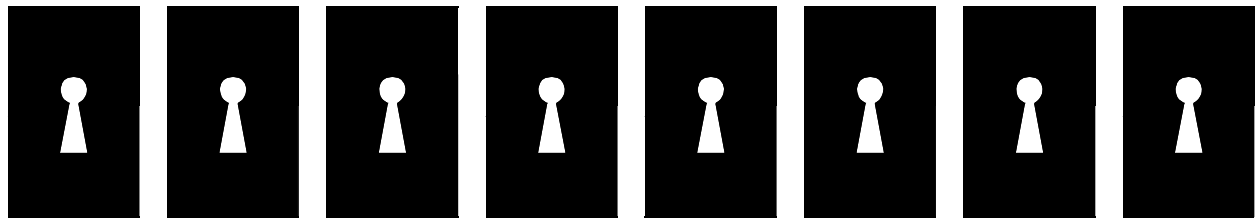


The Keyhole Problem

Scott Meyers
www.aristeia.com



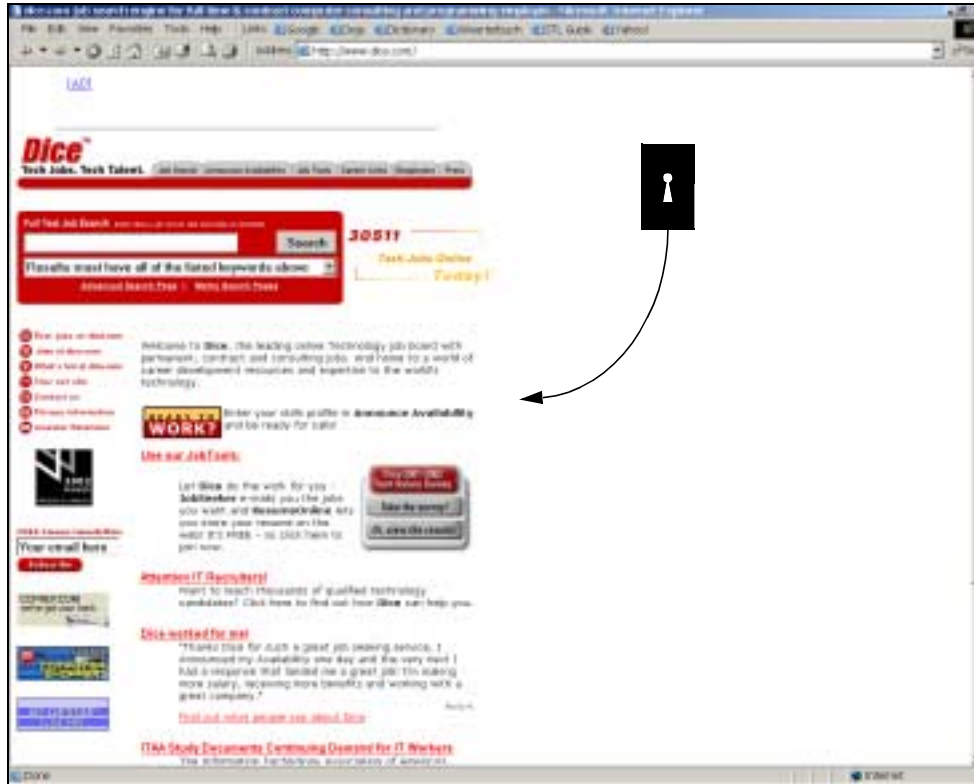


Visible Keyholes (GUI Components)

- The Fixed-Width Web Page keyhole
- The Vertical Listbox/Combobox keyhole.
- The Horizontal Listbox/Combobox keyhole.
- The Fixed Size Window keyhole.
- The Maximum Size Window keyhole.
- The Fixed Size Dialog keyhole.
- The Limited Tree Expansion keyhole.
- The Fixed Width Edit Control keyhole.
- The Lying Fixed Width Edit Control keyhole.

The Fixed-Width Web Page Keyhole

Dice's web site is typical:



Copyright (Text Only) © 2002 by Scott Meyers

Page 5

The Fixed-Width Web Page Keyhole

Like MSN, some 2/3rds of PC Magazine's Top 100 Classic Web Sites use fixed-width pages.



AOL is representative of those that center their fixed-width pages. Oooh!

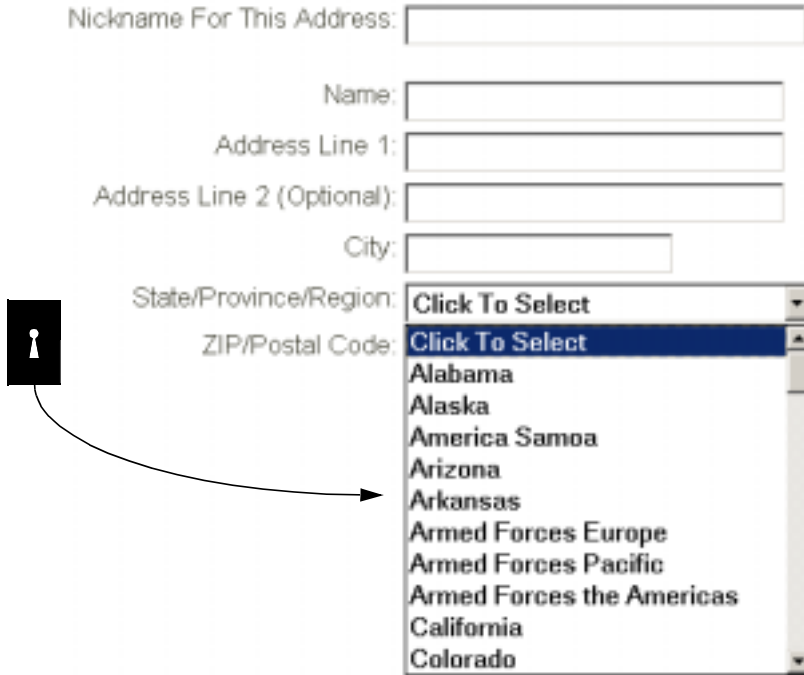


Copyright (Text Only) © 2002 by Scott Meyers

Page 6

The Vertical ListBox/ComboBox Keyhole

From [BooksAMillion's](#) web site:

