 in the Order Management Concepts 223 topic for more important information about configuring the IB TWS Broker Adapter.

**Step 6.** ***Test in Demo Mode***

So that you fully understand how Wealth-Lab tools and your ChartScript operate in a dynamic trading environment, you are highly encouraged to first observe automated trading with a "demo" account at your brokerage. For IB TWS users, Interactive Brokers has a browser-based Java TWS Demo that fully supports the automation interface, which must be configured as previously outlined.

**IB TWS Demo Notes:**

1. The IB TWS Demo is currently limited to 5 pages, with which it typically initializes. Consequently, you must delete one of the default pages to make room for the special ***API*** order page that appears with your first automated trade entry. To remove a page, select one and click **Page|Delete** from the main TWS menu.
2. If you attempt to trade a ticker that is not available for the Demo, you will receive an Error. (This also applies to symbols which are not available for your live trading account.) Search for the list of 'Available Demo Tickers' on the Interactive Brokers site.

**Warning!** You *must* close the TWS Demo in its entirety (both the Java Trader WorkStation Demo and also the browser page login screen) prior to logging in with the Order Manager to your live TWS trading account.

**Final Step -** ***Consider Contingencies***

Do you have a plan ...
... if your computer memory fails?
... if your ISP loses a principal connection to the internet?
... if a power outage occurs at your trading station?
... etc.

These few examples simply highlight that software is only one of the essential components for trading. Certainly everyone has their own worst-case scenario, and you should plan carefully for yours.

---

## Real-Time Intraday ChartScript Check List for Automated Trading

- **AtClose** orders are not currently supported in trading automation, therefore to

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automatically close intraday positions at the end of the day your ChartScript must generate an exit order upon completion of the *penultimate intraday bar*. The LastBar function cannot be used to detect the next-to-last intraday bar in real time. See the Wealth-Lab Knowledge Base for solutions.

- Implement the PortfolioSynch function to synchronize with actual, historic positions. Additionally, if you hold overnight positions you must load a sufficient number of seed bars to include the bar(s) on which previous trade(s) occurred so that synchronization takes place.
- One-minute intervals are the lowest bar interval supported for automated trading.
- ChartScripts that use multiple time frames (e.g., an intraday script that uses daily indicators) should include logic to calculate a *start bar* to begin the trading loop.

**Example**

```
{ Demonstrates one way to access a Daily Bar in an intraday chart.}
var Bar, hDailyCloseSer, DailyBar: integer;
Var PreviousDayClose: float;

{ A re-usable function to return the first bar of StartDay for an
intraday chart }
function FirstBarofDay( StartDay: integer ): integer;
begin
  var cnt, iBar: integer;

  Result := BarCount - 1;
  for iBar := 0 to BarCount - 1 do
  begin
    if BarNum( iBar ) = 0 then
      Inc(cnt);
    if cnt = StartDay then
    begin
      Result := iBar;
      break;
    end;
  end;
end;

{ Obtain the Daily closing prices and store in a series. }
SetScaleDaily;
hDailyCloseSer := #Close;
RestorePrimarySeries;

{ Start the loop with the first intraday bar of the second full day.
}
for Bar := FirstBarofDay( 2 ) to BarCount - 1 do
begin
  DailyBar := GetDailyBar( Bar );

{ Assuming that you're using Secondary-series alignment option #3,
then this will always return the previous daily closing price. }
  PreviousDayClose := @hDailyCloseSer[DailyBar];

{ On the first bar of the day, print the bar number, the date, and
the value of yesterday's close in the debug window }
  if BarNum( Bar ) = 0 then
    Print( 'Bar: ' + IntToStr( Bar ) + #9 + 'Date: ' + DateToStr(
GetDate( Bar ) )
           + #9 + 'Previous Close: ' + FormatFloat( '0.00',
PreviousDayClose ) );
end;
```

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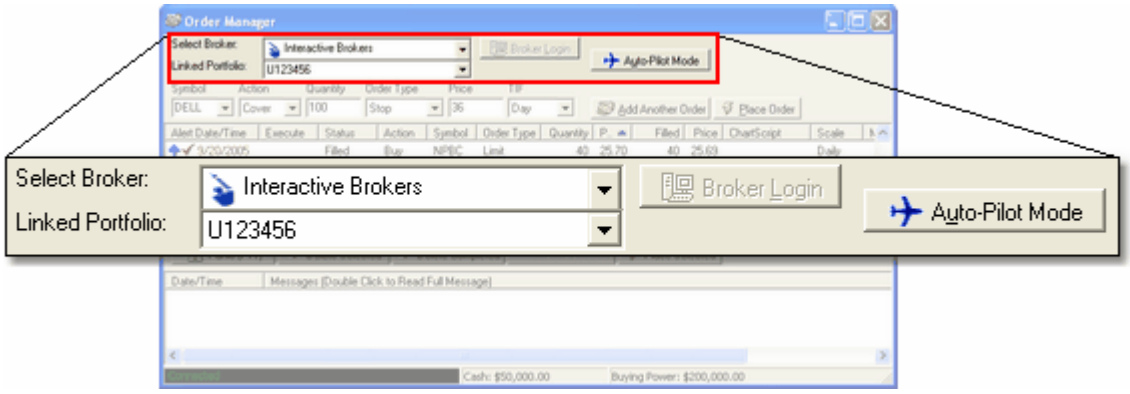
- See Real-time Considerations 131 for additional information.

## 17.4 Order Manager Options

Once you have properly configured 229 your broker's software, the first place to start after opening the Order Manager **(Ctrl+R)** is with the Options frame. Here, you select and login to your automated trading broker and decide if you want to manually confirm orders prior to submitting them or if you wish to remain out of the order-entry loop. Finally, you should identify the Linked Portfolio 232 to which trading fills will be logged.




***Order Manager Options (detail view)***

### Select Broker

Wealth-Lab Developer 4.0's broker implementation includes support for Interactive Brokers Trader Workstation Software, or simply *IB TWS*. If you have installed another third-party Broker Adapter, you can select it from the drop down list.

### Broker Login

Click this button to open a connection with the selected broker. For third-party adapters, check with your provider's documentation for necessary login procedures.

#### IB TWS Login

Prior to clicking Broker Login you must have the IB Trader Workstation running. Additionally, you should select a Linked Portfolio 232, if desired. If you have properly configured 229 IB TWS to **Enable ActiveX and Socket Clients**, IB TWS will respond to the **Broker Login** action with a message box, "Accept incoming connection attempt?". If you do not see the dialog, click on the IB TWS program in the Windows task bar or use **Alt+Tab** to make TWS the active application.

***You must accept the IB TWS connection attempt to complete the Broker Login process.***

Once you confirm the request, a green "Connected" message will appear in the Order Manager's lower left status panel. 240 Additionally a small window, which is

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the container for the IB TWS ActiveX control will appear with the message **"Powered by IB TWS"**. You can ignore this window, and it will be closed automatically when you shut down the Order Manager and/or close the IB Trader Workstation.

**Tip:** You can configure IB TWS to always be displayed so that the message above will never be hidden. Select **Configure|View|Keep TWS On Top** from the main TWS menu.

See Preparing for Automated Trading 229 for more important information on configuring IB TWS and the symbol-lookup file, **symlo.txt**.

### Auto-Pilot Mode

An aircraft autopilot manages a complex control loop to direct an aircraft to a destination, maintain straight and level flight, or even land without the requirement of a human pilot touching the controls. When you "couple" (select) the Wealth-Lab Auto-Pilot, the Order Manager will automatically *place* orders that are received from any tool that generates an Alert. This is true hands-off trading, therefore use this option carefully.

The Order Manager ensures a consistent order flow from trading scripts such that each trade remains open or canceled based on the trading system's logic and that no order is duplicated. However, if your trading system uses bracket orders (e.g. simultaneous orders for stop loss and a profit limit), when one of the orders is filled, the Auto-Pilot will automatically cancel the opposing order. If you do not use the Auto-Pilot, then you must *manually* cancel the unfilled order from a bracket pair.

**Note:** Orders that are already queued will *not* be submitted upon selecting Auto-Pilot Mode. Also, orders manually put in the queue by clicking the **Add Another Order** button will not be placed automatically to your broker even if the Auto-Pilot is enabled.

The Auto-Pilot will be "decoupled" (turned off) by any of the following actions:

- clicking the Auto-Pilot Mode button after it has been selected, or
- clicking the Panic button 236, or alternatively pressing F11 (keyboard panic button), or
- closing the Order Manager (disconnects from your broker)

### Linked Portfolio

When you create a portfolio using the Portfolio Manager 212, it will be available for linking the next time you open the Order Manager. Once you have selected a linked portfolio, it will remain selected until you delete it 213 or choose a different portfolio from the drop down control. Currently, the Order Manager can be operated concurrently with only a single Portfolio.

**Note:** Do not delete or change the linked portfolio while the Order Manager is open.

Linking a portfolio not only allows for automatic trade logging, it also protects you against exiting positions that you have not yet acquired due to perhaps a previous order processing error or cancellation.

Note that attempting a **Broker Login** without selecting a Linked Portfolio will result in a Warning:

**Warning!** "You have not selected a Linked Portfolio. The Order Manager will not be able to determine if you have existing positions. All Sell and Cover orders

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that are Submitted will be sent to the Broker. Are you sure you wish to Proceed?"

Answering affirmatively to this question will allow the Order Manager to submit orders to your broker that may not be covered by positions in your account.

**Note:** A side effect of not selecting a Linked Porfolio is that "Catastrophic Failure" dialog may be displayed when an order is filled. Consequently, selecting a Linked Portfolio is the recommended configuration.

Finally, when the Order Manager receives an exit order (**SellAt** or **CoverAt**) for a position that does not exist in the selected linked portfolio, it generates an Error status for the Order: *'Position not found in Linked Portfolio'.* Generally, you can avoid this error in your real-time trading scripts by using the PortfolioSynch function in your main trading loop.

**Delete Auto-Cancel Orders** *Applies to: Auto-Pilot Mode*

Select this option to automatically delete orders that have been canceled by the automated system. This is especially useful to avoid clogging the order list with multiple canceled orders from a trading system that uses trailing stop orders that are progressively replaced by new prices. Note that once an order has been deleted from the list, it is not possible recover its information.

---

## 17.5 Manual Order Entry

While Wealth-Lab automates your scripted trading activities, don't miss those other opportunities that arise in the markets by quickly entering a trade manually. If you have connected a Linked Portfolio, your manually-entered trades will be saved alongside the automated trades to give you a complete and accurate record of your account's transactions, which can be used by the Portfolio Manager 212 to generate a true-to-life equity curve 220.

**Warning!** *Applies to: IB Broker Adapter*

When using the Order Manager for automated trading, *do not* submit new trades directly from the IB TWS interface. Enter manual trades through the Order Manager if necessary as described here.

With the exception of the ability to use "AtClose" orders, which are not compatible with the Order Manager, the Manual Order Entry interface gives you the same order-entry options available to you in Wealth-Lab ChartScripts. The interface is quite self-explanatory. In the image below, for example, an order has been configured to Cover 100 Shares of DELL at a Stop Price of 36.

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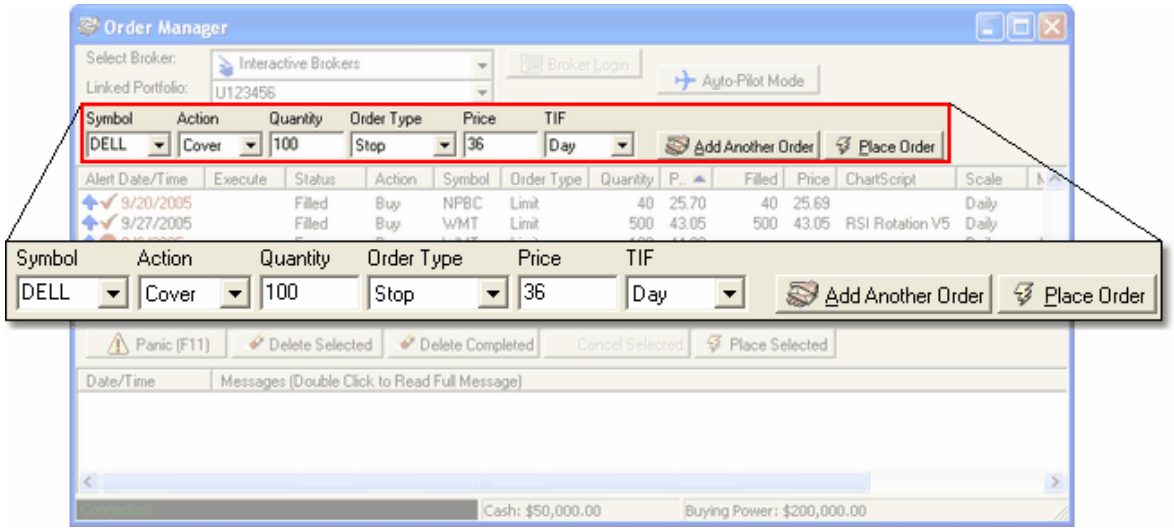


***Order Manager's Manual Order Entry (detail view).***

**Remarks:**

- For futures symbols, enter the number of contracts in the *Shares* field.

### Time in Force (TIF)

Manually-placed orders can be submitted as *Day* or *'Good Til Canceled'* (GTC).

### Add Another Order

This action places the order in the Order Manager's queue for submission at a later time. See the Order List & Management 236 topic to learn how to submit queued orders.

### Place Order

The Manual Order Entry Submit button is enabled when a connection exists with your broker. When clicked, the specified order is immediately submitted to your broker without passing through the queue. Manual orders are never checked against Portfolio positions, and therefore Wealth-Lab will never inhibit a Manual Order submission. If you later need to associate a filled manual order to be traded by an automated ChartScript, edit the Position 213 in the Portfolio Manager's Positions View 217.

**Note:** If you manually Submit an exit order (Sell or Cover) and a corresponding position does not exist in the linked Portfolio, your broker may open a new position, short or long, respectively. Irregardless, since you can keep multiple Portfolios, these trades are interpreted as exit signals in Wealth-Lab. Therefore, although the trade will appear in the Portfolio's Trade History 218, a new Position will not be created in the Open Positions View.

**Warning!** Do not use the **Submit** button in the Manual Order Entry frame to submit *Queued* orders. This could result in the immediate submission of another [manual] order to your broker. If you are not actively entering orders, you can hide this frame by clicking the ⌃ **Hide Details** button located to the left of the order list.

### Bracket Order, Manual Placement

You can place an OCO bracket order manually by entering a *stop and limit order pair*

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in the Order Manager's queue. The orders may enter the queue by populating the manual order entry interface and then clicking **Add Another Order** (once for the stop order and then again for the limit order), or by a ChartScript feeding the Order Manager (Auto-Pilot disabled) with a stop and limit order for the same symbol. To identify and place the pair as a bracket order, simultaneously highlight the stop and limit pair, right click, and select **Place Selected Order(s)**. Alternatively, click the **Place Bracket Order** button.

**Note:** You can highlight and place *any queued order* at the same time that you place bracket orders. OCO orders are identified by placing a stop and limit order simultaneously for the same symbol. The OCO behavior is automatic and not optional.

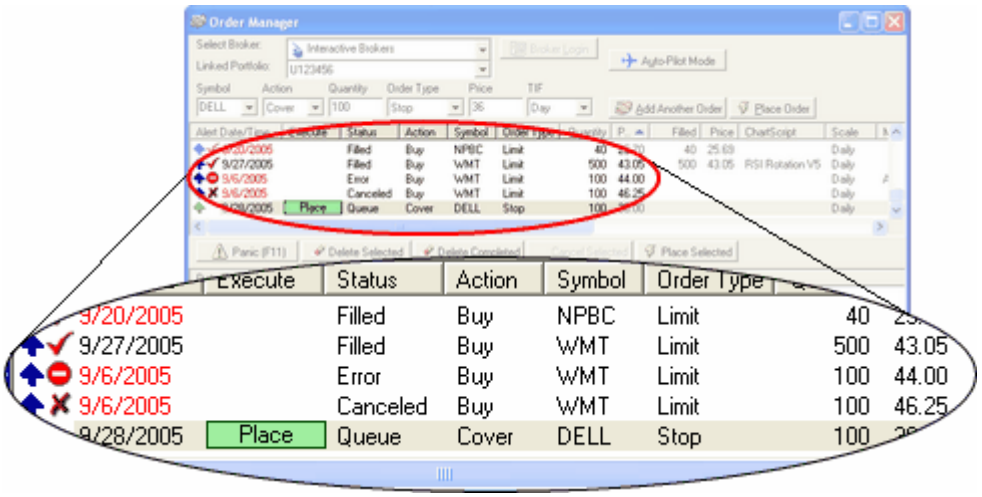
In the next example image, a active bracket order is shown to exit a 100-share position of PFE at either a stop (sell at stop) at $20.50 or at a profit target (sell at limit) at $22.00.

***Bracket (OCO) orders placed and active.***

---

## 17.6 Order List & Management

The Order List provides dynamic status and logging for each order queued and/or processed. Executed orders with a Filled status are passed to the Linked Portfolio, whose contents can be reviewed at any time in the Portfolio Manager 212. Although you cannot modify orders in the Order Manager's list, you can submit groups of queued orders or cancel live orders with just one click.




***Order Manager Order List detail***

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## Order List (Column Descriptions)

### Order Date

Date and time of the trade execution. The data is taken from the time stamp of the signal bar, which due to order-entry and execution delays, will always be prior to the time of the actual trade execution.