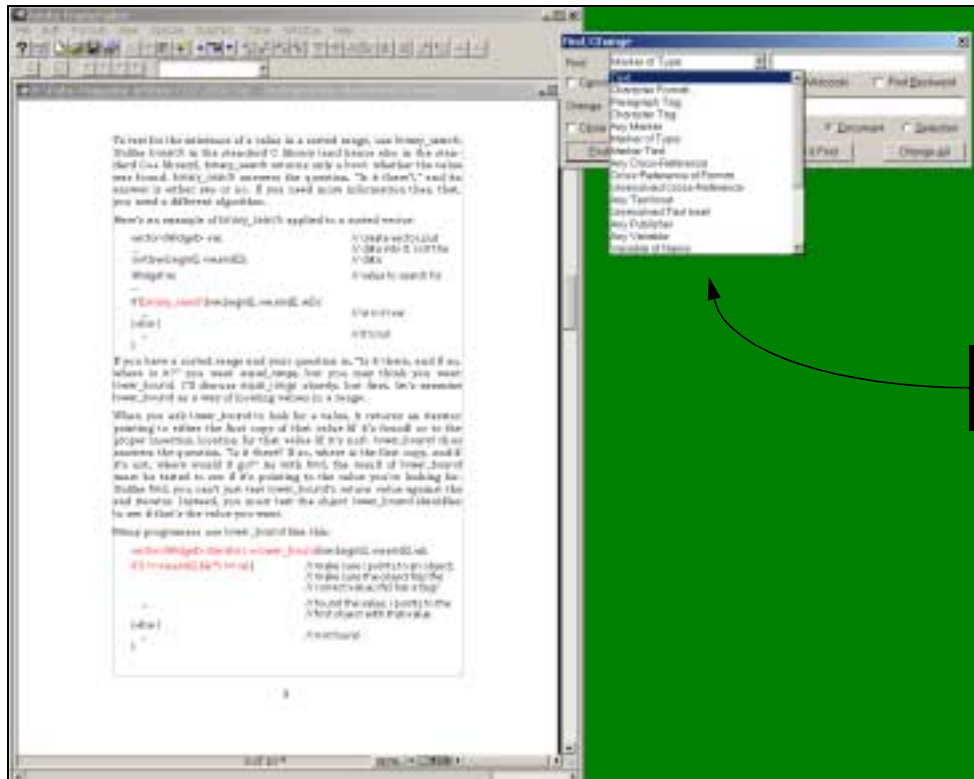


Copyright (Text Only) © 2002 by Scott Meyers

Page 7

The Vertical ListBox/ComboBox Keyhole

From [Adobe's](#) FrameMaker 6:



Copyright (Text Only) © 2002 by Scott Meyers

Page 8

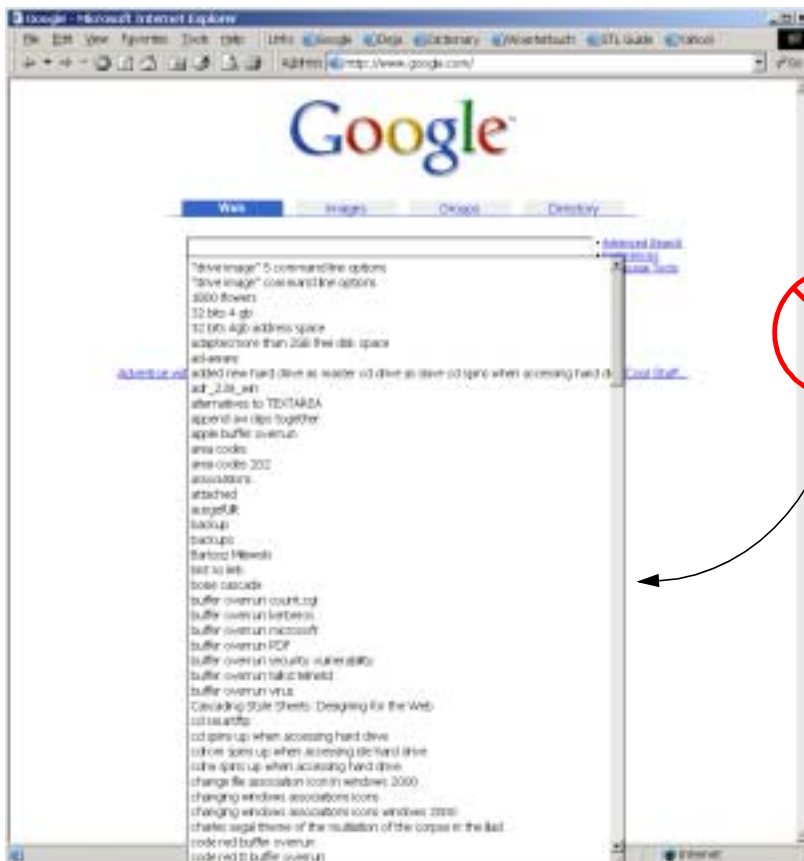
The Vertical ListBox/ComboBox Keyhole

From Microsoft's Visual Studio .NET:

```
public DataCollector(string URIorURIFileName) {
    ArrayList URIs = getURIs(URIorURIFileName);
    if (URIs.Count == 0) {
        Console.WriteLine("URI File is empty.");
        return;
    }
    while (true) {
        TimeSpan probes = new TimeSpan(TimeSpan.TicksPerHour);
        ArrayList URIs = new ArrayList();
        foreach (string uri in URIs) {
            string response = null;
            try {
                response = WebRequest.Create(uri).GetResponse();
                items.Add(new ItemInfo(response.GetResponseStream(), DateTime.Now));
            }
            catch { Console.WriteLine("\r\nUnable to access \"{0}\".", uri); }
            finally { if (response != null) response.Close(); }
        }
    }
}
```



It Doesn't Have to be This Way



The Horizontal ListBox/ComboBox Keyhole

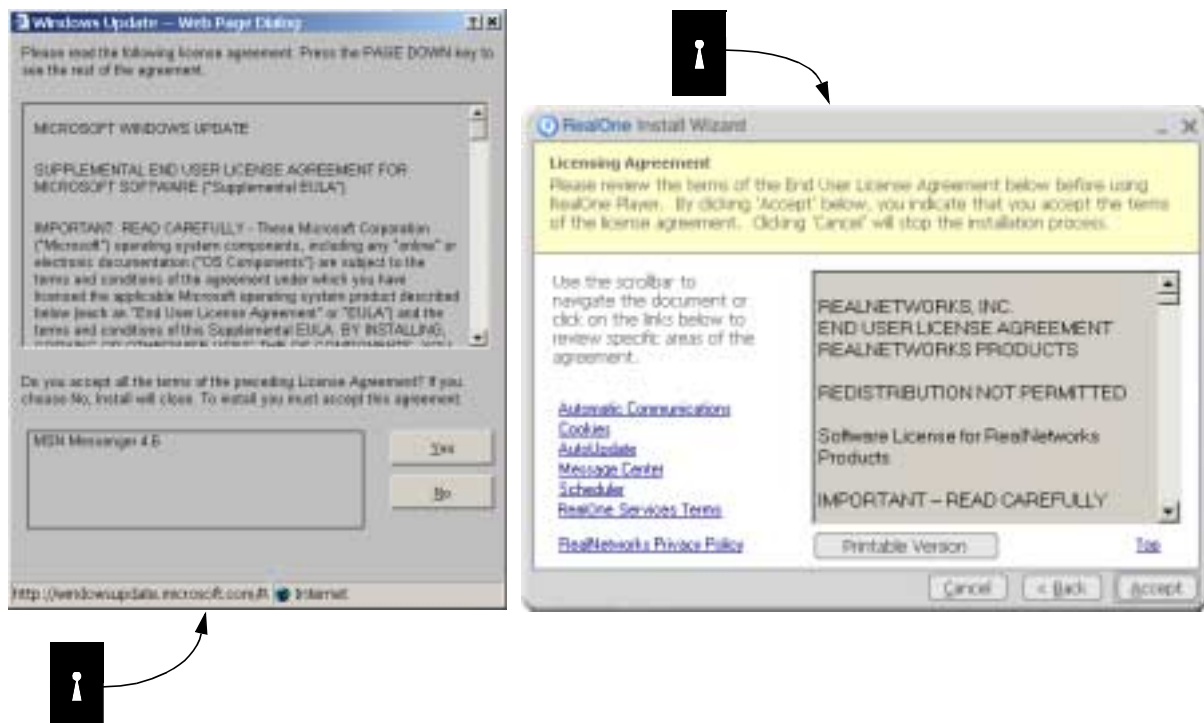
From Microsoft's web site for Windows Media Player:



To maximize usability, this is also a vertical Listbox keyhole.

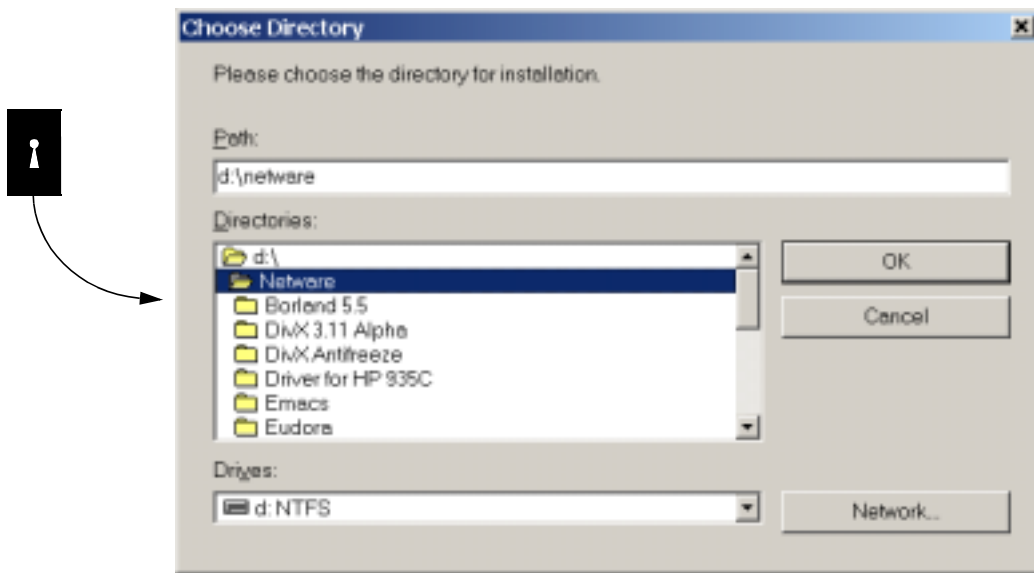
The Fixed Size Window Keyhole

Very popular for licensing agreements. From Microsoft and Real Networks:



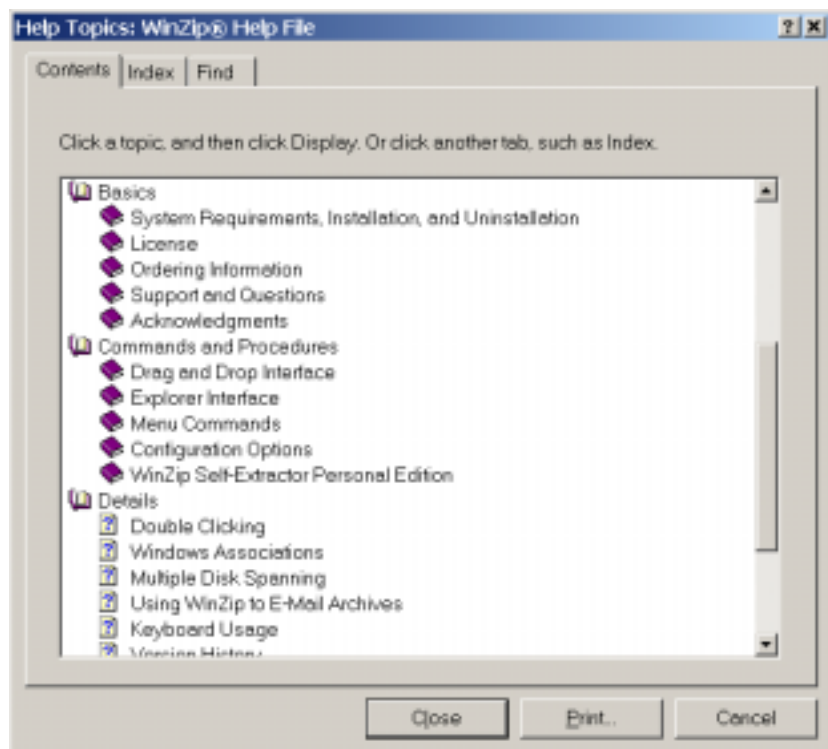
The Fixed Size Window Keyhole

Also common for installation directory dialogs. From [Apple's QuickTime 5 installer](#):



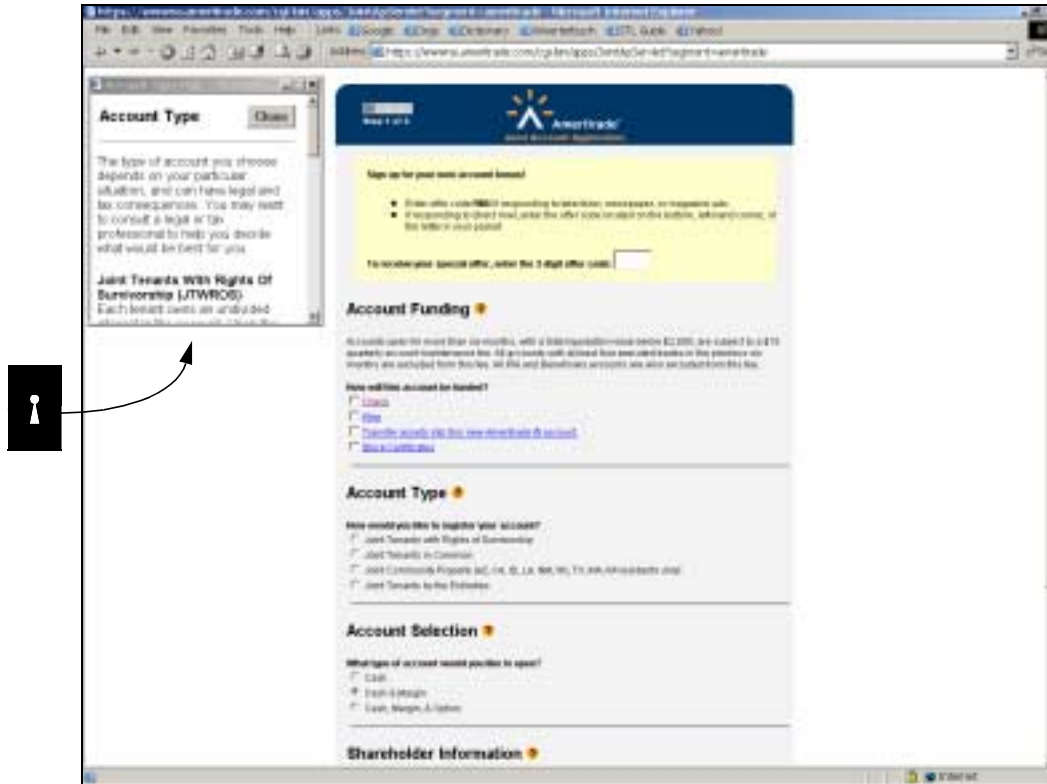
The Fixed Size Window Keyhole

Common for help, as well. From [WinZip Computing's WinZip 8](#):