### Execute

Cancel — Click the 'Cancel' button in this field to attempt to cancel an *Active* order. The order will transition through a *Cancel Pending* state before obtaining a confirmed *Canceled* status from your broker.

Place — Click the 'Place' button to immediately send a *Queued* order to your broker for execution. The order will transition through a *Submitted* state before obtaining a confirmed *Active* status from AT Pro. The button color is order-type dependent as follows:

Buy: Place Sell: Place Short: Place Cover: Place

### Status

*Queue* — Order is in a queued state awaiting placement to your broker. To Place the order, you must click Place in the Execute column, or highlight the row(s) and click the **Place Selected** button located below the order list. Alternatively, you can right click an order or group of selected orders and choose **Place Selected Orders** from the pop-up context menu 236.

*Submitted* — Order submitted to AT Pro, but not yet confirmed active.

*Active* — Order accepted and confirmed active by AT Pro. Active orders must be first canceled if you wish to clear them from the list.

*Partial* — Order partially filled and will remain active unless canceled.

*Filled* — Order completely filled. Note that this information is passed to the Portfolio Manager.

*Cancel Pending* — A request to cancel the Order has been submitted to AT Pro.

*Canceled* — Order confirmed canceled by AT Pro. See the Message 236 field for more information.

*Error* — An error occurred during Order processing. See the Message 236 field for more information.

Overfilled — On rare occasions, a broker may re-route an order to multiple exchanges. As a result an *Overfilled* condition may arise in which your order is completely filled by one exchange, but then completely or partially filled again by another. In this case you will see the order's status change from *Filled* to *Overfilled*. Immediately contact your broker to remove the overfilled portion of the order.

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| | |
|---|---|
| Unverified | This status will occur *if you close the Order Manager* while AT Pro is actively working orders. When you re-open the Order Manager, these orders will be *Unverified* even if the order is still open with AT Pro. To avoid this condition, you should not disconnect the Order Manager without first canceling live orders. |

**Note:** Prior to IB Adapter Build 9, Wealth-Lab could not verify the status of Active orders *if the broker disconnected* from the Order Manager. To avoid this condition, ensure that you have upgraded to the latest broker adapter, so that when you reconnect to the broker (via Broker Login 232) the Order Manager can monitor the trades that it submitted previously.

**Order**
*Buy, Sell, Short, or Cover* for securities.

**Symbol**
The security's symbol.

**Order Type**
*Market, Stop, or Limit* for securities.

**Shares**
The order's position size. This will be the number of shares, or contracts in the case of futures symbols, calculated by the Position Sizing control in the tool (ChartScript, Scans, etc.) that generated the Order.

**Price**
In the case of the *Market* Order Type, the Price shown in this column will be the basis price for the order. You can compare this with the actual execution price to determine slippage. For *Limit* and *Stop* Order Types, this field represents the limit or stop price.

**Filled (Shares)**
The number of shares, or contracts in case of a futures symbol, that were secured or sold for the Position. A cumulative number of partially-filled shares will appear in this field and be dynamically updated as additional shares are secured. This data is received from your broker.

**Price**
Trade execution price. The confirmed price at which the trade took place.

**ChartScript and Scale**
The name of the ChartScript and selected Scale from which the signal was generated. Intraday scales can be any number of minutes (second and tick bars are not supported for automated trading). These fields will be blank for manually-entered trades. Additionally, it's possible for the ChartScript field to be blank if the ChartScript that generated the trade has not been saved (not named).

**Message**
This field contains detailed information for orders with an *Error* or *Canceled* status. Error messages are received from your broker and may occur for any number of reasons.

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Wealth-Lab can also prevent an order reaching your broker by canceling it due to one of the following conditions; the first four of which are controlled in the Automated Execution Options 245 tab of the Options Dialog (F12):

- *'Value exceeds Buying Power'*
- *'Value exceeds Cash in Account'*
- *'Buying Power below user-defined threshold'*
- *'Cash below user-defined threshold'*
- *'Buy & Short Same Bar'*
- *'Position not found in Linked Portfolio'*

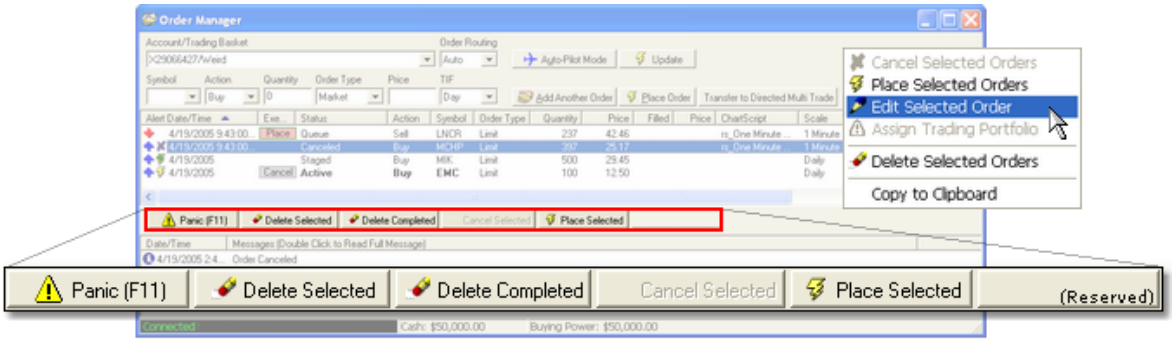
**Entry Date**
For entry signals (BuyAt and ShortAt), the Entry Date will match the Order Date. For exit signals (SellAt and CoverAt), this is the date and time of the corresponding entry signal. For queued orders, this will be the time at which the order is queued and does not update to the time at which the order is submitted.

---

## Order Management

You can interact with the order list using the standard list view techniques. Sort the list by clicking on the heading of any column. You can select multiple order items using the **Shift** or **Ctrl** keys in combination with the left mouse button in the standard Explorer manner. Alternatively, make multiple selections by holding the Shift key while tapping the up/down arrow keys. Finally, the DEL key will clear any item selected in the list.

Right clicking on a selected item(s) in the list will produce a pop-up menu with 3 options (Cancel, Submit, and Clear), which duplicate the functions of buttons in the Selected Orders frame (see below).




***Order Manager Order List Management actions (detail view).***

### Panic (F11)
Clicking the Panic button, or alternatively, striking the F11 key on the keyboard performs the following actions:

- Cancels *all* orders with an Active or Partial status
- Deselects Auto-Pilot Mode, if previously selected

**Warning!** The Panic button cannot cancel orders if a stable internet connection does not exist between Wealth-Lab and your broker. For emergencies, *always* have the phone number handy of the trading desk to get the status of open orders.

### Delete Selected
Removes all *selected* orders all orders having a status of *Filled*, *Overfilled, Canceled*, *Error*, or *Unverified* from the order list.

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**Delete Completed**
Removes remove all orders having a status of *Filled*, *Overfilled, Canceled*, *Error*, or *Unverified* from the orders list. This action will not clear *Partial*, *Queued*, *Submitted*, or *Active* orders.

**Cancel Selected**
Requests that your broker cancel all highlighted (selected) Active, including partially-filled, orders.

**Place Selected**
Submits all highlighted (selected) queued orders to your broker for execution.

By right clicking in the order list, the options described above are presented in a pop up menu, whose actions apply to the orders currently selected, or highlighted. The exception is **Copy to Clipboard**, which copies all the data in the order list, which can then be pasted in another application for later review.

**Cancel** and **Place** are enabled only when a connection exists with your broker. You cannot **Delete** or re-Submit orders having a *Submitted* or *Active* status, for example, and the Order Manager will ignore such requests.

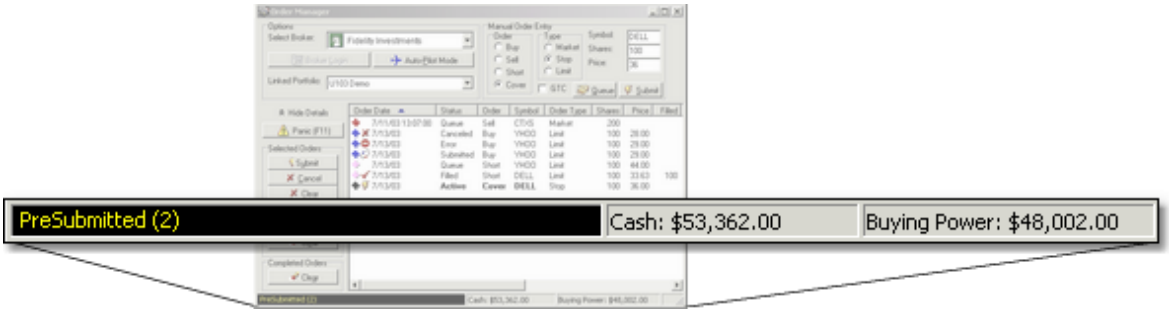
**Warning!** Most orders that generate *Error* statuses are never submitted to the market. In at least one special case, when simultaneously submitting a large number of queued orders, IB TWS may assign one or more of the orders an *Error* status with the message: "Max Rate of Messages per Second has been Exceeded: 50". Should this occur, you must check the IB TWS client application for the actual order status, and if *Active*, re-Submitting the order may duplicate it.

---

## 17.7 Status Panel Information

### Order Manager Status Panels

The status panels along the bottom of the Order Manager provide real-time information and account details that are provided directly from your broker.




***Order Manager Status Panels detail***

**Note:** The currency denomination ($, €, £, ¥, etc.) is controlled by your computer's regional currency settings in the Windows Control Panel. The symbol does not necessarily indicate the actual currency that you hold in your brokerage account. You can override the Windows currency setting in the Options Dialog|System Settings 255.

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### "Latest Status" Panel

This panel updates with the last status information received from your broker. The number in parentheses that follows the message, e.g., PreSubmitted (2), is the unique order ID assigned by Wealth-Lab at the time the order was created.

The information below pertains to the broker implementation of IB TWS and has been taken from the IB TWS API documentation. Check with IB's web site for the latest information.

***Connected***
The Connected message, which is appears in green, is the only status message "artificially" displayed by Wealth-Lab after having acknowledged the "Accept Incoming Request" TWS dialog. All other messages shown in this panel are produced directly from the broker.

***Connection Closed***
This event is triggered [by TWS] when TWS closes the sockets connection with the ActiveX control, or when TWS is shut down.

**Note:** *With IB Broker Adapter Build 9, WLD3.0 Build 10 and later*, if the connection is closed abruptly while orders are active, do not restart the Order Manager so that when you reconnect to the broker (via Broker Login 232) the Order Manager can monitor the trades that it submitted previously. Ensure that you are running the latest IB Broker Adapter from the Upgrades page.

***Pending Submit***
Indicates that you have transmitted the order, but have not yet received confirmation that it has been accepted by the order destination.

**Note:** This order status is not received from IB TWS. Rather, it is explicitly set by Wealth-Lab when an order is submitted.

***Pending Cancel***
Indicates that you have sent a request to cancel the order but have not yet received cancel confirmation from the order destination. At this point, your order is not confirmed canceled. You may still receive an execution while your cancellation request is pending.

**Note:** This order status is not received from IB TWS. Rather, it is explicitly set by Wealth-Lab when an order is canceled.

***PreSubmitted***
Indicates that a simulated order type (such as a stop order) has been accepted by the IB system and that this order has yet to be elected. The order is held in the IB system and the [TWS] status remains DARK BLUE until the election criteria are met. At that time the order is transmitted to the order destination as specified and the TWS order status color will change.

***Submitted***
Indicates that your order has been accepted at the order destination and is working.

***Cancelled***
Indicates that the balance of your order has been confirmed canceled by the IB system. This could occur unexpectedly when IB or the destination has rejected your order.

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***Filled***
The order has been completely filled for the number of shares/contracts specified.

**Cash**
The current cash value for the *currently-selected* Account/Trading Portfolio is dynamically updated by your broker. You can find this value in IB TWS by clicking "Account", and then viewing *Cash Balance* in the Balance frame.

**Buying Power**
Buying power for the *currently-selected* Default Account is also dynamically updated by your broker. IB TWS displays this figure in the Account/Balance frame as *Buying Power, Total*.

**Tip:** Configure the Automated Execution options 245 in the Options dialog 244 to prevent orders whose value exceeds your cash and/or buying power.

---

## 17.8 Order Manager FAQs

***Why does "Order Canceled - reason:" message appear without a reason?***

Most typically this is due to an unfilled stop or limit order that has expired. See the Message 236 field description in the Order List & Management topic for other reasons why Wealth-Lab may inhibit an order's submission. Any other text that is displayed in the Order Manager's message field is a product of your broker's interface.

---

***Can I use automatic trading that is not "PortfolioSynch'd" with a Portfolio?***

You might do this if you want to maintain theoretical entry and exit signals based on indicators, etc. If the number of shares filled winds up different than theoretical value this is okay, the Order Manager will adjust. Also, if you miss an entry the Order Manager is smart enough not to submit the corresponding exit order when triggered.

The danger is that for some reason a fill might occur in real life but not in theoretical (maybe because you have slippage set in the Options), and then you would be stuck with an open Position and never get an automated exit signal.

---

***How are orders canceled and replaced in real-time?***

Unexecuted orders are canceled on subsequent bars if the script does not continue to repeat the order. This is exactly the way it's done in backtesting, so you don't have to make any adjustments in your script for this to occur in real time.

Changes in a stop or limit price will also cause the previous stop or limit order to be canceled. When the cancel is confirmed, the order is resubmitted with the new price. This mechanization ensures that similar orders are not live simultaneously.

---

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***When placing orders for futures symbols, I get an error with a message 'Please enter a local symbol or an expiry'?***

You must make an entry in the *symlo.txt* file for the symbols causing the error. Refer to Symbol Mapping 223 and Preparing for Automated Trading 229 for more information.

---

***If I send a limit order to IB, how can I know inside my script if it is filled or still open?***

Use PortfolioSynch in your main trading loop. This allows your script to know exactly when, at what price, and how many shares positions were actually filled in your [linked] portfolio.

---

***Can I scale into and out of positions with the Order Manager?***

Yes, scaling is fully supported.

---

***I got an 'Unverified' status for an order that was filled. How can I enter the order in my linked Portfolio?***

Add the Position (Symbol, Shares, Long/Short, Price filled, and the date) to the Portfolio using the Portfolio Manager's Positions tab 217. Then right click the position and Edit the Alert, ChartScript and Scale details.

---

***When should I use the PortfolioSynch function?***

PortfolioSynch is used to synchronize positions in your Portfolio with those generated by a trading script in the Real-time ChartScript window 126, RT Scans 201, and WatchList Scans 136. Using **`PortfolioSynch`** will *suppress* new trading signals (orders) that do not match or make sense with the specified portfolio. For example, a real-time ChartScript using **`PortfolioSynch`** will not issue a **`CoverAt`** order if the portfolio doesn't have the corresponding short position. Irregardless, the Order Manager would not fill this order if you establish a Linked Portfolio 232, though the order would be flagged as an error.

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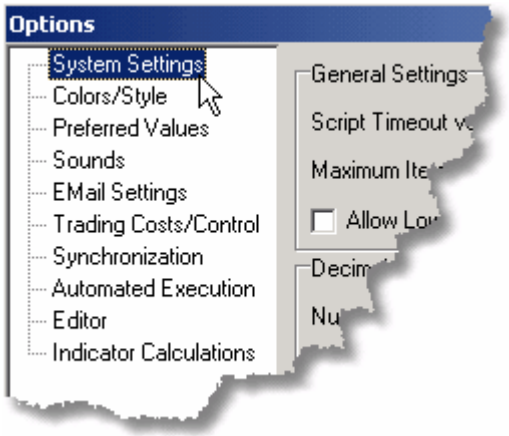
# 18 Options Dialog

## 18.1 Options Dialog Overview

The Options Dialog allows you to control and personalize the default settings in Wealth-Lab Developer 4.0. Some of the settings can be overridden from within a ChartScript using corresponding WealthScript functions. To be sure your scripts always use "known" settings, use of such functions is encouraged. When applicable, these functions are pointed out in the following topics.

Open the Options Dialog by pressing the [F12] function key, by selecting Options from the Tools menu, or by clicking the Options button in the Help Toolbar. The Options Dialog is divided into a number of functional tabs.




***Click an item in the Options Dialog tree menu to configure the settings.***

System Settings 255
Colors/Style 246
Preferred Values 250
Sounds 251
EMail Alerts 249
Trading Costs/Control 257
Synchronization 252
Automated Execution 245
Editor 248
Indicator Calculations 261

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# 18.2 Automated Execution Options

## Automated Trading Options

### Submit Trades from Weekly/Monthly Scale as Good Til Cancel

When trades are generated from ChartScripts using Weekly or Monthly timeframes, it's likely that your trading horizon is longer term. Check this option to automatically mark orders as GTC when placed in the Order Manager queue.

### Allow Stop/Limit Exits to be placed on Bar of Entry

*Applies to: Real-Time ChartScript Window and Real-Time Scans with "Feed to Order Manager" selected.*

With this option selected, stop and/or limit orders placed on the entry bar will be activated after the order has been confirmed Filled 236. The same-bar stop order value is based on the closest stop from either an "Installed" AutoStop or the value passed to SetRiskStopLevel. Same-bar limit orders, or profit targets, are based on InstallProfitTarget only.