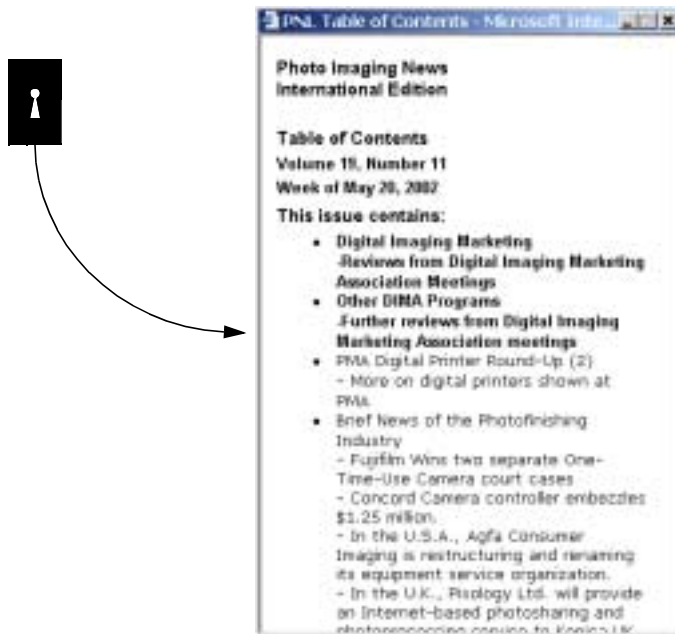
The Fixed Size Window Keyhole

Web sites like them, too. From Ameritrade's web site:



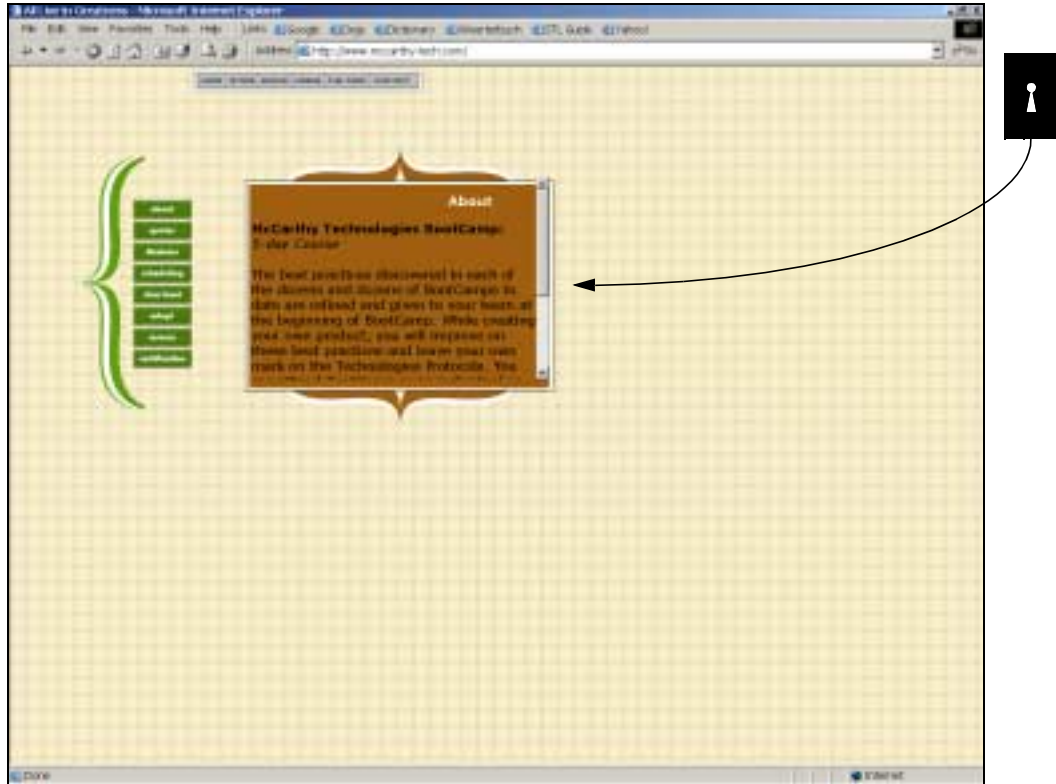
The Fixed Size Window Keyhole

An interesting twist: an unscrollable window from Photo Imaging News' web site:



The Fixed Size Window Keyhole

An unusual specimen from McCarthy Technologies' web site:



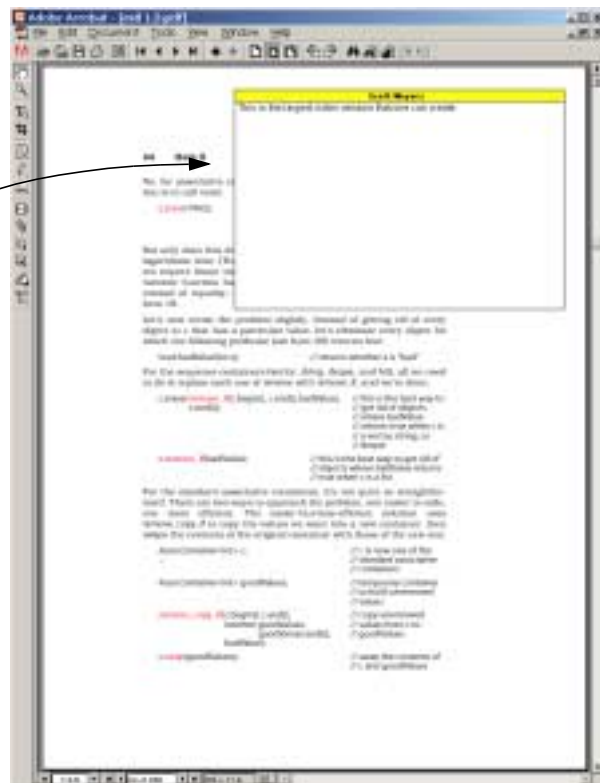
Copyright (Text Only) © 2002 by Scott Meyers

Page 17

The Maximum Size Window Keyhole

From Adobe's Acrobat 4 documentation:

The maximum size for the note window is 288 pixels high and 432 pixels wide.

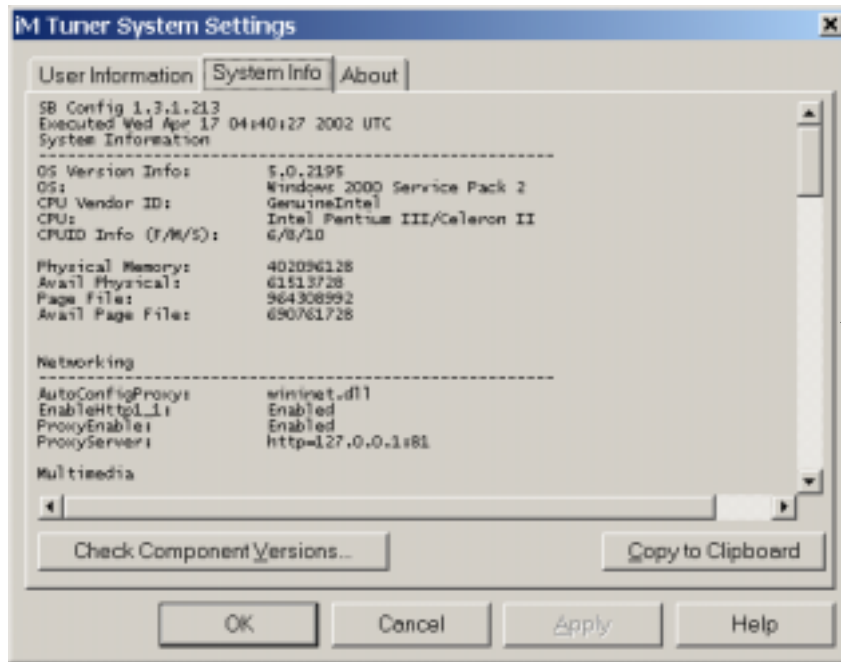


Copyright (Text Only) © 2002 by Scott Meyers

Page 18

The Fixed Size Dialog Keyhole

From Sonicbox's iM Tuner:

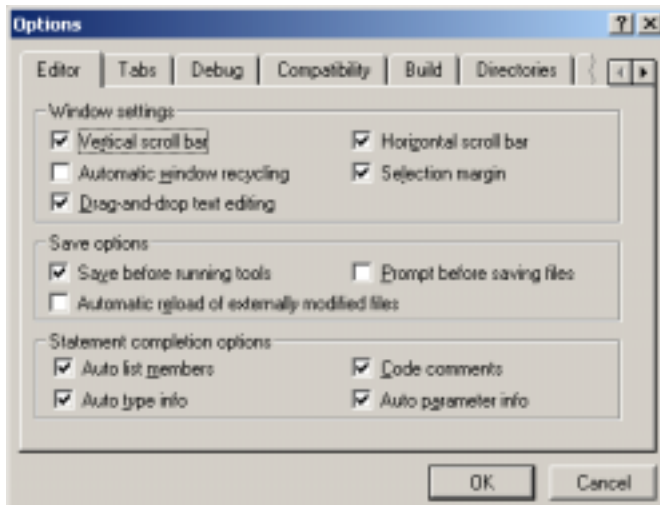


Copyright (Text Only) © 2002 by Scott Meyers

Page 19

The Fixed Size Dialog Keyhole

From Microsoft's Visual Studio 6:

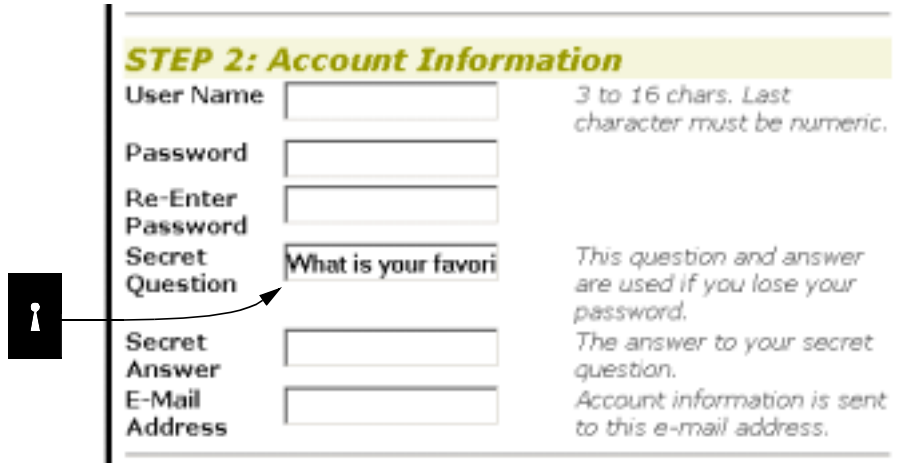


Copyright (Text Only) © 2002 by Scott Meyers

Page 20

The Fixed Width Edit Control Keyhole

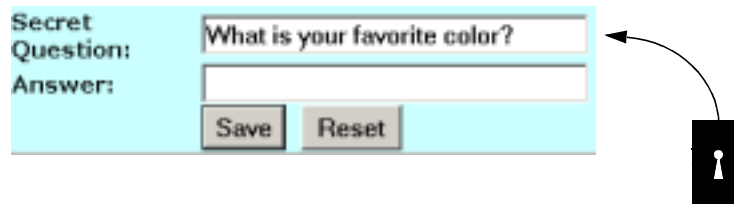
From [OneSuite.com](#)'s web site (account setup):



STEP 2: Account Information

User Name	<input type="text"/>	3 to 16 chars. Last character must be numeric.
Password	<input type="password"/>	
Re-Enter Password	<input type="password"/>	
Secret Question	<input type="text" value="What is your favori"/>	This question and answer are used if you lose your password.
Secret Answer	<input type="text"/>	The answer to your secret question.
E-Mail Address	<input type="text"/>	Account information is sent to this e-mail address.

From [OneSuite.com](#)'s web site (account maintenance):



Secret Question:

Answer:

Copyright (Text Only) © 2002 by Scott Meyers

Page 23

The Lying Fixed Width Edit Control Keyhole

From [Marriott](#)'s web site:



Check-in Date:

Check-out Date:

Number of Guests:

Enter your Marriott Rewards number to earn points or miles at participating Marriott Rewards hotels.

Marriott Rewards Number:

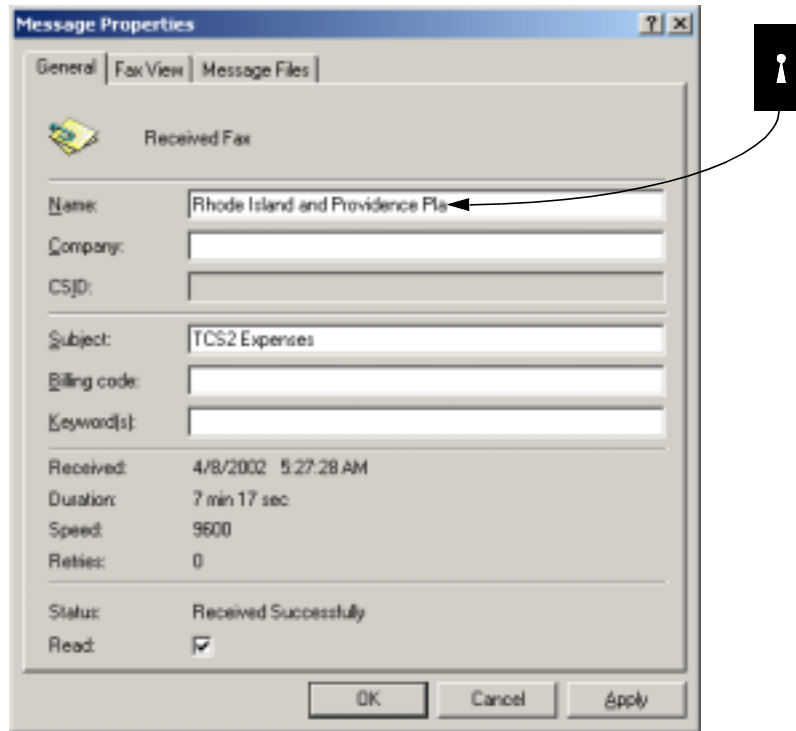


Copyright (Text Only) © 2002 by Scott Meyers

Page 24

The Lying Fixed Width Edit Control Keyhole

From Symantec's Winfax Pro 10:



Copyright (Text Only) © 2002 by Scott Meyers

Page 25

Invisible Keyholes

The Too Few Bits keyhole.

The Unnecessarily Signed Int keyhole.

The Restricted Field Size keyhole.

The Restricted Domain keyhole.

Important: **Invisible ≠ Undetectable!**

Copyright (Text Only) © 2002 by Scott Meyers

Page 26

The **Too Few Bits** Keyhole

From Roxio's web site (but the software is due to **Adaptec**):

If you have Easy CD Creator 4.00 and have more than 8Gb of free space, please create TEMP directories and fill up space in these until less than 8Gb of free space remains.

8GB is 33 bits...



The **Unnecessarily Signed Int** Keyhole

Naviscope's Naviscope status report:

```
Naviscope: Active, 10 Prefetched, -4116 Ads Blocked
```



The **Restricted Field Size** Keyhole

A phrase to index using Adobe's FrameMaker 6:

Prefer iterator to const_iterator, reverse_iterator, and const_reverse_iterator.

I want several different index entries:

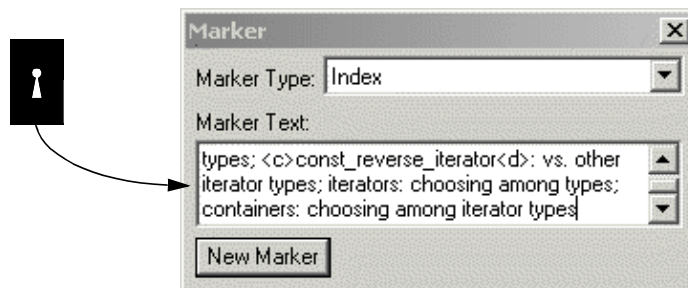
iterator: vs. other iterator types
const_iterator: vs. other iterator types
reverse_iterator: vs. other iterator types
const_reverse_iterator: vs. other iterator types
iterators: choosing among types
containers: choosing among iterator types

With markup, here's the index entry I want to make:

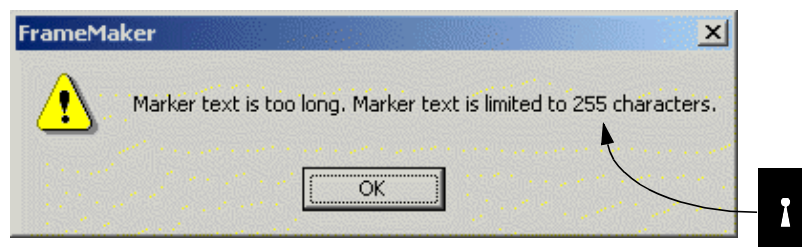
```
<$startrange><c>iterator<d>: vs. other iterator types;  
<c>const_iterator<d>: vs. other iterator types; <c>reverse_iterator<d>: vs.  
other iterator types; <c>const_reverse_iterator<d>: vs. other iterator  
types; iterators: choosing among types; containers: choosing among  
iterator types
```

The **Restricted Field Size** Keyhole

FrameMaker lets me type it into this lovely keyhole,



but when I click "New Marker"...



The Restricted Field Size Keyhole

From **Microsoft's** Visual C++ 6:

Compiler Warning C4786

The debugger cannot debug code with symbols longer than 255 characters.

From **Microsoft's** Visual Studio .NET Readme:

Setup fails if any path and file name combination exceeds 260 characters. The maximum length of a path in Visual Studio is 221 characters; accordingly, you should copy files to a path with less than 70 characters.

If you create a network share for a network image, the UNC path to the root install location should contain fewer than 39 characters.

Annotations in **Adobe** Acrobat 4 appear to be limited to 5000 characters.

Nostalgia:

- Local phone numbers will never have more than 7 digits.
- Two digits will always suffice to identify the year.

The **Restricted Domain** Keyhole

Unbelievably common for user IDs and passwords, often in conjunction with field size keyholes:

The University of Arkansas

CICS Passwords

- Must be between 3 and 8 characters.
- Can have alpha and numeric characters. No special characters (dollar sign, percent signs..)

Hotmail

Must be **at least six (6) characters long**, may contain numbers (0-9) and upper and lowercase letters (A-Z, a-z), but **no spaces**.

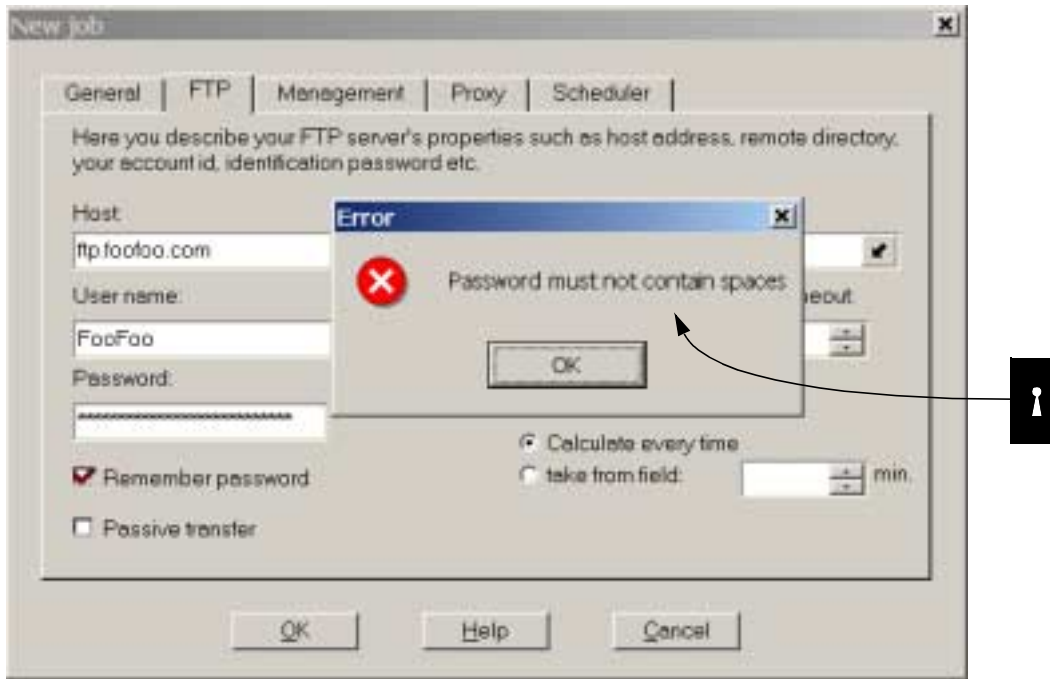
Ameritrade

Your PIN...