It's *not* required to ApplyAutoStops for entry-bar stop and limit orders. Simply by calling InstallStopLoss and/or InstallProfitTarget, you can create a bracketed exit only for the trade's entry bar. Thereafter, you can apply manual logic for stops and profit targets, which may also include a bracket-order strategy.

**Note:** Though it's not strictly necessary, Auto-pilot mode should be enabled to promptly place the entry-bar stop and/or limit orders.

*Checklist for enabling stop and limit exits on the entry bar:*

1. ChartScript code requirements:
   a. For a stop on the entry bar call InstallStopLoss or SetRiskStopLevel.
   b. For a profit target on the entry bar, call InstallProfitTarget.

   **Note:** You do NOT have to call ApplyAutoStops in the ChartScript unless you wish to continue using the auto stop method *after* the entry bar as well.
2. In the Automated Trading options, enable "Allow Stop/Limit Exits to be placed on Bar of Entry".
3. The orders must come from either a Real-time ChartScript Window 126 or RT Scans 201.
4. **Optional:** Auto-Pilot mode enabled. If you don't enable the A-P, you will manually have to click "Place" to submit all orders from the Order Manager's queue, including the same-bar exit orders.

---

## Trading Thresholds

### Do not submit Orders in Excess of Buying Power

Check this option to inhibit automated orders from being placed that would exceed your real-time buying power 240. This option applies to manual and automated orders submitted through the Order Manager. While connected to your broker, the Order Manager dynamically displays your brokerage account's current buying power in the status bar.

**Warning!** The option does not protect you from exceeding buying power when entering *market* orders manually.

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### Do not submit Orders in Excess of Cash

Check this option to inhibit automated orders from being placed that would exceed your real-time cash reserves. This option applies to manual and automated orders submitted through the Order Manager. While connected to your broker, the Order Manager dynamically displays your brokerage account's current cash reserves in the status bar.

**Warning!** The option does not protect you from exceeding cash when entering *market* orders manually.

### Stop Trading if Cash falls below: [Value]

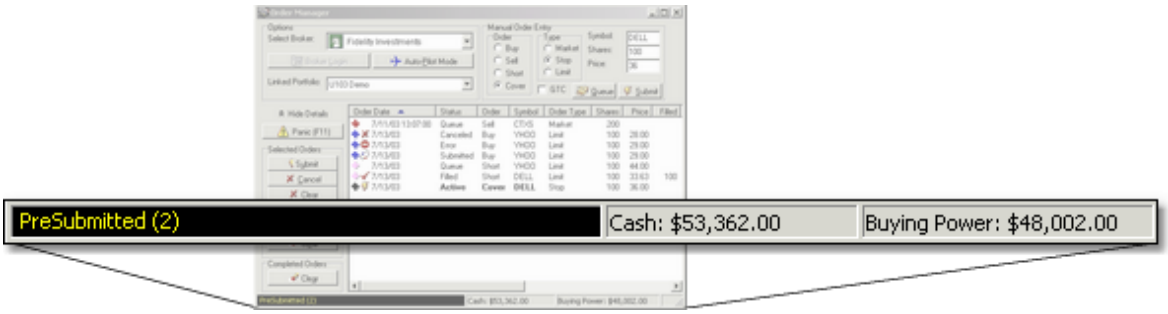
When checked, this option does not allow new positions to be entered when the cash in your account falls below the *Value* amount specified. This option applies to manual and automated orders submitted through the Order Manager and does not affect signals that exit positions.

### Stop Trading if Buying Power falls below: [Value]

When checked, this option does not allow new positions to be entered when your account's real-time buying power falls below the *Value* amount specified. This option applies to manual and automated orders submitted through the Order Manager and does not affect signals that exit positions.

### Cancel all Active Orders when Thresholds above reached

When checked, this option cancels all active *entry* orders (BuyAt or ShortAt) in the Order Manager if either Cash or Buying Power fall below specified levels. This option applies to the ***Stop Trading*** options (either or both) only if they are checked. Otherwise, this option is disabled.




***Order Manager's Status Panel detail showing current Cash and Buying Power, which is updated dynamically with information provided by your broker.***

## 18.3 Colors/Style Options

The Colors/Style Options let you specify different default color values for your charts, as well as various drawing options. This Options view can be accessed at any time using the **Ctrl+L** keyboard shortcut. Many chart-rendering properties can also be controlled by your scripts using these WealthScript's Cosmetic Chart functions:

SetColorScheme
SetBackGroundColor
SetPaneBackgroundColor
SetSeriesBarColor
SetBarColor

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Chart color and style default options are applied to ChartScript windows that are opened *after* configuring new options.

**Tip:** To apply a new configuration to the current chart, right-click the Chart area and select **Chart Colors/Settings... (Ctrl+L)** from the pop up menu.

---

## Chart Colors and Settings

### Background

The color of the chart background.

### Up Bars

The color of bars whose PriceClose is greater than the PriceOpen. See the "Fill Candlesticks" option.

### Down Bars

The color of bars whose PriceClose is less than or equal to the PriceOpen.

### Volume Up / Volume Down

The color of the volume histogram corresponding to Up/Down bars as defined above.

### Grid Lines

The color of x and y axis grid lines on the chart.

### Bottom Margin

The color of the bottom margin of the chart, where dates are displayed.

### Fill Candlesticks

With this option deselected, Up Bars will be hollow but outlined in the color selected above. Check this item to fill candlesticks with the Up Bar color. If you regularly print charts on a black & white printer, leave this option unchecked to easily differentiate up and down bars.

### Disable Price Box Rollover

Inhibits the pop-up display of the OHLC/change summary box when hovering the normal cursor 65 over the bars in the price pane.

---

## Grid Lines

Horizontal and vertical grid line spacing is controlled automatically. Horizontal lines are drawn at the major grid points along the Y-axis, and vertical lines are generally drawn every 5 to 20 bars depending on the time frame and bar spacing selected.

### Horizontal

Enables horizontal grid lines for display.

### Vertical

Enables vertical grid lines for display. For intraday charting, a double-thick vertical grid line is drawn on the first bar of the day.

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### Drag / Dropped Indicators

#### Plot Labels on Chart

The Indicator QuickPlot 58 feature utilizes the PlotSeriesLabel function to display a Price Series and a descriptive label in a chart pane. **Plot Labels on Chart** enables (checked) and disables (unchecked) the display of the label found in **any** PlotSeriesLabel function. DrawLabel and DrawText functions are not affected by this option.

### Real-Time Charts

**Show Special Vendor Symbol Lists** *Applies to:* QCharts 132, TaiPan 134

QCharts, for example, provides special lists of the most active stocks, largest gainers/losers, etc. When this option is checked, special folders are created and populated with these symbols.

**Show Recently-Used Symbols** *Applies to:* Real-Time ChartScript Window

Uncheck this option to disable the MRU list in a Real-Time ChartScript Window. Disabling this option can be handy to stabilize the DataSource tree while choosing symbols from a static WatchList.

### Chart Fonts

Set font type, style, size, and effects separately for the following items.

- Axis and Value Labels
- Trade Labels

Click the button next to the item to bring up a common dialog box in which to choose your settings.

## 18.4 Editor Options

The Editor Options tab can be opened directly from the Editor view by right-clicking the code area and selecting **Editor Options** from the pop-up menu.

### Editor Font

Choose the base font and size. Because the Editor aligns characters in columns, a choice of non-proportional fonts work best, like `Courier New`.

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### Tab Spacing

#### Spaces per Tab

Striking the Tab key will move the cursor in the ChartScript Editor view by the number of spaces/columns set here. Consequently, this number also controls the number of columns for "Block Indent/Outdent", **Shift+Ctrl+I** / **Shift+Ctrl+U**, respectively. To use these shortcuts, you must highlight at least one character as a block.

**Tip:** See the Editor Keyboard Shortcuts 85 topic for more useful shortcuts in the ChartScript Editor View.

### Syntax Highlighting

#### Background Color

Click the Background Color button to bring up the common color dialog. Choose a basic color, or create a custom color to use in the background of the code window.

#### (All Others)

To change the color and effect of a syntax-highlight item, start by clicking the item. Its current settings will be reflected in the Bold, Italic, and Underline check boxes as well as the Font Color. Adjust these controls to you choosing, and repeat for other items. Click **OK** to save your changes

## 18.5 EMail Alerts

You can configure Wealth-Lab Developer 4.0 to send you an email when alerts from buy/sell signals come in. In this section you specify the types of alerts that you want to be notified about, and your email account settings.

### Send EMail When

#### Alert Triggered from Quote Manager

This setting causes an email to be sent whenever a price hits its target level in the Quote Manager 190.

**Note:** Some virus scanning programs, such as *McAfee VirusScan*, may interpret repeated EMail Alerts as "potential worm activity".

#### Alert Triggered from Real-Time ChartScript Window

This setting causes an email to be sent whenever a buy, sell, cover or short signal is triggered in a Real-Time ChartScript Window 126 or in Real-Time Scans 201.

### EMail Properties

#### EMail Address

Type the email address to which you want alerts to go. Currently only a single

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address is possible.

**SMTP Host**

Specify the outgoing (SMTP) email server here.

**User ID**

Some SMTP servers require that you use a User ID when sending outgoing mail. You may need to provide your User ID here.

**Authentication**

Check this box if your email server requires you to authenticate outgoing mail with a user name/password. If Authentication is checked, you should enter your email password in the Password field.

**SMTP Port**

Change the SMTP port number if your outgoing mail server uses a different port number than the standard port 25.

---

## 18.6 Preferred Values Options

For more information, refer to the Preferred Values Manager 273 topic.

---

### Use Preferred ChartScripts in

**WatchList Scans**

If this option is selected, WatchList Scans will use whichever Preferred ChartScripts that you defined for individual symbols. For symbols where no Preferred ChartScripts are defined, the ChartScript selected for the Scan is used.

**$imulator**

If this option is selected, the $imulator will use whichever Preferred ChartScripts that you defined for individual symbols. For symbols where no Preferred ChartScripts are defined, the ChartScript selected for the $imulation is used.

---

### Use Preferred #OptVars in

For a discussion of Preferred #OptVars, see the topic on ChartScript Optimization 112 and Preferred Values Manager 273.

**ChartScript Windows/RT Scans**

If this option is selected, any Preferred #OptVars that you defined will be used in ChartScript Windows 41 and/or RT Scans 201; overriding the #OptVar default values defined in the script.

**WatchList Scans**

If this option is selected, any Preferred #OptVars that you defined will be used in WatchList Scans 136.

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**$imulator**

If this option is selected, any Preferred #OptVars that you defined will be used in the $imulator 155.

**Rankings**

If this option is selected, any Preferred #OptVars that you defined will be used in ChartScript 177 and WatchList 184 Rankings.

---

## 18.7 Sounds Options

Sound options control when to play sounds, and what sounds are played. You can change the program's sounds to use any local WAV file. To change a sound, click the small button next to the sound and pick a new WAV file to use. Sounds can be played when any of the following events occur:

**Alert Triggered from Quote Manager**

Plays the specified sound whenever a price hits its target level in the Quote Manager 190.

**Alert Triggered from ChartScript Window**

Plays the specified sound whenever an alert is triggered in a ChartScript Window 45. This can be especially handy when using Real-Time ChartScript Windows and following several markets at once.

**Tip:** If you trade intraday and use a script that holds stop and limit orders open for more than one bar, you may want to hear an audible alert, but not for each new bar. For total control over producing sounds from the ChartScript window, see PlaySound in the Function Reference.

**Alert Triggered from Real-Time Scan**

Plays the specified sound whenever an Alert is triggered in RT Scans 201. The sound file is played once for each triggered Alert.

**New Bar Arrives in Real-Time ChartScript Window**

Plays the specified sound whenever a new bar of data arrives in a Real-Time ChartScript Window 126.

**Note!** The "New Bar" sound may override the **Alert Triggered from ChartScript Window** sound. Consequently, if it's important that one sound be heared, select that sound option only.

**User Interface Interactions**

Plays a predetermined sound for chart interactions such as dragging and dropping indicators or moving the normal cursor over a manual drawing object.

**Related topic:** WealthScript System function, PlaySound.

---

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## 18.8 Synchronization Options

These Synchronization Options control how multiple data series behave when used within the same script. When working with multiple data series, it's crucial to ensure that the data is aligned properly by date.

Wealth-Lab Developer 4.0 uses a concept of a *primary data series* and one or more *external data series*. The primary series is the one that you clicked in the DataSource Tree. External series are ones that you use in your script via calls to SetPrimarySeries or GetExternalSeries. *Wealth-Lab synchronizes external series to the primary 'clicked' symbol upon their first reference*. This statement is significant and often lost in the interpretation, so let's emphasize it with an example.

**Example**

```
var Bar, hExt: integer;
var ClickedSym: string;

{ ClickedSym is the 'main' Primary Series }
ClickedSym := GetSymbol;

{ When the next statement is executed, 'IBM' is automatically
synchronized (if enabled) to ClickedSym }
hExt := GetExternalSeries( 'IBM', #Close );

{ Plot the synchronized 'IBM' #Close series }
DrawLabel( 'Clicked/primary symbol: ' + ClickedSym, 0 );
PlotSeriesLabel( hExt, 0, #Blue, #Thick, 'IBM(Close)' );
```

**Controlling Synchronization within a ChartScript**

You have finer control of synchronization within your script itself. See the EnableSynch, SynchSeries and SynchAll functions in the WealthScript Reference for Price Series Functions (or QuickRef) for more details.

**Related Topic:** Series Synchronization Checker 275

---

### Secondary Symbol Synchronization

**Enable Automatic Date/Time Synchronization of External Series**

If this option is turned on (default) Wealth-Lab will synchronize any external data series to the primary series. If an external series contains dates that do not exist in the primary series, they will be eliminated from the secondary series. If the secondary series is missing dates that are contained in the primary series, the bars will be added. The price and volume values of the newly added bars will be taken from the previous bar's values.

Turn this option off to disable synchronization altogether. You might want to do this if your script is processing all of the symbols in a WatchList, for example, and you don't care about synchronizing to the symbol that was clicked. Note that if you turn off synchronization and you try and create or plot indicators based on external data series you might receive errors because the different price series may contain different numbers of bars.

**Synchronization Notes**

- When synchronization is enabled, series are immediately synchronized upon their first reference during script execution.

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- Once a series or indicator is loaded, it cannot be refreshed or reloaded during a script's execution unless you first call ClearExternalSeries.
- Synchronization is "destructive", i.e., a synchronized series cannot be unsynchronized.
- It then follows that once a series is loaded and synchronized, references to that series will always return the same synchronized series regardless of possibly having changed the synch settings, e.g., EnableSynch.
- See How Secondary Symbols Are Synchronized in the Knowledge Base at Wealth-Lab.com.

---

## Compressed Price Series Alignment

This setting affects how data from higher time frames is aligned within a chart. For example, you can access weekly data from within a daily chart, or daily data from within an intraday chart.

When combining data from different time frames you must be careful that the data are available in the expanded time frame in the order it would be in actual trading. Imagine being able to trade an intraday system knowing beforehand the high and low price of the day. Wealth-Lab protects you from this type of *postdictive* error with its default behavior. For a detailed discussion and a list of functions that let you work with data in different time frames, see Understanding Time Frames in the WealthScript Guide.

**Note:** Although the following settings are described in terms of daily and weekly bars, they are equally applicable to data alignment in other time frames as well.

### Option 1: Compressed Bar Available on Last Bar of Period (* default behavior)

New weekly bar data would be available on Friday (or, the end of the week if not Friday). The daily bars for Monday through Thursday would have access to the weekly bar from the previous week. This default behavior should be used if you're writing scripts that make trading decisions from data in higher time frames. For example, you daily script might rely on a weekly moving average crossover signal. The signal would be made available at the close of the day on Friday, ready for a new order to be placed for trading on Monday.

### Option 2: Compressed Bar Available on the First Bar of Period

The weekly data is aligned to the daily so that it lines up visually for charting purposes. The weekly bar aligns to the Monday-Friday daily bars from which it was created. If your script uses the weekly data to base trading decisions on a daily chart you should **not** use this option, since the Monday through Thursday bars have access to the weekly data, which wouldn't have been available until Friday.

### Option 3: PREVIOUS Compressed Bar Available on the First Bar of Period

When working with intraday charts, the default behavior (first option above) synchronizes the day's closing price following an IntraDayFromDaily function call, for example, to the last bar of the intraday chart. Choose this option if you prefer to always use the previous day's closing values with your intraday chart, even for the last bar of the day.

**Note:** For real-time intraday trading systems *that use Daily bar compression* (SetScaleDaily/RestorePrimarySeries), **choose Option 3**. In real-time, Option 1 will always assume that the most recent (last) bar of the chart is

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the final bar of the day, which synchronizes the *current day's* OHLC with the last bar. See Synchronizing Daily Series in Intraday Timeframes in the Wealth-Lab Knowledge Base for more information.

---

## Intraday Bar Compression

**Use the Start time of the first Bar of the day to bar Compression** *(Default: Not selected)*

This option affects how intraday bars are compressed to a higher time frame using the SetScaleCompressed function or the Scale toolbar 50 in the following manner.

**Note:** Wealth-Lab uses and assumes end-of-bar intraday time stamp convention for all Intraday DataSources. Therefore, a 5-minute bar that is time stamped "09:35" is assumed to be the first bar from a market that opens at 09:30 and it includes all data from 09:30:00.01 to 09:35.