- Must be a 4-digit number
- Cannot begin with a zero
- Cannot include letters or symbols

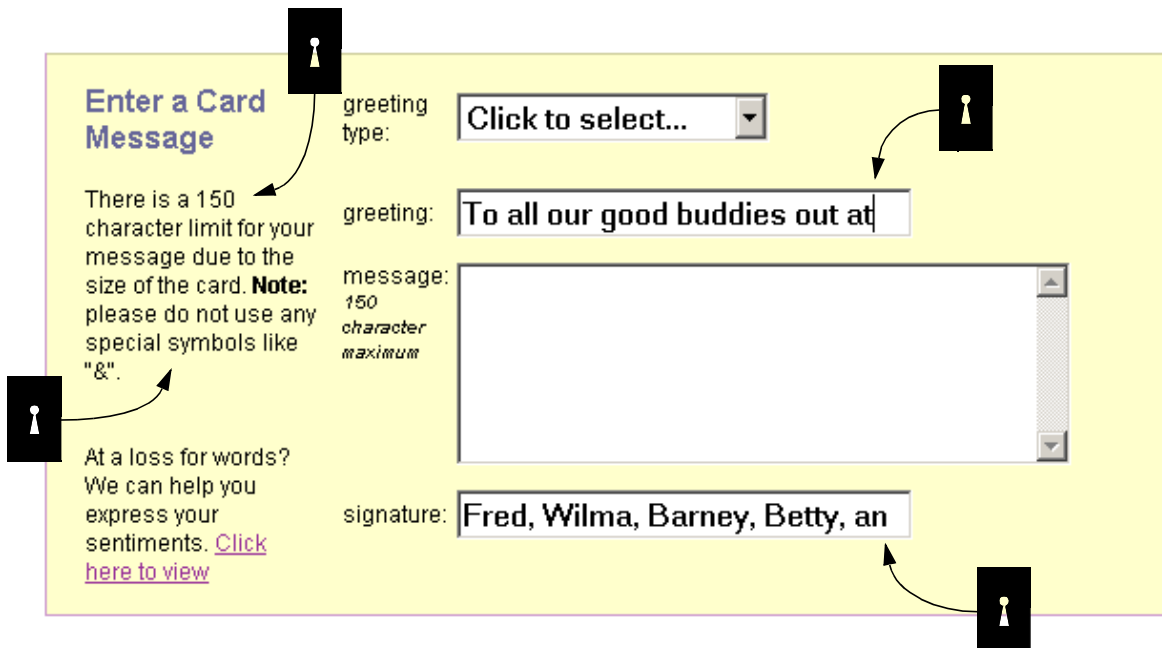
The Restricted Domain Keyhole

From Rifco's DC SmartFTP:



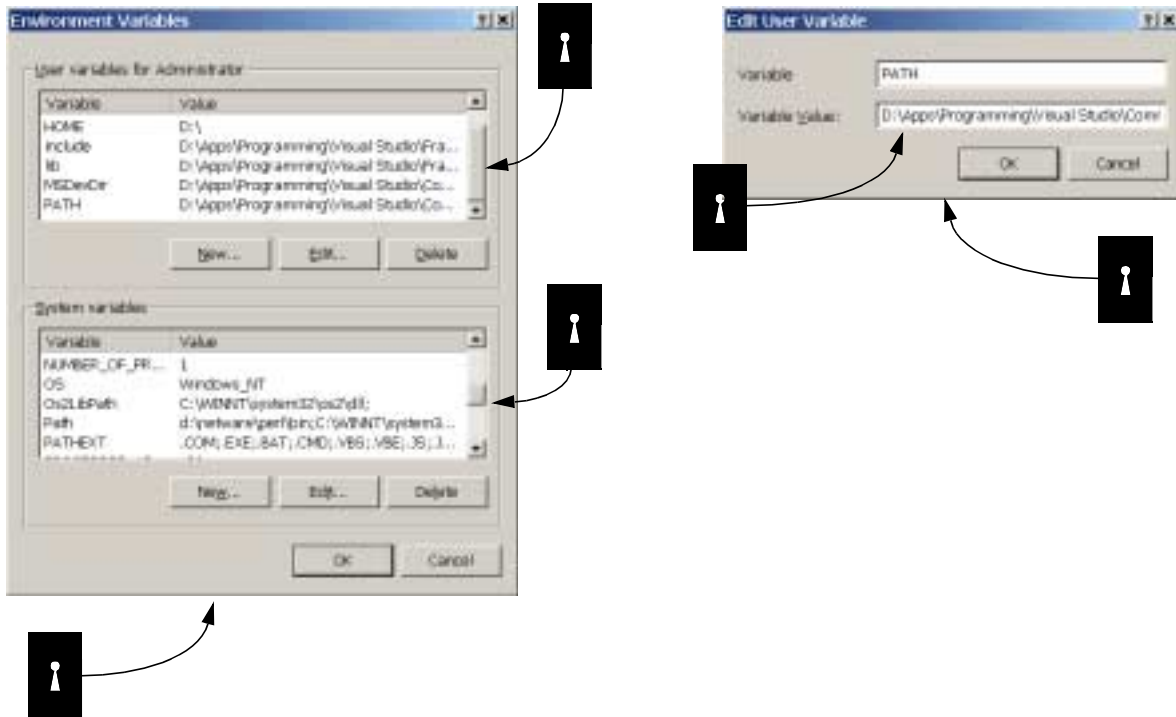
The Restricted Domain Keyhole

From 1800flowers.com's web site:



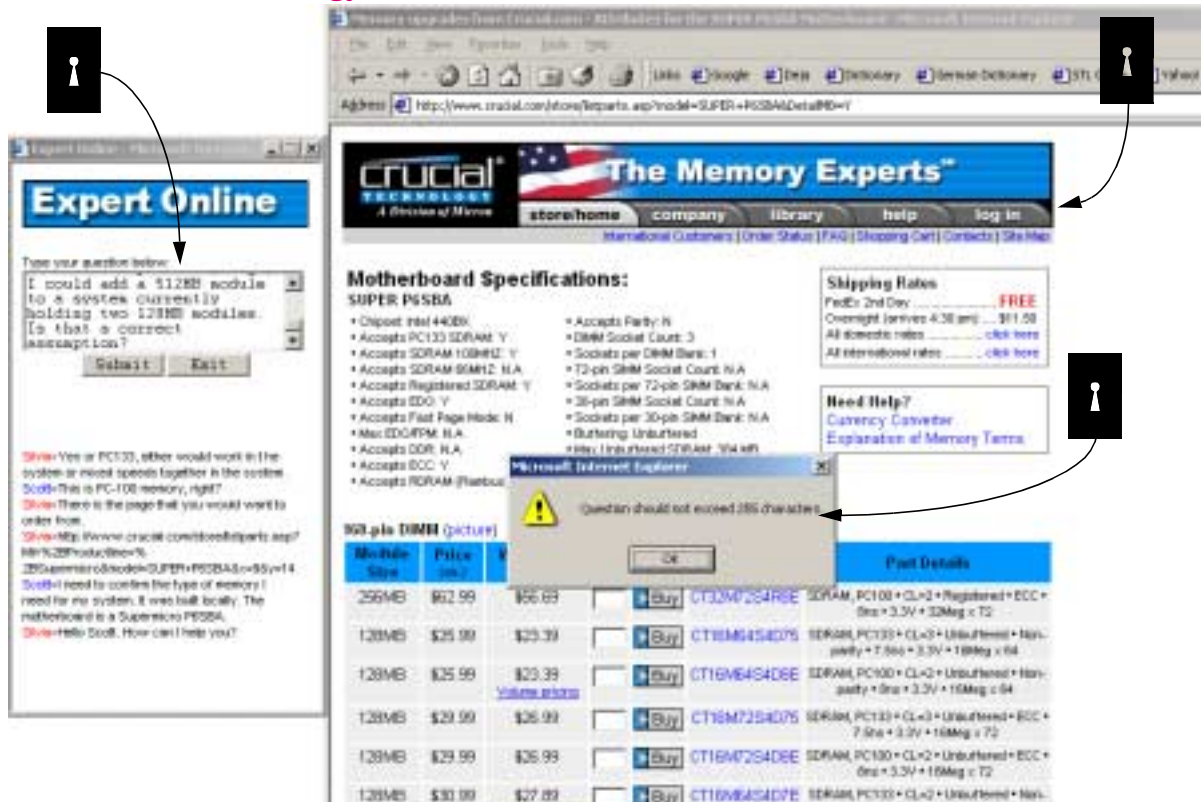
Keyholes Everywhere

Here is Microsoft's Windows 2000's interface for editing it:



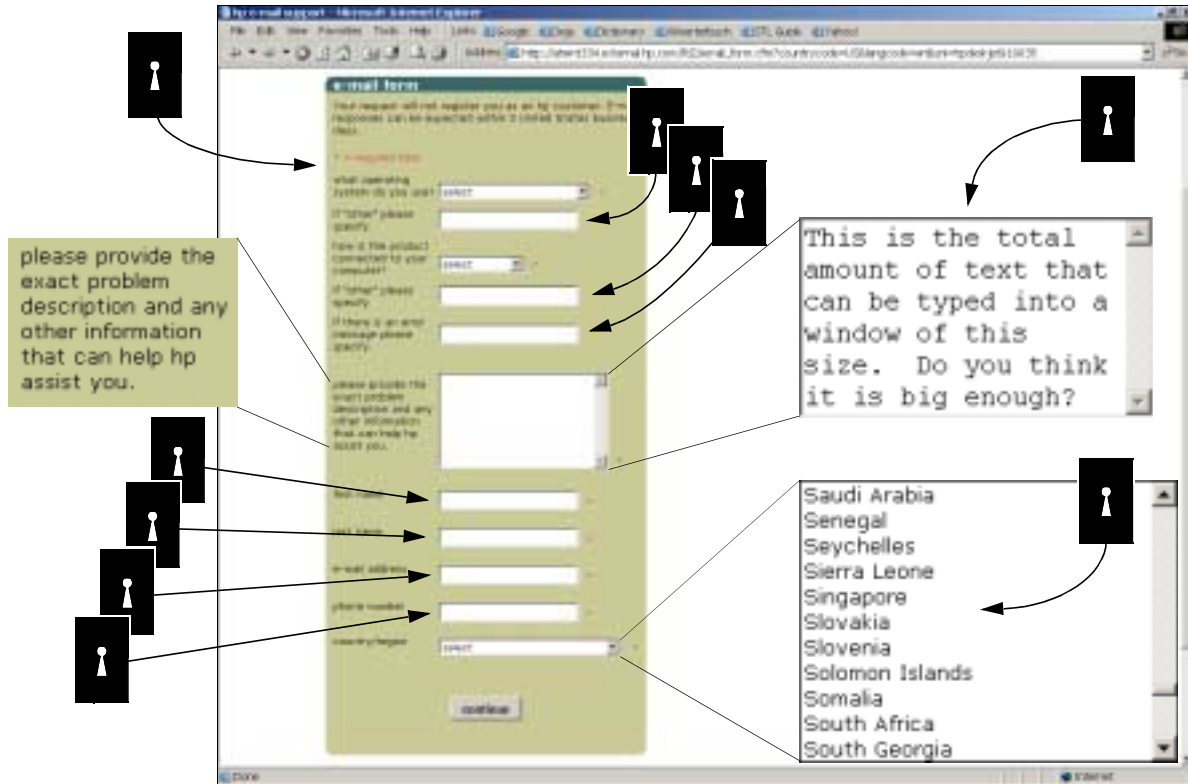
Keyholes Everywhere

From Crucial Technology's web site:



Keyholes Everywhere

From HP's web site:



Copyright (Text Only) © 2002 by Scott Meyers

Page 39

Beyond Inconvenience

What happens when the log exceeds 65.535" in width?



"It was a very serious bug. It really could have killed someone."

Copyright (Text Only) © 2002 by Scott Meyers

Page 40

Beyond Inconvenience

Fixed-size buffers + programmer incompetence or oversight = Hackers' Delight.

- Code Red and Code Red II worms

A quick Google search yields reported buffer overrun vulnerabilities all over the place:

- **gzip** under **Linux**
- **xdat** under **AIX**
- **count.cgi** everywhere
- MIT's **Kerberos**
- SGI **df**, **pset**, and **eject** under **IRIX**
- HP's **Openview Network Node Manager Alarm Service**
- Microsoft **Clip Art Gallery**
- **Microsoft Index Server 2.0** under **Windows NT**.
- **rpc.espd** daemon under **IRIX**
- **xterm** under **OpenBSD**
- **statd** under **Unix**
- **talkd** under **HPUX**
- **NTP** under **NetBSD**
- **AOL Instant Messenger** under **Windows**
- Microsoft **Windows Media player**
- Microsoft **HyperTerminal**
- Microsoft **SQL Server**
- Microsoft **Internet Explorer** under **MacOS**
- Microsoft **IIS**
- TalentSoft's **Web+**
- CDE's **dtspcd** daemon under **Unix**
- **login** under System-V-derived **Unix**
- Microsoft's **C Runtime Library**
- Apple's **sudo** under **MacOS**

Beyond Inconvenience

The stakes can be high...

- **March 1979:** TMI-2 comes within 30 minutes of total meltdown
- **Contributing factor:** A steam temperature readout is programmed **never to display values over 280° F**



What You Can Do

Get a Feel for the Ubiquity of the Problem:

- For one full day, count the number of friction-inducing keyholes you encounter.
- Calculate how many times you are interrupted by the need to work around needless keyholes.

Fundamental: Avoid imposing gratuitous restrictions.

- As much as possible, determine things dynamically instead of statically:
 - Window sizes
 - Layout of window content
 - Field and buffer sizes
 - Etc.

What You Can Do

General practices:

- Reject components (especially GUI components) that impose keyholes.
- Before putting something somewhere, make sure it will fit!
- Don't try to shave bits.
- When counting things, use unsigned integers.

Web site designers:

- Follow the advice above.
- When in doubt, copy Amazon.
- When not in doubt, check Amazon anyway.

But, But...

But programming with keyholes is faster and easier than programming without them:

- **Typically false for GUIs.** Standard components/techniques offer better behavior:
 - Fixed-width web pages are easily eliminated (cf. Amazon)
 - Ditto fixed-size windows (cf. most Windows apps)
 - Ditto windows with a maximum size.
 - Ditto fixed-width edit controls (cf. Windows search)
 - Ditto lying fixed-width edit controls.
- **Also often false for invisible keyholes:**
 - Use of unsigned ints typically trivial.
 - Use of variable-sized fields typically trivial.
 - Use of unrestricted value domains typically *easier* (when it makes sense).
- **Even when true, a lousy argument:**
 - Write non-keyhole components once, then use them all over.
 - You have to write some infrastructure anyway.

But everybody uses keyholes:

- **Listen to your mother:**
 - “If everybody jumped off a cliff, would you jump, too?”

Thanks for the Gratuitous Frustration to

About 2/3rds of the World's Web Sites

Microsoft

Adobe

Real Networks

Apple

WinZip Computing

SonicBox

Symantec

Adaptec

Naviscope

Rifco

And all the other Keyhole-Happy Software Vendors

Please Note

Scott Meyers offers consulting services in all aspects of the design and implementation of software systems. For details, visit his web site:

<http://www.aristeia.com/>

Scott also offers a mailing list to keep you up to date on his professional publications and activities. Read about the mailing list at:

<http://www.aristeia.com/MailingList/>