### Intraday Historical DataSource

When you create an Intraday Historical DataSource 26, you should specify a Market Open time even if you choose not to filter data. For these DataSources, the specified time will *usually* serve as a reference when compressing bars *with or without* "Use the Start time" option selected (see *Exception*). Note that the Market Open time can be modified if necessary using the DataSource Properties 29 button.

Say, for example, you've created an IH DataSource of 1-minute bars with a Market Open at 09:25 and the first bar happens to be 09:32. If you switch to a 10-minute compressed scale, the first bar will be time stamped 09:35 and will include all bar data from 09:25:00.01 to 09:35 in the first bar.

***Exception*:** If however, the specified Market Open *equals or is after* the time stamp of the first bar, the ASCII logic (below) is utilized. The logic is exercised on a day-by-day basis.

### ASCII and other DataSources

With "Use the Start time" *not selected*, Wealth-Lab aligns compressed bars as if they began at the top of the hour. In the previous example with the first 1-minute bar at 09:32, the first compressed 10-minute bar would be time stamped at 09:40, which includes all data from 09:30:00.01 to 09:40.

However, with "Use the Start time" *checked*, Wealth-Lab will align compressed bars using the day's first bar as a reference on a day-by-day basis. Therefore, with the first 1-min bar at 09:32, the first compressed 10-minute bar would be time stamped at 09:41, which includes all data from 09:31:00.01 to 09:41.

### Streaming / Live Feed

Since the data provider returns Intraday Bars in the interval requested, this option has *no effect whatsoever* for streaming data.

---

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# 18.9 System Settings Options

## General Settings

### Script Timeout Value (Seconds)

Controls the number of seconds before script processing will time out, or stop. It is possible to code scripts that enter infinite loops, so it can be important to define this timeout value. To override the script timeout, specify a value of zero here. Alternatively, you can always stop a script's processing by pressing the ESC key. The time out value does not apply to PerfScript processing.

### Maximum Items to load into Trade Lists

You can limit the number of trades added to the trades lists in the Trades view of the ChartScript Window and $imulator. Loading thousands of trades into the list can be time consuming, and restricting the number can yield a much faster completion of $imulations. Specify a value of zero to allow an unlimited number of trades to be loaded into the list.

**Note:** To save all $imulator trade results 158 and to view all By Period 172 Entry and Exit tallies as well as all Analysis Series data points, you must set first "Maximum Items" to zero (and then Execute or Apply sizing to repopulate the Trades View 167).

### Allow Lowercase Characters to be used for Symbol Entry

If the option is *not* enabled, whenever you type a symbol into the ChartScript Symbol Entry Panel 46, the Futures Symbols Manager 271, or Quote Manager 190 (Add Alert), lowercase letters are automatically converted to uppercase. Check this option if you work with symbols requiring lowercase punctuation.

---

## Decimals and Currency Settings

### Number of Decimal Places

Specifies the default number of decimal places to use when displaying prices. You can override this value for individual symbols in the Futures Symbol Manager.

### Currency Symbol

Specifies the currency symbol to use when displaying prices. This setting is also used in the Order Manager's status panel 240.

### Indicator Decimal Places

Specifies the number of digits after the decimal when displaying indicator values in the Data Window 269 and in chart panes/axes *other than the Price or Volume panes*.

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## ChartScript AutoBackup

### Enable Autobackup on ChartScript Save

When this option is turned on, Wealth-Lab Developer 4.0 maintains backup copies of your script's *previous state* whenever you make a change. The backup copies are stored as WL files under the Database folder. If you want to back up ChartScripts in their current state, you should select **File|Backup ChartScripts** from the main menu.

Keep in mind that all ChartScripts are stored in the *TradingSystems* database. For the most security, you should periodically back up the **\Database** folder to archive all of your Wealth-Lab databases.

## Mouse Wheel Options

### Zoom Bar Spacing

If this option is selected, turning the mouse wheel zooms the chart in and out, increasing and decreasing the spacing between bars.

### Scroll Through Chart Data

If this option is selected, turning the mouse wheel scrolls through the chart data.

### Scroll Rate (Bars)

If the **Scroll through Chart Data** option is selected, this value determines the number of bars that are scrolled each time the mouse wheel is moved. This number may be multiplied by the number of scrolling lines you have configured in your mouse properties.

## ChartScript AutoBackup

Selecting this option will enable a backup copy of a ChartScript to be saved each time that you save a ChartScript. Select **File|Backup ChartScripts** to manually backup all ChartScripts.

## Performance Metrics

### Equity Drop Ratio Threshold

**Note:** This option has been removed and is hard-coded to 5%.

The Equity Drop Ratio Threshold, expressed as a percentage, is the magnitude required of an equity drop to be included in the Equity Drop Ratio 163 performance measure.

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### ChartScript Execution

**Prevent the selection of a Symbol and execution of a ChartScript when a new window is opened**

Use this global option instead of adding the {$NO_AUTO_EXECUTE} directive to individual ChartScripts to prevent Wealth-Lab from automatically loading a symbol when a new ChartScript Window is launched.

---

## 18.10 Trading Costs/Control Options

The Trading Costs & Control Options let you control position sizing for stocks and futures individually. Wealth-Lab Developer 4.0 determines if futures position sizing should be used by looking the symbol up in the Futures Symbols Manager.

---

### Commission

**One Way Commission**

The specified commission value is a dollar amount deducted for each individual trade. This setting is also used in the $imulator and new settings can be Applied 158 without re-running a complete $imulation. You can set the commission to be calculated on a **per Trade** or a **per Share/Contract** basis. Entry and exit commissions cannot be set independently.

**Use the selected CommissionScript**

Scripts saved in the **CommissionScript** ChartScript folder will be available for selection in the drop down control. The selected CommissionScript is processed once for each trade entry and again for each exit to determine commission fees. See CommissionScripts in the WealthScript Language Guide for more information.

---

### Slippage

These slippage controls allow you to simulate less-than-perfect fills for your trades that can happen in the real world. When Slippage is enabled, the trade's entry price and exit price are adjusted slightly based on the amount of Slippage specified.

**Note:** From within a ChartScript, you can override the following settings using SetSlippage WealthScript function. The single SetSlippage function has parameters for each of the settings described below.

**Activate Slippage**

Check this box to include the effects of slippage in your system performance results.

**One Way Slippage**

This specifies how much Slippage to apply to the entry and the exit prices of the trades for AtMarket, AtClose, and AtStop orders. For futures, each Slippage Unit represents a single Tick. For stocks, each Slippage Unit represents 1/10 of 1% of the base price. The following example will clarify how Slippage settings will modify entry and exit prices.

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```
Stocks, Slippage Setting = 5
Entry Price = $50, Exit Price = $60
Entry Slippage = $50 * 0.5% = 0.25
Adjusted Entry Price = $50.25
Exit Slippage = $60 * 0.5% = 0.30
Adjusted Exit Price = $59.70

Futures, Slippage Setting = 5, 1 Tick = 0.25
Entry Price = $500, Exit Price = $510
Entry Slippage = 5 * 0.25 = $1.25
Adjusted Entry Price = $501.25
Exit Slippage = 5 * 0.25 = $1.25
Adjusted Exit Price = $508.75
```

**Note:** Slippage will never cause entry or exit prices to be adjusted beyond the low/high range of the bar.

#### Limit Order Slippage

By selecting this option, slippage will be applied to Limit orders as well. In these cases, Slippage doesn't adjust the entry or exit price of the orders (see *Exception*), but, it does add the additional condition that price must have traded at least to the Slippage-adjusted price. If prices fail to trade to the adjusted price, the Limit order is not executed. This option makes the probability of limit order execution in back testing more realistic because many competing limit orders in actual trading may prevent yours from being filled. Consequently, you can be more certain that your order would have been filled if price actually exceeded your limit price.

***Exception:*** If the limit price is exceeded on an opening gap, slippage will be applied to the opening price to obtain a new execution price to the extent allowed by the bar's range.

For example, say you're using 10 units of limit order slippage with a long position, and, the market is trading at 24.00, with a profit limit of 24.50. If the market gaps open to 25.00, the trade will be executed at the *greater of* 24.75 (25 - (25 * 10 * 0.1%)) or the low of the bar.

**Notes:**

1. Limit Order Slippage is not compatible with zero-range bars, i.e., time-of-sales, or tick data. Since trade executions are enabled only for bars that achieve the slippage-adjusted price, and, execution price cannot be outside the bar's range, aberrations in execution price will result. When back testing, the slippage-adjusted price will effectively serve as the limit order price.
2. Whereas slippage applied to market orders will almost always penalize a trading system, Limit Order Slippage may actually keep your simulations from entering trades that ultimately would have resulted in losses (positive impact). Likewise, you may reject trades that would have been "winners" if Limit Order Slippage were not applied.

---

### Round Lots

#### Round Shares to nearest 100

Enable Round Lots by placing a check mark next to this option. For example, if a Position were sized as 250 shares, selecting this option would automatically adjust the share size up to 300. Likewise, a Position sized as 249 shares would be set to 200 shares. The Round Lots options also affect Positions sized by SimuScripts. For the greatest control over position sizing with SimuScripts, disable the Round Lots

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option and perform all sizing and rounding in a SimuScript.

**Note:** Round Lots does not apply to futures symbols.

#### Round Shares < 50 up to 100

When Round Lots is enabled above, checking this option will cause a Position that is sized with fewer than 50 shares to be rounded up to 100 shares. otherwise, Round Lots will round the shares to zero, resulting in a rejected or "skipped" trade.

**Note:** The < 50 option will not round shares up to 100 if you use a SimuScript to intentionally reject a trade by setting its Position size to 0.

---

## Futures Trading

#### Related Topics:

Futures Symbols Manager 271
Futures Mode 36

#### Prohibit Trades in Direct of Market Moves on Limit Days

If this option is checked, trades will not be taken in the same direction of limit moves for futures symbols. This option does not apply to intraday scales.

**Note:** Wealth-Lab uses rudimentary detection of a locked limit condition by testing equality between open, high, low, and closing prices. Use this option carefully for illiquid contracts.

#### Use Ceiling/Floor Logic when adjusting Price to Tick Value

Stop and limit prices are adjusted to the next ceiling or floor Tick value according to the order type as follows:

| | |
|---|---|
| ***Ceiling Limit Price*** | **`ShortAtLimit`**; **`SellAtLimit`** |
| ***Ceiling Stop Price*** | **`BuyAtStop`**; **`CoverAtStop`** |
| ***Floor Limit Price*** | **`BuyAtLimit`**; **`CoverAtLimit`** |
| ***Floor Stop Price*** | **`SellAtStop`**; **`ShortAtStop`** |

**Example 1** (No Slippage)

Assume you're holding a long position, p, of a futures contract that has a Tick Value of 0.25. Your calculated profit target (limit price) is $50.33. Wealth-Lab will *ceiling* the limit price in the signal **`SellAtLimit(`**`Bar + 1, 50.33, p, ''`**`);`** to the next higher Tick increment, consequently, the sale will take place when price reaches $50.50 (or greater for an opening gap in price).

**Example 2** (1 Tick of Slippage)

With the same long position in Example 1, you have calculated a stop loss of $46.21. Wealth-Lab will *floor* the stop price in the signal **`SellAtStop(`**`Bar + 1, 46.21, p, ''`**`);`** to the next *lower* Tick increment. Consequently, the sale for a loss will be executed at $46.00 or lower. If 1 Tick of slippage were activated, this sale would take place at $45.75.

#### Round Price Value to the closest Tick (old default behavior)

Stop and limit prices are adjusted to the *closest* Tick value regardless of order type. Using this option, the execution price in Example 1 would be $50.25, and, for Example 2, $46.25 (without slippage) and $46.00 (with slippage).

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## Rates for $imulator

The $imulator (alone) has the ability to apply fixed interest and margin loan rates to a Portfolio $imulation. Interest (paid or earned) is calculated daily and on weekends and holidays, i.e., non-trading days. As the system closes positions, any margin balance is "paid off" from the proceeds of closed positions. Interest can be calculated using a *Daily Multiplier*:

$$DailyMultiplier = e^{\frac{\ln(1+r)}{365}}$$

where *r* is the annual rate (e.g. For a 3.5% annual rate, *r* = 0.035). In other words, multiply a cash balance by the DailyMultiplier to arrive at the new cash balance. This equation can be expressed in WealthScript as follows:

```
DailyMultiplier := Exp( Ln( 1 + AnnualRate ) / 365 );
```

Consequently, the interest on *Cash* for any given day can be calculated by:

```
Interest := Cash * ( DailyMultiplier - 1 );
```

### Interest Rate for Cash

Enter an annual rate to earn interest on free cash during $imulations. For example, enter 3.5 for a 3.5% annual percentage rate.

### Margin Loan Rate

Enter an annual rate to pay interest on cash borrowed to purchase equity during $imulations. For example, enter 4.25 for a 4.25% broker call rate.

### Apply Interest and Margin Loan Rates in $imulations

Enables interest and margin loan rates to be applied to subsequent $imulations.

- The Apply 158 action in the $imulator honors the most-recent selection of **Apply Rates**.
- Portfolio $imulation Mode Optimizations *do not* apply rates.

The next illustration indicates areas in a typical $imulator equity curve where the interest and margin rates are applied.

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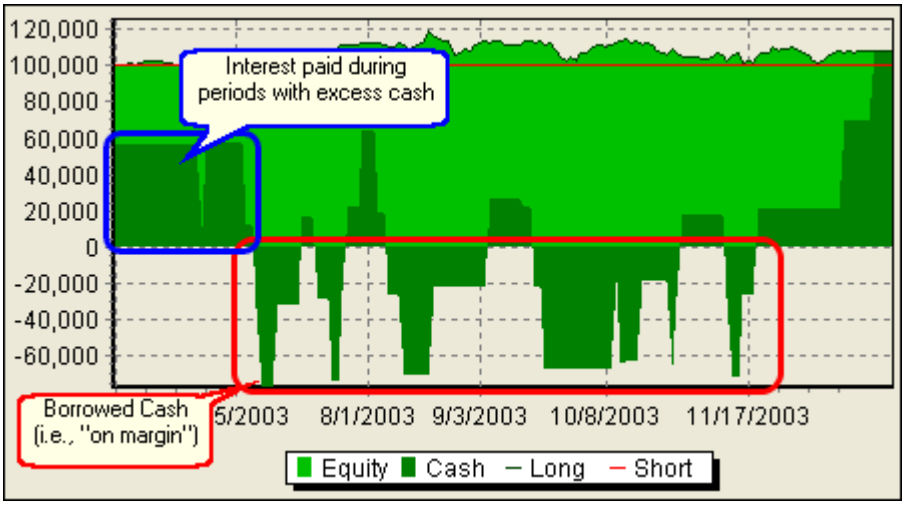
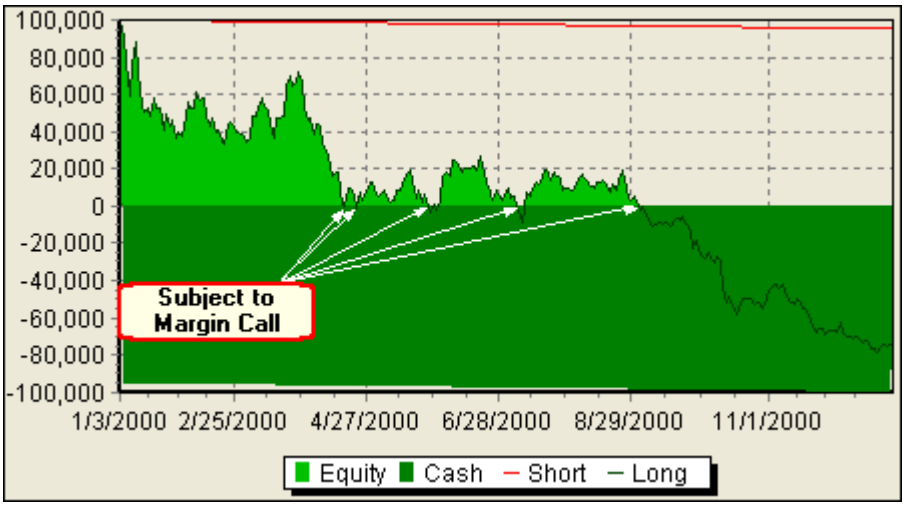



***The dark green area below zero indicates periods where you borrowed cash to buy or short equity positions.***
***See Rates for $imulator 257 to control interest for cash and margin.***

Note that when equity dips to zero in a $imulation, you would have certainly received a margin call from a broker. In practice, margin calls are based on equity dropping below a *maintenance margin* value, which typically will occur much earlier than when equity reaches zero. For more information, read your margin agreement with your brokerage.




***Anytime that the total portfolio equity value dips below zero, the account is subject to a margin call. (This particular $imulation uses nearly the full 2:1 margin to buy and hold a single security at just the wrong time.)***

## 18.11 Indicator Calculations

When more than one generally-accepted method is available for calculating a popular indicator, you can configure Wealth-Lab Developer 4.0 to use the method you prefer as a default.

### Exponential Moving Average

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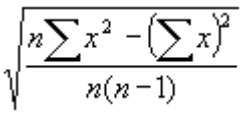
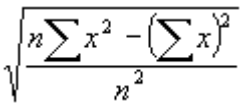
Wealth-Lab supports two different methods to calculate the EMA exponent used in the EMA indicator. Note that you can still control the method dynamically during ChartScript execution using the WealthScript function UseUpdatedEMA.

### Standard Deviation

Select between the standard deviation of a sample and that of an entire population for the StdDev indicator and other indicators that use a standard deviation, such as Bollinger Bands (BBandUpper, BBandLower). If the sample size is large, i.e., *the Period*, *n*, then either formula will return approximately the same value.



***Formula for standard deviation of a sample***



***Formula for standard deviation of a population***

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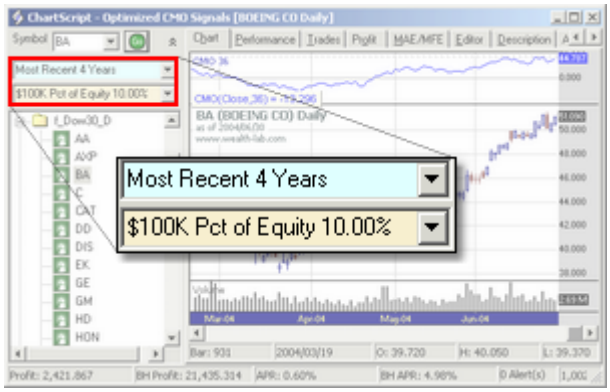
# 19 Other Tools

## 19.1 Position Sizing Control

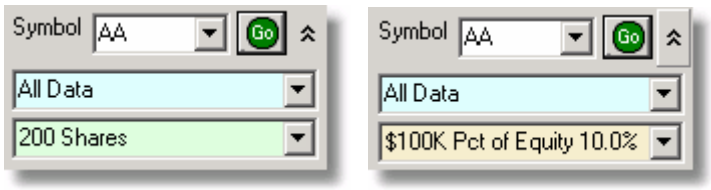
The Position Sizing Control is Wealth-Lab Developer 4.0's money management feature that offers you several options to easily apply to your trading methodologies.




***Detail of Common Controls. Data Loading (light blue, top) and Position Sizing (bottom)***

In Wealth-Lab Developer 4.0, the Position Sizing Control is used for ChartScripts, Rankings, and Scans. In each of these tools, you'll find a control that has a light-green or mellow-yellow background depending on the selected mode - Raw Profit Only 263 or Portfolio Simulation 263, respectively. The location of the control varies with the tool as follows:

| Tool | Location of Common Data Loading Control |
|---|---|
| ChartScript | DataSource tree (must be showing) |
| Rankings | Selection tab |
| Scans | Selection tab |
| Real-Time Scans | Data Range / Position Sizing frame, upper center form (if showing) |
| Screener | Results/Criteria selection |




***Common Controls - Position Sizing Control (bottom)***
When light green, Raw Profit Only is selected, whereas light yellow indicates Portfolio Simulation mode.

When expanded, the control presents a dual-tab dialog that facilitates the selection of position sizing options. First, select the tab of the mode that you want to use, Raw Profit Only 263 or Portfolio Simulation 263, and then the desired sizing option. It's important to know that the last tab selected when clicking **OK** is the mode that will used.

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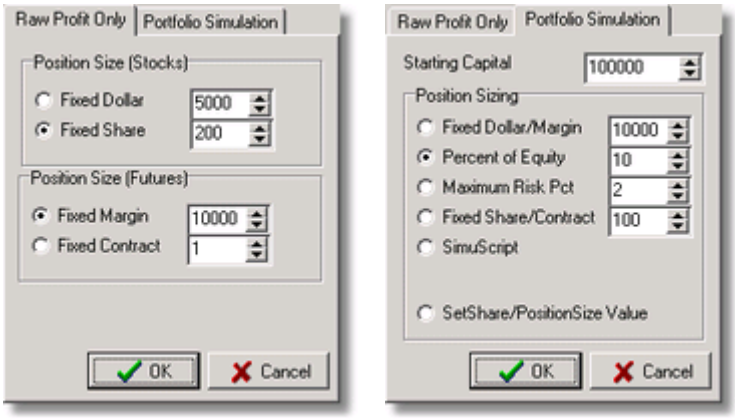


Options for Raw Profit Only (left) and Portfolio Simulation (right)

## Usage Notes by Tool

### ChartScript Window:

- To hide/show the Position Sizing and Data Loading Controls, click the / double-caretted button, respectively.
- When using Raw Profit Only, the light-green drop down control will display the choice for "Position Size (Stocks)" when a stock symbol is selected for the ChartScript. The "Position Size (Futures)" setting will be shown if you have properly entered the selected futures symbol in the Futures Symbols Manager 271. In the latter case, Futures Mode 36 must be enabled.
- Following the selection of sizing options, the ChartScript is automatically executed to ensure that the sizing configuration is properly reflected in the performance data.

### Rankings / Scans:

- When using Raw Profit Only, the light-green drop down control will display the choice for "Position Size (Stocks)" - only. Be assured that the "Position Size (Futures)" setting will be used during Rankings and Scans provided that you have properly entered the selected futures symbol in the Futures Symbols Manager 271 and that you have enabled Futures Mode 36.

### $imulator:

- By virtue of running $imulations, the $imulator 155 incorporates the control's Portfolio Simulation options only, which are found on the $imulator's **Pos Sizing** tab.
- You can run a $imulation in Raw Profit Mode *by entering 0* for Starting Equity. See the $imulator Interface 158 topic for more details.

### Screener:

- The Screener does not support the use of the *Maximum Risk Pct* or *SetShare/PositionSize Value* Portfolio Simulation mode sizing options, and therefore those options are not available.

Each option of the Position Sizing Control is described in the following segments.

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## Raw Profit Only

In Raw Profit mode, *all trades* that are signaled are reflected in the system's Performance results. The concept of starting equity does not exist, therefore you will get an idea of the script's raw profit potential. This can be useful in making comparisons between trading scripts when using the Fixed Dollar/Margin settings.

### Position Size (Stocks)

#### Fixed Dollar

This option gives each position an equal currency size. The number of shares is determined by dividing the position's basis price into the selected amount. We recommend using this option when testing stocks to avoid distorted results that might occur when using fixed share position sizes.

**Notes:**

1. When using Fixed Dollar/Margin sizing, you must specify a dollar (margin) value that would result in the purchase of at least 1 share (contract) otherwise the trade cannot be executed. e.g., If an instrument is trading for $1000/share, then you must specify a minimum value of 1000 to purchase at least 1 share.
2. Basis price may be calculated at a higher precision than the price displayed in an Alert, for example. The higher precision can result in a share size that is slightly higher or lower than you expect - especially for "penny stocks". See Data Precision Considerations 36 for more information.

#### Fixed Share

Each position will be assigned the number of shares specified.

### Position Size (Futures)

For a symbol to use Futures Position Sizing, you must add an entry for it in the Futures Symbols Manager 271. If the symbol does not have an entry in the FSM, then its size will be based on the Stocks Position Size configuration described above.

#### Fixed Margin

Analogous to Fixed Dollar for stocks, this option sizes positions on a constant margin basis. The number of contracts is determined by dividing the symbol's margin, found in its Futures Symbols Manager 271 entry, into the specified fixed margin. Any remainder is truncated so that the result is always an integer number of contracts.

#### Fixed Contract

Analogous to Fixed Share for stocks, each position will be assigned the number of contracts specified.

## Portfolio Simulation

Wealth-Lab Developer 4.0's Portfolio Simulation is a *true trading simulation* with money management rules. In Portfolio Simulation mode, you define the amount of starting equity and the position sizing rules to be used. If several trading signals occur on the same day (bar) and your portfolio does not have enough free cash to enter all (or any) of the new trades, then the simulation will reject these trades. For more information, see How the $imulator Chooses Trades 155.

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Generally speaking, when in Portfolio Simulation mode, the ChartScript Window, Scans, and Rankings tools will generate the same results as the $imulator tool provided that none of the $imulator's options are selected, lead bars are set to zero, and that the same initial conditions and data loading configuration are used.

**Starting Capital**

The amount of starting capital to use for the Portfolio Simulation.

**Fixed Dollar/Margin**

This option gives each position an equal dollar (stocks) or margin (futures) size. This is the same setting as the one described above for Raw Profit Only 263, with the only difference of being placed in a $imulation environment with starting capital. This implies that if the simulated portfolio runs out of cash or equity, the $imulation will not *enter* additional trades/positions.

**Percent of Equity**

This option lets you scale position sizes based on changes to the overall portfolio equity level. You specify a percentage of the total account equity that each position should take. Account equity is based on cash available plus the value of open positions on the bar prior to the trade. Once this value is determined, position sizing proceeds along the same lines as the Fixed Dollar/Margin options above.

For example, suppose you want each new position to be worth 10% of your account's equity. If the account equity were $50,000 at the time your script generated an entry signal, the position size would be $5,000. For a stock trading at $20 per share, this would translate into 250 shares.

**Note:** The maximum selectable Percent of Equity is 100%. The $imulator is an exception, where the maximum value is determined by the Margin Factor 158 x 100% (when enabled).

**Maximum Risk Pct**

This option creates a position size based on an initial risk level that is set in the ChartScript. Your ChartScript should use SetRiskStopLevel (which supersedes SetPositionRiskStop) to set the initial stop loss price level. This $imulator setting requires you to specify the maximum portfolio equity loss that you are willing to tolerate. The $imulator finds the position size based on your maximum loss level by calculating the magnitude between the position's entry price and stop price. For example:

```
Current Equity:          $100,000
Position Entry Price:    $80
Initial Stop Level:      $72
Maximum Risk Pct:        3 (risk no more than 3% of total capital per trade)
-------------------------------------------------------------------------
Position Size Shares:    ( 0.03 * $100,000 ) / ( $80 - $72 ) = 375 Shares
Position Size Dollars:   375 * $80 = $30,000 Dollars
Loss at stop price:      375 * ( $80 - $72 ) = $3,000
```

At a position size of $30,000, if our trade stops out at the $72 level, we lose 3% ($3,000) of our total account equity. Note that the trade itself is a 10% loser, ($80 - $72) / $80 = 10%.

As noted in the SetRiskStopLevel reference documentation, your ChartScript must control the position's actual exit for the maximum loss at the stop price passed by this function.

**Note:** If the calculated position *cash value* is greater than the current equity, the

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$imulator will create a position size based on 100% of current equity. For the sake of argument, assume that Maximum Risk Pct in the example above were selected to be 12%. In this case, 1,500 shares would be calculated as the share size, which is worth $120,000 at $80/share. Since the Current Equity is only $100,000, the calculated position will be reduced to 1,250 shares ($100,000 / $80). Consequently, if the portfolio were fully in cash, the trade would be executed.

**Fixed Share/Contract**

This option assigns a specified number of shares (stocks) or contracts (futures) to a position. This is the same setting as the one described above for Raw Profit Only 263, with the only difference of being placed in a $imulation environment with starting capital. This implies that if the simulated portfolio runs out of cash or equity, the $imulation will not *enter* additional trades/positions.

**SimuScript**

This advanced, Wealth-Lab unique feature lets you select a SimuScript to use to control the position sizing. SimuScripts are special scripts that are stored in the SimuScripts folder of the ChartScript Explorer. They utilize a subset of WealthScript functions that you can use to program sophisticated position sizing algorithms. The selected SimuScript is called/executed once for each new position processed. See the SimuScript topic in the WealthScript Guide for more details.

**SetShare/PositionSize Value** *(Prior to WLD3.0 Build 4 was: Value defined in ChartScript)*

Selecting this option instructs the Wealth-Lab to use the position size that is set at the ChartScript level. When this option is selected, the ChartScript must utilize either the SetPositionSize or SetShareSize functions to control the position size from within the script. If neither of these functions appear in the script, no trades will be generated.

---

## 19.2 Function QuickRef

The Function QuickRef contains an entry for each WealthScript function and has special integration with the ChartScript Editor 81 and the Wealth-Lab.com web site.

### Function QuickRef Interface

The Function QuickRef occupies a section of the main Tools Bar. It contains a tree control that has an entry for each function category in WealthScript. Expand one of these nodes to see the individual WealthScript functions underneath it.

When you click on one of the functions, you'll see a description appear in a documentation window. These documentation entries provide a complete example of each WealthScript function, excluding most Math functions that are self-explanatory. Above the description you'll see the WealthScript format, or syntax, of the function. Below the tree is a hyperlink that you can click to view the entry for this function at the Wealth-Lab.com web site. The web site entry may contain more detailed information, as well as links to other web resources and member comments.

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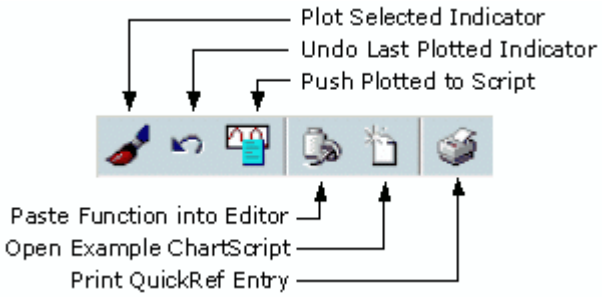
### Integration with the ChartScript Editor

When you're working within the ChartScript Editor you can quickly bring up the Function QuickRef entry for any native WealthScript function by placing the cursor on the function name in the Editor and pressing [F1].

The QuickRef documentation window contains a toolbar located in the upper-left corner. Paste and Print tools are available for all functions. Only native indicators have the Plot ability, and, the Open Example button is displayed whenever the documentation includes an example that can be opened in a new ChartScript window.




The Plot Indicator utility is integrated with the Indicator QuickPlot 58, which allows you to visually interact with an indicator and its parameters before committing the code to the ChartScript. When satisfied with the configuration of the indicator(s), click the "Push Plotted to Script" button, also located in the Indicators Toolbar 58.

Use the QuickRef Paste button to insert the function directly into the ChartScript Editor. First, position the cursor in the Editor view where the code should be placed and just click the **Paste** button. A default set of arguments will be inserted into the function's parameter list, therefore you should edit them for your specific application.

**See Also:**

Smart Code Editor 83
Indicator QuickPlot 58

## 19.3 Commentary Viewer

The Commentary Viewer contains custom ChartScript Commentary. The Commentary is generated within the ChartScript itself by using the **AddCommentary** function. AddCommentary takes a single parameter that contains the string to add to the commentary.

### Bar by Bar Commentary

By clicking different bars on the chart, the Commentary Window updates to show you the commentary as of the clicked bar.

### HTML Formatting

The Commentary Viewer uses HTML formatting. You can use any valid HTML tags when constructing your commentary text. Some useful HTML tag examples are shown below:

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```
<h1>Heading 1st Level</h1>
<h2>Heading 2nd Level</h2>
This text is <b>bold</b>
This text is in <i>italics</i>
To force a new line to start <br>
<pre>code examples</pre>
```

**Example**

```
var s, sLine: string;
var n: integer;
var xChange: float;
AddCommentary( '<h1>Symbol: ' + GetSymbol + '</h1>' );
n := BarCount - 1;
xChange := PriceClose( n ) - PriceClose( n - 1 );
AddCommentary( 'Daily change: ' + FormatFloat( '$#,##0.00', xChange )
);
```

---

## 19.4 Data Window

Select **Data Values Window (Ctrl+Alt+V)** from the **View** menu, or click the Data Window toolbar button, located in the View Toolbar, to open the Data Window. The Data Window displays the Date, Time, Open, High, Low, Close, and Volume data as you move the mouse over the bars of a Chart. It also displays the values of any indicators that you've plotted on the chart. To specify the number of decimal places for indicators, see Decimals and Currency Settings in the System Settings Options 255.

---

## 19.5 Debug Window

Select **Debug Window (Ctrl+Alt+D)** from the **View** menu, or click the Debug Window toolbar button, located in the View Toolbar, to open the Debug Window. The Debug Window contains the output of Print statements that execute in your ChartScript. Use the Debug Window to output indicator or variable values to help understand what's going on as a script processes. The combination of the Debug Window with the ChartScript Integrated Debugger 103 give you powerful tools with which to quickly squash bugs that creep into your code.

**Remarks:**

- Messages are Printed to the Debug Window only from the ChartScript Window. Consequently, Print statements are ignored in all other Wealth-Lab tools.

The example below is a simple system based on the CMO indicator. It outputs the CMO value to the debug window at the time a buy is initiated.

**Example**

```
var Bar: integer;
for Bar := 20 to BarCount - 1 do
begin
  if not LastPositionActive then
  begin
    if CMO( Bar, #Close, 20 ) < -50 then
    begin
      BuyAtMarket( Bar + 1, 'CMO' );
```

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```
      Print( 'CMO at time of entry = ' + FloatToStr( CMO( Bar, #Close,
20 ) ) );
    end;
  end
  else
  begin
    if CMO( Bar, #Close, 20 ) > 10 then
      SellAtMarket( Bar + 1, LastPosition, 'CMO' );
  end;
end;
```

**Related WealthScript Functions:**

Print; PrintFlush

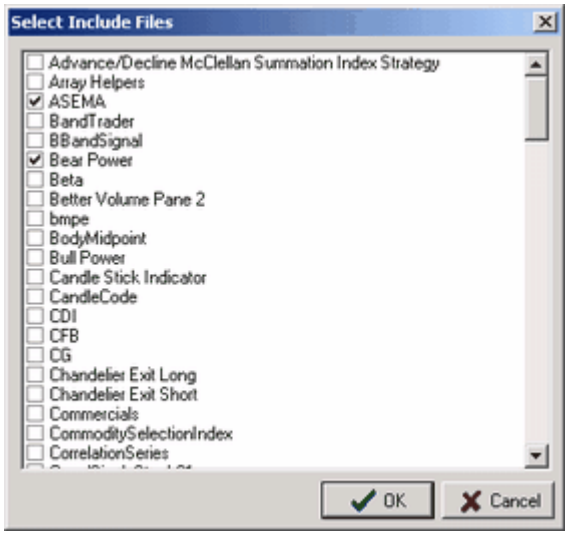
---

## 19.6 Include Manager

Don't rewrite code for each new ChartScripts, *re-use* tried and tested routines! The **Include Manager** makes this possible by making references to scripts saved in the **Studies** and **Indicators** folders. With this reference, you can call functions, use procedures, or create class objects from included scripts. Exploit the Include feature in ChartScripts as well as in SimuScripts.

**Note:** It's not necessary to use the Include Manager for native WealthScript functions and indicators, like **BuyAtMarket** or **SMASeries**. Rather, include scripts to utilize custom indicators or to perform some other non-native study or procedure.

Select **Include Manager** from the **Tools** menu or strike the [F6] function key to open the Include Manager dialog. The Include Manager is automatically populated with all of the ChartScripts stored in the Studies and Indicators folders in the ChartScript Explorer 42.




Use the Include Manager to select one or more Studies and Custom Indicators to include in the currently-selected ChartScript Window 45. Check the boxes of the Studies and/or Custom Indicators that you wish to include in your script. After clicking **OK**, the Include Manager will generate the special "Include Comments" in your code.

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**Example**

```
{$I 'ASEMA'}
{$I 'Bear Power'}
```

---

### Calling Included Functions and Procedures

With the Include Comments at the top of script, you may call the routines just as if they appeared in their entirety as functions and procedures in your ChartScript or SimuScript. Including scripts from the Studies and/or Indicator folders assumes that you know something about the routines and why you want to include them. Consequently, you must be familiar with their syntax. The Smart Code Editor 83 cannot furnish the same assistance that it provides for native WealthScript functions and indicators since Include Comments are processed only at compile time, which is just before the script is executed.

If you are not familiar with the syntax, your only recourse is to open a ChartScript Explorer, **Ctrl+O**, navigate to Studies or Indicators folder in which the routine is found, and inspect the WealthScript code by clicking on the WealthScript Code tab at the bottom.

For example, the ASEMA indicator script contains the following two functions, either of which may be called from a script that has the `{$I 'ASEMA'}` Include Comment.

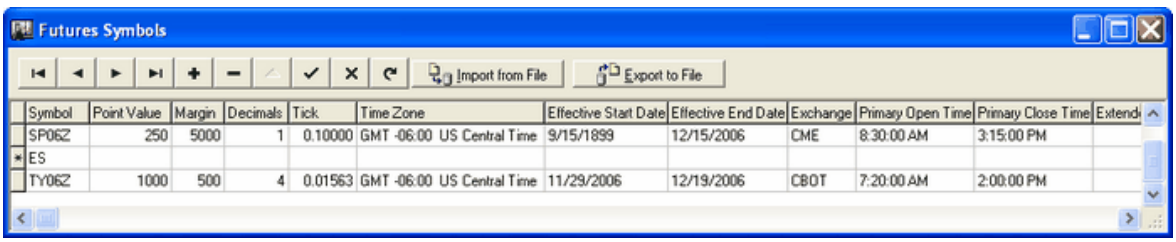
```
function ASEMASeries( Series: integer; per_up, per_down: float ):
integer;
function ASEMA( Bar, Series: integer; per_up, per_down: float ): float;
```

By examining the function declarations in this manner you will be able to properly make use of included studies and indicators.

---

## 19.7 Futures Symbols Manager

The Futures Symbols Manager (FSM) lets you specify the properties of different futures symbols. You can assign **Point Value**, **Tick Value** and other items to futures symbols according to their contract specifications as well as the initial **Margin** requirement. Wealth-Lab Developer 4.0 uses the data provided here as long as Futures Mode 36 is enabled under the **DataSources** menu.




***Wealth-Lab Developer 4.0's Future Symbols Manager, inserting a new symbol.***

Wealth-Lab Developer 4.0 processes Futures symbols in the following ways:

**Symbol**

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The futures symbol required for charting. If your data feed and your broker use different symbols, then refer to the instructions for Symbol Mapping 223 in the Order Manager chapter for modifying the symlo.txt file.

### Point Value

Point Value determines the amount of profit generated by 1 contract for a 1 point increase in price. For example, assume that you have a long Position in cotton for 1 contract. If the Point Value of cotton is $500, then your Position will gain $500 profit for every point increase in the price of cotton.

### Margin

The Margin value determines the amount of equity required in a trading account to establish a single contract Futures Position. The $imulator 155 uses this value to make sure that you don't overextend and take on more Positions that your current equity level can support.

#### Margin and the $imulator

The Margin value is also used to determine how many contracts to acquire in the $imulator 155. For example, if you have the $imulator set with a starting capital of $100,000 and a 20% of equity per Position size, your first entry in cotton (CT) with a margin setting of $2,500 would be for (100,000 * 0.2) / 2500 = 8 contracts. Subsequent positions would use the same logic, except that it would be based on the current equity level, instead of the starting $100,000. Lastly, don't confuse the futures Margin with the $imulator's *Margin Factor* 158!

### Decimals

Sets the number of digits after the decimal when displaying prices for the issue.

### Tick

Sets the tick value, or the minimum price move of the futures symbol. This value is available in a ChartScript through the **GetTick** function.

### Time Zone

This setting should be set to market's time zone. The only time this value is important is when requesting intraday bars from eSignal 133. Wealth-Lab determines the difference between your computer's and the market's time zone so that eSignal can set the correct starting time for the intraday bars.

You can control the behavior for stop and limit orders when these prices fall between Tick increments. For more information see Futures Trading 257 in the Trading Costs/Control 257 Options dialog.

### Primary Open & Close Times

These values determine the market trading hours for the symbol. When using Real-Time ChartScript Windows these market values are used if you select to filter data outside of market hours in the Real-Time Data Loading control 33. If you don't specify values in the FSM, the market open & close times defined in the Data Loading control will be used. See Real-time Data Loading Options 33 for more information.

### Other Fields

A number of other symbol properties are not currently used in Wealth-Lab Developer 4.0 and are reserved for growth.

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### Adding Data to the Futures Symbols Manager

Use the mouse or arrow keys to navigate between cells in the FSM. Add a new entry to the FSM by clicking the **+** Insert Record button, or by positioning on the last row and striking the Down Arrow key. Once in edit mode, you can move between fields with the mouse, Tab, or Shift+Tab (backwards). To change a data entry, position the active grid cell and strike the Enter key or left click the cell. Note that some fields may require that you select data from a drop down control. Moving off a record (up or down) is sufficient to post a change, while the ✓ Post Edit button serves the same purpose.

***Use the top row of buttons to navigate the manager's database and to make edits.***

#### Importing and Exporting

Different data vendors may have different symbols for futures contracts. You can share your futures symbol list with other Wealth-Lab users by exporting the list to a file. Use the import facility to load the information from an export file. The file is formatted such that it contains one symbol record per line, tab delimited, with the field ordered left to right: Symbol, Point, Margin, Decimals, Primary Open Time, Primary Close Time, Tick, and Time Zone. Other fields are not currently considered for import/export.

#### Add Futures Syms

A quick way to populate the Futures Symbol Manager with your own symbols is right from the DataSource Manager. If you have a DataSource containing your future symbols, you can add all of its symbols with one click. For more information see Add Futures Syms 29 in the DataSource Manager 28 Topic.

## 19.8 Preferred Values Manager

Select **Preferred Values Manager (Ctrl+Alt+P)** from the **Tools** menu to launch the Preferred Values Manager. This tool lets you assign a Preferred ChartScripts for a given symbol and assign Preferred #OptVars for any Symbol/ChartScript combination.

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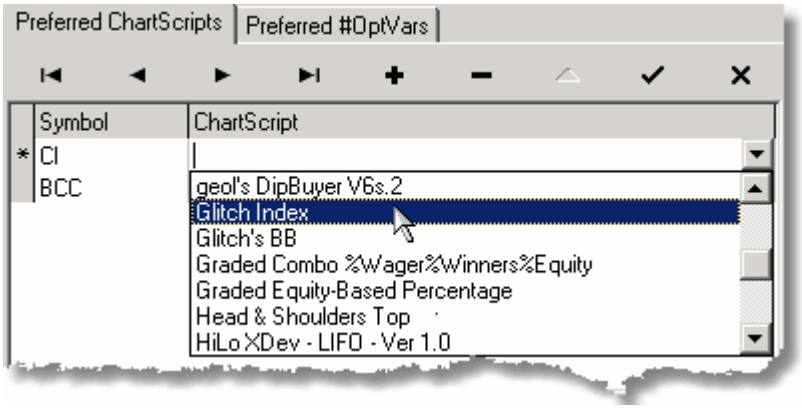


***Assigning the "Glitch Index" as the Preferred ChartScript for the symbol "CI".***

## Preferred ChartScripts

The image above demonstrates an assignment of a symbol to a ChartScript of choice. Begin the designation procedure by clicking the **+** button to add a new entry.

***Use the top row of buttons to navigate the manager's database and to make edits.***

Click the row in the Symbol column and type the symbol exactly as it appears in your DataSource. Using the Tab key, right arrow key, or mouse, highlight the entry box in the ChartScript column and hit Enter. This will enable a drop down selection containing all ChartScripts in every folder. Open the drop down selection with the mouse by clicking on the inverted triangle button at the right of the column. You can quickly navigate to a specific ChartScript by typing the first few letters of its name. Once located, click it using the mouse or strike the Enter key to insert the name. Finally, click the check mark *Post* button to complete the operation. If you make a mistake and wish to return the record to its original state, just click the **X** *Cancel* button in the top row.

Once you have made the assignments, you must configure Wealth-Lab Developer 4.0 to automatically use the Preferred ChartScripts when performing WatchList Scans 136 or a $imulations 155. These settings are configured on the Preferred Values 250 tab in the Options Dialog 244, and, they allow you to apply or retract preferred values in a global manner.

## Preferred #OptVars

If you're working with a ChartScript that includes optimization variables, or #OptVars, then it's possible that you'll find a set of variables that work better with some symbols than with others. In this case, there's no need to make multiple copies of the same script with different default values assigned to an #OptVar. Instead, you can store Preferred #OptVars for a Symbol/ChartScript combination.

The manual method for entering Preferred #OptVars is similar to that described above for Preferred ChartScripts. However, two much easier ways exist to insert entries for Preferred #OptVars - during ChartScript Optimization or directly from a pop up menu 82 in the ChartScript Editor 81.

It's most likely that you'll find the best set of variables for many symbols during the ChartScript Optimization 112 process itself. Refer to the Preferred #OptVar topic 123 for

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ChartScript Optimization for details on how to quickly create or change entries for Preferred #OptVars from the Results Explorer 120.

Once you have created entries for Preferred #OptVars, you must configure Wealth-Lab Developer 4.0 to use them within the ChartScript Window 45, and when you perform a WatchList Scan 136, $imulation 155, or ChartScript Ranking 177. The control for these settings are found in the Options Dialog 244 on the Preferred Values 250 tab.

---

## 19.9 Series Synchronization Checker

Select the **Series Synchronization Checker (Ctrl+Alt+S)** from the **Tools** menu to launch the Series Synchronization Checker. This tool helps to pinpoint missing dates between two or more data series. If you write ChartScripts that use external data series (for example, to compare the price of an underlying stock with that of a market index) it's important to ensure that the dates in both series are synchronized. Unsynchronized data can lead to incorrect and misleading system results.

The Series Synchronization Checker runs through the bars of data in each series. It reports the starting and ending dates of both series, and compares each bar of data for the date range that overlaps. The tool lists each date that appears in one of the series but not in the other. This information can be very helpful to locate and correct data errors. If you locate data errors in your Web Download DataSources keep in mind that you can use the Data Editor 29 feature in the DataSource Manager 28 to fix the data.

**Note:** You can also verify intraday DataSources, however, the Synch Checker currently reports only *dates* even when series differ only by a single bar on the same date. In the U.S. stock market, one or more "missing bars" may occur frequently for listed issues and other securities that experience a delayed opening.

### Checking a Complete WatchList

The second tab of the Series Synchronization Checker allows you to check the data in a complete WatchList. The tool compares the dates of all symbols in the selected WatchList, and reports any missing or duplicate dates, as well as any dates that are out of sequence.

---

## 19.10 Unload ActiveX Libraries

Effective with Wealth-Lab Developer 4.0, Build 9, a new Tools menu item is available to manually unload unused ActiveX Libraries (shortcut Ctrl + U). Prior to Build 9, Wealth-Lab unloaded DLLs periodically whenever the reference count reached zero, potentially causing incompatibilities with the unloading/reloading of real-time adapters, for example. Also, even though DLLs were unloaded, a ChartScript window would still retain a handle to add-in DLLs, so they could not be recompiled.

The "Unload" tool places the freeing of ActiveX DLLs in the hands of the user. There is no harm if this option is never used. However, this productivity improvement allows software developers working on an Add-In DLL to free the DLL and recompile their project - even if the ChartScript Window using the in-process server remains open.

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**Note:** Unloading will not work for add-ins that use the PaintHook interface, because the DLL remains loaded due to the paint-hook.

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# 20 COM Support

## 20.1 COM Support Overview

To be sure, Wealth-Lab Developer 4.0 is a full-featured application that continues to extend its complexity through native enhancements as well as through the code library contributions by you and others in the Wealth-Lab community. For the real do-it-yourselfers, publishes a *type library* that makes the platform limited only by your imagination. By embracing Component Object Model (COM) technology Wealth-Lab is extendible across any programming application that supports COM, including Delphi, VC++ and VC#, VBA, VB6, VB.Net, and others.

COM Support in WealthScript 277
WealthScript contains a special function and a special data type that let you create and manipulate COM objects directly in your script.

COM (OLE) Automation 279
Wealth-Lab itself provides a COM interface that lets external programs interact with the system.

Creating COM Add-Ins 282
COM Add-Ins are DLL's that can execute trading system rules within a ChartScript. Using Add-Ins you could perform any kind of advanced processing that typically isn't possible at the scripting level.

Creating COM Adapters 284
Extend the reach of your Wealth-Lab Developer 4.0 analysis and trading platform by creating and using static and real-time DataSource adapters. If your electronic brokerage has an order-entry API, then you can use Wealth-Lab's Order Manager to submit orders directly! Also, although Wealth-Lab comes equipped with the most popular chart styles 50, you can design unique chart representations with the Chart Style API.

---

## 20.2 COM Support in WealthScript

WealthScript contains a special function and a special data type that let you create and manipulate COM objects directly in your script. Use the **`CreateOleObject`** function to create an instance of a COM object. You pass the object's COM "class name" to the function, which creates and returns an instance of the object. This instance should be stored in a variable of the data type ComVariant.

**Example (illustrative only)**

```
{ Create an instance of a COM object }
var lib: ComVariant;

lib := CreateOleObject( 'AddOnLib.WLAddOn' );
lib.DoSomething;
```

In the example above we create an instance of the COM object with a class name of "AddOnLib.WLAddOn". Once we have the COM object we can call any method that's defined within the object.

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## Late Binding

WealthScript employs "Late Binding" to access the methods in a COM object. Late binding means that the interface of the object isn't known (at design time) until the instance of the object is created (at run time). The COM objects that you create and interact with within WealthScript should be "Dual" interfaces, implementing IDispatch. Typically, any COM object that you could create and interact with within Visual Basic or VBA should also be available from within WealthScript.

## Return Values of COM Objects

WealthScript returns values from COM objects as ComVariants. If you need to access the return values of COM objects you can use a set of special WealthScript functions to convert them into the types that you need.

| | |
|---|---|
| **AsInteger** | Convert to integer |
| **AsString** | Convert to string |
| **AsBoolean** | Convert to boolean |
| **AsFloat** | Convert to float |

### Example

```
var lib: ComVariant;
var rc: integer;
lib := CreateOleObject( 'AddOnLib.WLAddOn' );
rc := AsInteger( lib.PerformFunction );
```

## COM Variant Arrays

WealthScript also supports passing variant arrays to and from COM objects. This is useful for transferring an array of arbitrary size to a COM Add-on, which may populate the array with other values to be returned to the calling ChartScript. The following is a complete example of this process.

### Example

```
{ WealthScript code (client side) }
var vc: ComVariantArray;
var obj: ComVariant;

vc := [1,2,3,4];
obj := CreateOleObject( 'AddOnExample.System1' );
obj.FillArray( vc );
ShowMessage( IntToStr( vc[2] ) );
```

Another way of assigning a value to the ComVariantArray is to assign it an existing WealthScript array.

### Example

```
var vc: ComVariantArray;
var obj: ComVariant;
var ar: array[0..100] of integer;
vc := ar;
obj := CreateOleObject( 'AddOnExample.System1' );
obj.FillArray( vc );
```

Completing the example, the in-process server (DLL) written in VB6, may look

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something like the following.

**Example (VB6 DLL)**

```
' System1 class object code for DLL named 'AddOnExample'
Public Sub FillArray(ByRef COMArray As Variant)
  Dim i As Long
  For i = 0 To UBound(COMArray)
    COMArray(i) = 100 - i    ' Change the values
  Next
End Sub
```

### A COMVariant Global Array

By assigning a typed array to a COMVariantArray, you can access that array through global memory as shown in the example.

**Example 1**

```
{ Script 1 - Initialize the global array }
var VA: ComVariantArray;
var j: integer;
var A: array[1..5] of integer;
for j := 1 to 5 do
  A[j] := 11 * j;
VA := A;
SetGlobal( 'GlobalArray', VA );
```

**Example 2**

```
{ Script 2 - Access the global array }
var j: integer;
var B: ComVariantArray;
try
  B := GetGlobal( 'GlobalArray' );
  for j := B.Low to B.High do
    Print( IntToStr( B[j] ) );
except
  Print( 'Global array not initialized.' )
end;
```

Note that the lower bound of a COMVariantArray is always zero, consequently it's convenient to use the .Low and .High methods of arrays to identify the lower and upper bounds of the global array when accessing it from another script.

For more on Arrays in WealthScript, please refer to its dedicated topic in the WealthScript Guide.

---

## 20.3 COM (OLE) Automation

Wealth-Lab itself provides a COM interface that lets external programs interact with the system. Wealth-Lab Developer 4.0's COM library name is "WealthLab" and the interface name is "WL3". You can still utilize the prior version's classname if you wish to utilize a "legacy" Wealth-Lab system for automation after migrating to Wealth-Lab Developer 4.0.

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## WL3 Functions

The following automation functions are currently available, and, more can be added as demand increases.

```
AddAlert( Symbol: string; AlertType: AlertTypeEnum; Shares: integer;
          OrderType: OrderTypeEnum; AlertPrice: double );
```

Adds an new alert to the Quote Manager. *AlertType* must contain an enumerated value as defined by the **AlertTypeEnum**. Likewise, *OrderType* parameter must contain an enumerated value as defined by the **OrderTypeEnum**.

| OrderTypeEnum | AlertTypeEnum |
|---|---|
| orderMarket = 0 | alertBuy = 0 |
| orderLimit = 1 | alertSell = 1 |
| orderStop = 2 | alertShort = 2 |
| | alertCover = 3 |

```
ActivateQuoteManager( Activate: boolean );
```

Activates or deactivates the Quote Manager. This method controls the corresponding **Activate** button in Quote Manager. You may also use `ActivateAlertManager` as this method's name.

```
BidAskFilter( Filter: boolean );
```

Controls whether or not the Quote Manager should ignore alerts that are triggered when the trigger price is outside of the reported bid/ask range. This method controls the corresponding "Bid/Ask Alert Filtering" check box, which is found inside the Quote Manager's Options frame.

```
CloseWindows;
```

Closes all open Windows in Wealth-Lab Developer 4.0. Some programming applications may require the open set of parentheses for this function call.

```
DeleteAlerts( Symbol: string );
```

Deletes the alerts in the Quote Manager whose symbol matches the Symbol parameter. If you pass a blank string, all alerts from the upper Alert Symbol list will be cleared. This method does not clear alerts that have been triggered.

```
ExecuteScript( Script, WatchList, Symbol: string );
```

Causes Wealth-Lab Developer 4.0 to execute the specified ChartScript on the specified WatchList and symbol. The script is executed even if the chart is already open to the symbol.

```
ExecuteScriptTimed( Script, WatchList, Symbol: string ): integer;
```

Same as **ExecuteScript**, but this function returns the number of milliseconds that it took to complete the operation.

```
GetAlertList( Symbol: string ): string;
```

Returns a string that contains all of the Quote Manager alerts that match the specified Symbol. If the Symbol parameter is blank, all alerts are returned. The function returns a semicolon delimited string that contains the alerts. Each alert record is returned in the following format:

*Symbol*;*AlertType*;*Shares*;*OrderType*;*AlertPrice*;*Target%*;

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```
InstallAlertHook( Hook: IWealthLabAlert3 );
```

Install a hook into the Quote Manager. You must pass a COM interface of type *IWealthLabAlert3*. IWealthLabAlert3 contains a single method, *Trigger*. Trigger is called whenever a new alert is triggered from the Quote Manager. The *Trigger* method contains the following syntax:

```
Trigger( Symbol: string; Shares: long; AlertType: AlertTypeEnum,
         OrderType: OrderTypeEnum; AlertPrice, ExecutePrice, Bid, Ask,
         High, Low, OpenPrice: double );
```

```
SetChartScriptRange( RangeType, RangeValue: integer; StartDate, EndDate:
                     Date );
```

Configures the Data Loading control for the next ChartScript window that is opened. Pass Start and End dates if a date range is desired. Otherwise, pass zero value for one or both of the dates so that they are not used. Valid parameter values for RangeType and RangeValue are as follows.

*RangeType* 0 - All Data, 1 - Fixed Number, 2 - Most Recent

*RangeValue* A number of bars or years for *RangeType* 1 or 2, respectively.

**Tip:** The parameters *StartDate* and *EndDate* are of the Date type. If you create an instance of WL3 from with a ChartScript, use the DateToStr function to convert an integer date (yyyyMMdd) to a string, which will be typecast automatically as a Date type.

```
SuspendAlerts( Suspend: boolean );
```

Controls whether or not alerts should be triggered if the Quote Manager is active and showing quotes. Corresponds to the "Suspend Triggering" check box on the Quote Manager.

```
WatchListNames(): string;
```

Returns a carriage return/line feed (#13#10) delimited string containing the names of all WatchLists (and DataSources).

```
WatchListSymbols( WatchList: String ): string;
```

Returns a carriage return/line feed (#13#10) delimited string containing the names of all WatchLists (and DataSources).

```
WebUpdate( DataSource: string );
```

Causes Wealth-Lab Developer 4.0 to perform a "Web Update" on the specified DataSource. The DataSource Manager is temporarily launched to perform the update, and closed upon completion.

*The following group of functions return data from the last [manual] $imulation run.*

```
SimBarCount(): integer;
```

Returns the number of total bars used in the $imulation.

```
SimDate( Bar: integer ): date;
```

Returns the date of the Bar specified.

```
SimTradeCount(): integer;
```

Returns the total number of trades produced by the $imulation. Includes open trades.

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```
SimTradeInfo( Trade: integer ): integer;
```

Returns a '~' delimited string containing the following information of the specified *Trade*.

```
[ Symbol ]~[ Position ('Long' or 'Short') ]~[ Basis ]~[ EntryBar ]~[
EntryPrice ]~[ ExitBar ]~[ ExitPrice (or LastClose) ]~[ RiskStopLevel
(or -1) ]~[ CEntry ]~[ C1 ]~[ C2 ]~ ... ~[ CExit ],
```

where C*n* is the closing price of each bar while the trade was open.

---

### Invoking WL3

To create an instance of the Wealth-Lab Automation interface in an external program, create an instance of the "WealthLab.WL3" COM object.

#### Delphi Example

```
type
  TForm1 = class(TForm)
    Button1: TButton;
    Edit1: TEdit;
    Edit2: TEdit;
    Edit3: TEdit;
    Button2: TButton;
    Edit4: TEdit;
    Button3: TButton;
    procedure Button1Click(Sender: TObject);
    procedure Button2Click(Sender: TObject);
    procedure Button3Click(Sender: TObject);
  private
  public
    wl: OleVariant;
  end;

procedure TForm1.Button1Click(Sender: TObject);
begin
  wl := CreateOleObject( 'WealthLab.WL3' );
end;

procedure TForm1.Button2Click(Sender: TObject);
begin
  wl.ExecuteScript( edit1.Text, edit2.Text, edit3.Text );
end;

procedure TForm1.Button3Click(Sender: TObject);
begin
  wl.WebUpdate( edit4.Text );
end;

end;
```

---

## 20.4 Creating COM Add-Ins

COM Add-Ins are DLL's that can execute trading system rules within a ChartScript. The DLL's must be COM Libraries. You create an instance of the COM object within a ChartScript (as described previously) and then call the methods of the object as you normally would.

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Your COM add-in can interact with the script by accessing the methods of a special interface that you can pass to it. The interface is called **IWealthLabAddOn3**, and is available via a WealthScript function of the same name.

Using Add-Ins you could perform any kind of advanced processing that typically isn't possible at the scripting level. For example, you could link to external DLLs or local databases.

### Trading System Rules

Your Add-In can execute complete trading system rules by calling methods of the **IWealthLabAddOn3** interface. The interface exposes methods such as BarCount, OpenPosition and ClosePosition, as well as a full set of data access methods that you can use to read the chart information.

### Creating Custom Indicators

Your Add-In can populate the value of a custom indicator using the **SetSeriesValue** method of **IWealthLabAddOn3**. You're responsible for passing a valid Price Series to the Add-In in your ChartScript code. The Price Series should be the result of a call to CreateSeries.

### PaintHooks

You're Add-In can even be given full control over rendering on the chart via a *PaintHook*. The *PaintHook* is executed whenever the chart needs to be rendered. Your Add-In is passed with Windows Device Context (DC) of the chart bitmap, and can use any Windows GDI calls to render on the chart. See the Wealth-Lab Developer 4.0 Add-On API article for more details on PaintHooks under the topic **IWealthLabPaintHook3 Reference**.

### Advanced Discussion

For more information regarding Wealth-Lab Add-On Application Programming Interface, click to see the web site article: Add-On API

The following code is a complete example that accesses an Add-In written in Visual Basic to execute trading system rules and populate a custom indicator. To run the example, you must first install the VB Add-In DLL, which is available from the previously mentioned article.

### Example

```
var lib: ComVariant;
var CustomSeries: integer;
lib := CreateOleObject( 'VBWL.VBWLInterface' );
lib.Execute( IWealthLabAddOn3 );
CustomSeries := CreateSeries;
lib.CustomIndicator( #Close, CustomSeries, 24, IWealthLabAddOn3 );
PlotSeries( CustomSeries, 0, #Navy, #Thick );
```

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## 20.5 Creating COM Adapters

### COM DataSource Adapters

Wealth-Lab Developer 4.0 also provides the ability to build your own static and real-time DataSource Adapters that can read data from virtually any format. Consult the following articles on the Wealth-Lab.com web site for detailed instructions on creating COM Adapters.

**Static DataSource Adapters**
http://www.wealth-lab.com/cgi-bin/WealthLab.DLL/kbase?id=25

**Real-time DataSource Adapters**
http://www.wealth-lab.com/cgi-bin/WealthLab.DLL/kbase?id=26

---

### COM ChartStyle Adapters

The *Chart Style Adapter API* allows third party developers to create their own unique chart styles that are perfectly integrated into Wealth-Lab Developer 4.0. The Chart Style Adapter takes full responsibility for rendering the bars of the chart. Custom chart styles can be simple variations of bar and candlestick charts, or can include complex styles that do not have a fixed horizontal bar size.

Wealth-Lab Developer 4.0 **Chart Style Adapter API**
http://www.wealth-lab.com/cgi-bin/WealthLab.DLL/kbase?id=28

---

### COM Broker Adapters

The Broker Adapter API allows third party developers to build their own interfaces to order execution platforms that can be used in the Order Manager 222 tool of Wealth-Lab Developer 4.0. You can use Adapters to allow Wealth-Lab Developer 4.0 to automatically execute trades on various broker back-end systems.

**Wealth-Lab Developer 4.0 Broker Adapter API**
http://www.wealth-lab.com/cgi-bin/WealthLab.DLL/kbase?id=27

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# Index

## - # -

#OptVar 113
#OptVar Graphs 120
#OptVars 114
  Default 114
  Start 114
  Step 114
  Stop 114

## - $ -

$Avail Trade Cap (Positions view) 217
$CASH$ (Trade History view) 218
$imulation 8
  defined 8
$imulator 155
  choosing trades 155
  exporting data 158
  FAQs 175
  Options 158
  Period 158
  Position Sizing 158
  save results 158
  Scale 158
$imulator actions 158
  Apply 158
  Begin 158
  Cancel 158
$imulator Processes and Compatibility with Selected Functions 124, 155
$NO_AUTO_EXECUTE 14

## - . -

.sim (file) 158
.wor (file) 120

## - < -

<ICONS_CORPACTIONS> 246

## - A -

Activate (Quote Manager) 191
Activate (RT Scans) 201
Active (status) 236
Adapter 135
  Real-Time 135
  Static DataSource 27
  Broker 284
  ChartStyle 284
  DataSource 284
Add 196
  Alert 196
  Alert (manually) 193
  Position (Portfolio Manager) 213
  Symbols 196
  symbols (RT Scans) 201
  Symbols (WatchList) 32
  WatchList 32
Add Futures Syms 29
AddFutureBars (Optimization) 113
AddScanColumn 145
AddScanColumn (RT Scans) 204
AddScanColumnStr (RT Scans) 204
Alarm ON 191
Alert 196
  Change % 196
  List 196
  Order Type 196
  Price 196
  Save to 2.1 File Format 140
  Symbol 196
  Target % 196
  Type 196
Alert File format (WLD 2.1) 193
Alert Manager (see Quote Manager) 190
Alerts 249
  $imulator 173
  ChartScript Window 46
  multiple 128
  save to file 136
  Scans 141
  sorting 191
  triggered 191
Align ($imulator) 158
All Data 33
All Session Data 194
Allow 158
  same bar AtClose orders 158
  same bar AtStop/AtLimit orders 158
Analysis Series 87, 173
AnalyzeSeries 87
Annual Percentage Return (APR) 163
Annualized Gain % 163
API 282
  Add-on 282

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API 282
Chart Style 50
Real-Time Adapter 132
Static Adapter 27
Apply 257
Dividend Payments 257
Interest and Margin Loan Rates 257
Rates 257
Apply ($imulator) 158
Apply to Script 114
Arrays 277
COM Variants 277
global 277
Arrows 56
AsBoolean 277
ASCII DataSource 21
AsFloat 277
AsInteger 277
Assign 123
#OptVars 123
AsString 277
authors 42
AutoBackup 255
automated trading 229
configuration 229
demo mode 229
preparation 229
Stop/Limit exits on entry bar 245
Weekly/Monthly as GTC 245
AutoPilot 232
Auto-Pilot Mode 232
bracket trading 232
Auto-Sort 194
Avg Bars Held 76, 163
Avg Profit/Loss 76, 163

# - B -

backup 99
auto 255
Balance 213
Portfolio 213
Bar (Chart Style) 50
Bars Held 79, 167
Bars since Last Equity High 171
basis price 263
market orders 158
BH Profit 46
Bid/Ask 194
Bins 80, 170
Bitmap Image 65
Bracket Order (OCO) 232
Auto-Pilot 232
icon 236
manual placement 234
bracket orders 232
bracket trading 223
breakpoints 104
Broker 223
API 223
Link 223
status information 240
Broker Call Rate 257
brokerage Login 232
Bulk Update 32
Buy & Hold 169
Buy & Hold (ChartScript) 46
Buy & Hold Equity 163
Buying Power 240
By Period 172

# - C -

Callout 65
Cancel 223
an order 223
Cancel Pending (status) 236
Canceled (status) 236
Candlestick (Chart Style) 50
candlesticks 246
fill 246
Capacity (Data Series Size) 255
Cash 169
Cash (Order Manager) 240
Ceiling/Floor Logic (Futures Trading) 257
chainlink icon 114
Change #OptVar Value 120
Change Rules in Wizard 91
Change Symbols 29
ChangeBar (Optimization) 113
Chart Books 65
Chart Style Adapter API 50
Chart Styles 50
Bar 50
Candlestick 50
EquiCandle 50
EquiVolume 50
Kagi 50
Line 50
Line Break 50
Point & Figure 50
Renko 50

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ChartScript 8
assigning risk level 46
backup 99
corrupted 99
creating 88
damaged 99
defined 8
mode 46
new 88
preferred 100
restore 99
status bar 46
ChartScript Explorer 42
ChartScript Integrated Debugger 103
ChartScript Rankings 177
ChartScript Window 45
ChartScript Wizard RuleBuilder 91
ChartScript/Account Association 213
ChartScripts 41
Download 98
favorites 99
quarantined 98
CID 103
Circle 65
Class not registered 14
(general) 14
Class not registered (eSignal) 133
Clear 196
All Alerts 196
completed orders 236
orders 236
Portfolio 213
queued orders 236
selected order(s) 236
Close 213
Position (Portfolio Manager) 213
Colors (options) 246
COM 27
adapters 27
Add-Ins 282
Automation 279
Broker Adapters 284
ChartStyle Adapters 284
DataSource Adapters 284
creating (in WealthScript) 277
late binding 277
return values 277
variant arrays 277
Commentary 268
Commissions 257
CommissionScripts 257
default setting (Options Dialog) 257
per contract 257
per share 257
per trade 257
Portfolio Manager 217
CommissionScripts 257
Common ChartScript Errors 101
Invalid Range Error 101
List index out of bounds 101
Name "variable" already exists 101
Number Expected ("0") 101
Script Timed Out 101
components 15
Compressed Price Series Alignment 252
configure 229
automated trading 229
broker 223
options 244
ControlFile.txt (QuoteTracker) 134
Controls 263
Money Management 263
Position Sizing 263
Convert to Market Order 194
copy 42
ChartScripts 42
order list (Order Manager) 236
corrupted 99
Create 26
Intraday Historical DataSource 26
New DataSource 18
Portfolio 213
shortcut 42
WatchList 32
CreateOLEObject 277
Crosshairs 65
Cumulative Profit 79, 167
Currency 255
Cursor 65
Custom 167
Columns ($imulator Trades View) 167
Columns (ChartScript Trades View) 79
Columns (RT Scans) 204
Columns (Scans) 145
fields 21
Custom Indicators 63

# - D -

Daily 50
Daily Update 29
damaged 99

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data 17
adapters 17
definitions 17
historical 17
On Demand 46
precision 36
real-time 17
rounding 36
static 17
Data Access 17
Data Editor 29
Data Loading Control 33
real-time 33
static 33
Data Series Size 255
data vendors 132
real-time 132
Data Window 269
DataSource 28
Real-time 126
real-time adapter 284
static adapter 284
DataSource Manager 28
Add Futures Syms 29
Change Symbols 29
Daily Update 29
Data Editor 29
Delete 29
Modify Symbols 29
Properties 29
Random WatchList 29
Reload Symbols 29
SmartUpdate 29
Symbol Details 29
Symbol Reload 29
Web Refresh 29
Web Update 29
DataSource Tree 46
hide 46
show 46
DataSources 29
ASCII 21
COM 27
Intraday Historical 26
Lenz & Partner 25
MetaStock 21
Primate 19
QuotesPlus 25
Tai-Pan 25
TC2000 24
Web 18
Debug Window 269
debugging 110
approach 110
quickstart 103
debugging tools 105
Decimals 255
Default 114
#OptVar 114
Delete 236
(Clear) orders 236
Auto-Cancel Orders 232
ChartScript 42
Custom Indicators 63
DataSource 29
Folder 42
Portfolio 213
Studies 63
symbol (RT Scans) 201
Symbols 29
WatchList 32
demo mode 229
Description 86
Details (Evaluator) 208
Diamond 65
Directed Trading 234
Discard Symbols that have no trades 158
Distribution of Returns 172
download 91
ChartScripts 98
data 18
Drag & Drop Indicators 58
Drawdown 76, 163, 171
Drawing 65
Drawing Tools 65
Circle 65
Diamond 65
FIB 65
Gann 65
Horizontal Line 65
Regression Channel 65
Speed Resistance Lines 65
Square 65
Tradable Trendline 65
Trendline 65
Triangle 65
Vertical Line 65
DTN IQFeed 135
DWM (see Daily 50
Weekly ,Monthly) 50

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# - E -


Edit 218
  historical position (Portfolio Manager) 218
  Position (Portfolio Manager) 213
Editor 82
  keyboard shortcuts 85
Editor (options) 248
EMail (options) 249
Enable Live Feed 126
EPSILON 36
equality 36
EquiCandle (Chart Style) 50
Equity Curve ($imulator) 169
Equity curve (ChartScript) 80
Equity Curve View (Portfolio Manager) 220
Equity Drop Ratio 163
  Threshold 255
EquiVolume (Chart Style) 50
Error (status) 236
errors 101
  common 101
  compilation 103
  logic 103
  out of memory (see Data Series Size) 255
  run-time 103
  Unknown name 82
eSignal 133
  Class not registered 133
  TickDataDays 133
  ZoneAlarm 133
Estimate 117
Evaluator 207
ex-date 257
Execute ChartScript 82
Exhaustive 117
Explorer 42
  ChartScript 42
Export 158
  $imulation results 158
  Alerts in 2.1 File Format 140
  ChartScripts 42
  Optimization results 120


# - F -


FAQs 175
  $imulator 175
  Data Access 39
  Order Manager 242
  Portfolio Manager 220
  Wealth-Lab Developer 14
favorites 99
Feed to Order Manager (Quote Manager) 194
Feed to Order Manager (Real-time ChartScript) 128
Feed to Order Manager (RT Scans) 201
Fibonacci 65
  arcs 65
  fan lines 65
  retracement 65
  time zones 65
Fidelity Investments 6
fields 21
  custom 21
fill candlesticks 246
Filled (status) 236
Filter and Grouping 120
Filter Data Outside Market Hours 33
Filtering the Data (Evaluator) 208
Fix ChartScript 82
Fixed 158
Fixed Dollar/Margin (Position Sizing Control) 263
Fixed Number of Bars 33
Fixed Share/Contract (Position Sizing Control) 263
floating point 36
  equality 36
  values 36
Folder 98
  Quarantine 98
folders 42
font 246
  chart labels 246
  color 248
  style 248
  type 248
Function Profile 208
Function QuickRef 82, 267
Futures 36
  Trading Options 257
Futures Mode 36
Futures Symbol Manager 158
Futures Symbols Manager 271
  Margin 271
  Point Value 271
  Tick 271
Futures Trading 257


# - G -


Gann fan 65
Ghost Bar 128


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Graph 58
Indicators 58
Graph Options 120
GTC 234

# - H -

historical data 17
Horizontal Line 65
HostName 223
How Secondary Symbols Are Synchronized 252
http://sourceforge.net/projects/fastmm/ 15

# - I -

IBData 135
IgnoreRTH 223
Import 193
alerts 193
ChartScripts 42
Include 73
Trendline Alerts (ChartScript Window) 73
Trendline Alerts (RT Scans) 201
Trendline Alerts (WatchList Scans) 136
Include "Day Trades" in Open Trades Graph 158
Include Manager 63, 270
Include Market Orders 193
Include Price Series without complete historical data 158
Includes 63
Indicators 58
interacting with mouse 58
plotting 56
Industry Group 32
Initial Capacity (Data Series Size) 255
Insufficient Data 33, 174
Intellisense 83
Interactive Brokers 135
data 135
Interest Rate 257
interest/loan rates 169
and dividends 169
Interval (intraday bars) 50
Intraday Bar Compression 252
Intraday Bar Interval 50
Intraday Historical DataSource 26
Intraday Historical DataSources 134
Invalid Range Error 101
IQFeed 135
IWealthLabAddOn3 282

# - K -

Kagi (Chart Style) 50
keyboard shortcuts 13
alphabetical 13
by Category 10
Editor 85
Knowledge Base 87, 229

# - L -

Late Binding 277
Lead Bars 158
Leeway 158
position sizing 158
Limiit Pos Size to % Volume 158
Limit days 257
futures 257
Line (Chart Style) 50
Line Break (Chart Style) 50
Linear 50
Linear Regression 169
link icon 114
Linked Portfolio 232
List 236
orders 236
trades (Order Manager) 236
trades (Portfolio Manager) 218
List index out of bounds 101
Live Feed 126
enable 126
Load 193
alerts 193
Load Alerts from File 193
Loan 158
Location 29
lock 128
scrollbar 128
Log 50
Log Scale 169
Login 232
brokerage 232
Long + Short 163
Long and Short Equity 169
Long Only 163
lowercase 255
Luck Coefficient 163

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# - M -

MAE 79, 81, 167, 171
Managers 28
  DataSource 28
  Futures Symbols 271
  Include 270
  Order 222
  Portfolio 212
  Preferred Values 273
  Quote 190
Manual Order Entry 234
  Queue 234
  Submit 234
margin 271
  futures 271
  trading 175
Margin Factor 158
Margin Loan Rate 257
Market's Time Zone 33
Max Open Positions 158
Maximum Risk Pct (Position Sizing Control) 263
Medved QuoteTracker 134
menu 105
  Debug 105
Message 236
MetaStock DataSource 21
MFE 79, 81, 167, 171
minutes 126
Mode 36
  Futures 36
  Stock 36
Modify 223
  an order 223
  Symbols 29
Money Management Control 263
Monte Carlo 117
Monthly 50
Most Recent 33
  Years 33
move 42
  ChartScripts 42
  data to a new computer 39
Multi-Scan 138
Multi-Symbol Script Scanning 136

# - N -

Name "variable" already exists 101
NBBOCONVERT 223
Net Profit 76, 79, 163, 167
New 42
  ChartScript 42
  DataSource 18
  Portfolio 213
New ChartScript Wizard 91
  Allow Stop and Reverse 91
  Change Rules in Wizard 91
  Drag & Drop Indicators 91
  Multiple Open Positions 91
  Single Open Position 91
  Unlock WealthScript Code 91
New DataSource Wizard 18
New Indicator Wizard 97
New WatchList 32
No Data Available 33, 174
NO_AUTO_EXECUTE 14

# - O -

OCO (see Bracket Order) 234
One Pass 201
Open Positions (Scans) 144
Open Trades 169
Optimization 112
  #OptVar Graphs 120
  Change #OptVar Value 120
  Exhaustive 117
  floating point numbers 114
  Graph Options 120
  metrics 117
  modifying a ChartScript 113
  Monte Carlo 117
  notes 8
  Portfolio $imulation Mode 117
  target 117
  User Defined metric 117
  variables 113
Options 158
  $imulator 158
  Automated Trading 245
  Colors/Style 246
  Editor 248
  EMail 249
  Order Manager 232
  Preferred Values 250
  Sound 251
  synchronization 252
  System Settings 255
  Trading Costs/Control 257
Options Dialog 244

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OptVars 114
Default 114
Start 114
Step 114
Stop 114
Order 6
cancel 223
modify 223
routing 232
Order List 236
Order Manager 222
Concepts 223
FAQs 242
orientation 8
to Wealth-Lab Developer 3.0 8
Out of memory 255
Overfilled (status) 236
Overview 155
$imulator 155
ChartScript Integrated Debugger 103
ChartScript Rankings 177
ChartScript Window 45
ChartScripts 41
COM Support 277
Data Access 17
DataSource Manager 28
Evaluator 207
Optimization 112
Options Dialog 244
Order Manager 222
Portfolio Manager 212
Quote Manager 190
Real-Time ChartScript 126
Real-Time Scans 201
Screener 149
WatchList Rankings 184
WatchList Scans 136

# - P -

PaintHooks 282
Panes 56
creating 56
custom 56
Panic button 236
Paper Portfolio 213
Partial (status) 236
Partial Fills 223
Passes 117
Payoff Ratio 76, 163
Percent of Equity 158
Percent of Equity (Position Sizing Control) 263
Performance 163
Portfolio Simulation 163
Raw Profit Only 76
Scripts 76, 163
Performance (Scans) 143
PerfScript 163
$imulator Performance View 163
ChartScript Performance View 76
Period ($imulator) 158
Pessimistic Rate of Return 163
PlaySound 251
Plot 58
Indicator QuickPlot 58
indicators 56
Point & Figure 50
Point Value 271
Portfolio 212
Balance 213
Create 213
Delete 213
Manager (Overview) 212
Paper 213
Update Last Prices 213
Portfolio $imulation Mode (Optimization) 117
Portfolio Manager 220
FAQs 220
Portfolio Simulation mode 201
Position Sizing 158
Leeway 158
notes 8
Position Sizing Control 263
precision of data 36
Preferred 100
#OptVar 273
ChartScripts 273
DataSource for Updates 213
Values 273
Values (Options Dialog) 250
Values Manager 273
assignment 123
Price Pane 50
Primate 32
Primate DataSource 19
Profit 170
Profit curve 80
Profit Factor 76, 163
Profit per Bar 76, 79, 163, 167
Properties 29
Providers 200
quote data 200
Purchase 6

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Push 123
#OptVar Defaults 123

# - Q -

QCharts 132
QT 134
Quarantine 98
ChartScripts 98
Queued (status) 236
QuickPlot 58
Drag & Drop Indicators 58
Indicators 58
Integration with New ChartScript Wizard 91
QuickRef 267
Quote Manager 190
utilization 199
quotes 199
general purpose 199
quotes data providers 200
QuotesPlus DataSource 25
QuoteTracker 134

# - R -

Random WatchList 29
Rankings 177
ChartScript 177
WatchList 184
Rates 257
for $imulator 257
interest 257
margin 257
Raw Profit mode 158
$imulator 158
Raw Returns 172
RealTick 134
real-time 131
considerations 131
Real-Time Adapters 135
Real-Time ChartScript 126
real-time data 17
Real-time Data Vendors 132
eSignal 133
Interactive Brokers 135
Medved QuoteTracker 134
QCharts 132
RealTick 134
Real-Time Data Adapters 135
Tai-Pan Real-Time 134
Townsend Analytics 134
Real-time DataSource 126
Real-Time Scans 201
setting up 201
Recovery Factor 76, 163
red dot ($imulator) 174
red dot (ChartScript Rankings) 182
red dot (WatchList Rankings) 189
Refresh 29
DataSource 29
Register 6
Regression Channel 65
Remove 63
Custom Indicators 63
DataSource 29
Position (Portfolio Manager) 213
Selected Alert(s) 196
Studies 63
Symbols 29
Symbols (WatchList) 32
WatchList 32
Renko (Chart Style) 50
Reset from Script 114
restore 99
Results Explorer 120
Results View (WatchList Rankings) 185
Return Values (COM Objects) 277
Risk Free Return 255
Risk Reward Ratio 76, 163
Round Lots 257
Round Price Value (Futures Trading) 257
rounding prices 36
route 232
order 232
RuleBuilder 91
Runs 117

# - S -

Save 158
$imulation results 158
Alerts in 2.1 File Format 140
Alerts to File (Quote Manager) 196
Optimization results 120
symbols (RT Scans) 201
Workspace 14
Scale 50, 207
Toolbar 50
Scale ($imulator) 158
Scaling (options) 246
Scan Results View 204

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Scans 141
Alerts 141
Control 136
end-of-day 136
Multi-Scan 138
Open Positions 144
Performance 143
Real-Time 201
WatchList 136
WatchList(s) 136
Scope 207
Screens 149
create 149
Create a New WatchList 153
create ChartScript 149
edit 149
execute 152
folders 149
open 149
Results 153
running 152
save 149
selecting conditions 149
Send to Order Manager 153
Script timed out 101
Scrolling 255
search (for 42
seconds 126
Selection 158
Semi-Log 50
Send to Order Manager ($imulator Alerts) 173
Send to Order Manager (Scans) 141
Send to Quote Manager (Scans) 141
Set Template Code 88
SetPositionPriority 155
SetShare/PositionSize Value (Position Sizing Control) 263
Shapes (see Drawing Tools) 65
Sharpe Ratio 163, 172
Short Only 163
shortcut 42
ChartScripts 42
Editor 85
keyboard (alphabetical) 13
keyboard (by Category) 10
sim (file extension) 158
SimuScript (Position Sizing Control) 263
skeleton code 88
Slippage 257
activate 257
limit order 257
one way 257
Smart Alert Removal 194
Smart Code Editor 83
SmartUpdate 29
SMTP 249
Sound Options 251
Speed Resistance Lines 65
Split 218
historical position (Portfolio Manager) 218
open position 213
splits (see Data Editor) 29
Splitting a historical position 213
Square 65
static data 17
Status (order) 236
Active 236
Cancel Pending 236
Canceled 236
Error 236
Filled 236
Overfilled 236
Partial 236
Queued 236
Submitted 236
Unverified 236
status bar 46
Status Panels (Order Manager) 240
step 105
into 105
over 105
Stock Mode 36
Stop Trading 245
buying power below user-defined 245
cash below user-defined 245
Stop Trigger 223
Stop-Based Risk 158
Studies 63
difference 63
Style (options) 246
Submit 234
manual order 234
queued orders 236
selected order(s) 236
Submitted (status) 236
support request 99
support@wealth-lab.com 229
Suspend Triggering 194
Symbol 29
Reload 29
Symbol Details 29
symbol mapping 223
Symbols 29
Modify 29

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Symbols 29
Remove 29
symlo.txt 223
Synchronization 252
options 252
Secondary Symbol 252
Series 275
Synchronizing Daily Series in Intraday Timeframes 252
System Settings (Options Dialog) 255

# - T -

tab 248
Tai-Pan 25
DataSource 25
Target % (Quote Manager) 196
TC2000 DataSource 24
Template code 88
Text Balloon (see Callout) 65
Text Note 65
The Effect of Dividends and Distributions on DataSources 18
Tick 271
TickDataDays (eSignal) 133
ticks 126
TIF 234
Timeout 255
toolbar 105
debugging 105
Chart 50
Drawing Tools (1) 65
Drawing Tools 2 65
Editor 85
Indicator 58
Scale 50
Tradable Trendline 73
Trade History Context Menu 218
Trade Notes 56
Trade Type (Screener) 149
Trades 79, 167
trading 8
Paper Portfolio 213
Trading Costs/Control (options) 257
Trading System 8
Development 8
Methodology 8
Performance 8
Trading Thresholds 245
buying power 245
buying power below 245
cash 245
cash below 245
transfer 39
data to a new computer 39
Transfer (to Directed Multi Trade) 234
Trendline 65
percentage 65
Tradable 73
Trendline Alerts 73
Triangle 65
Trigger 194
only on Open Price 194
Selected Alert(s) Manually 196
suspend 194
Threshold 194
TriggerMethod 223

# - U -

Ulcer Index 163
Underwater Equity Curve 171
Unknown name 101
Unload 275
ActiveX Libraries 275
Unlock WealthScript Code 91
Unverified (status) 236
Up tick 194
Update 29
DataSource 29
Update Equity Curve (Portfolio Manager) 220
Upgrade Policies 6
uppercase 255
User Defined (Optimization metric) 117

# - V -

Variable Inspector 107
Vertical Line 65
Volume Pane 50

# - W -

Warning ($imulator) 155
WatchList 28
loop 155
WatchList Rankings 184
WatchList Scans 136
WatchLists 32
create from selected 140
create new 32
Wealth-Lab 163
Error Term (Porfolio Simulation) 163

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Wealth-Lab 163
Error Term (Raw Profit Only) 76
Reward Ratio 163
Score 163
FAQs 14
WealthScript 8
defined 8
Web 29
Refresh 29
Update 29
Web DataSource Provider 18
Weekly 50
Welcome 7
Wizards 91
New ChartScript 91
New DataSource 18
New Indicator 97
wor (file extension) 120
Workspaces 14
Save 14
Tip (RT Scans) 201

# - Z -

zoom 80, 169
Zoom Mouse Wheel 255

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