

CSE 3461

Layout Organization and Management

Models for Component Layout

1. Absolute (aka fixed)
 - Control for component size and position
2. Struts and springs
 - Control for component position
3. Variable intrinsic size
 - Control for component size

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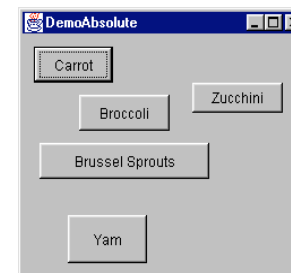
Absolute Layout

- The principle is to specify the position and the size of each component
 - provide absolute values (not relative)
 - position is specified by x and y screen coordinates (typically in pixels, origin in top-left corner)
 - size is specified by width and height values (typically in pixels)

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Example

DemoAbsolute.java



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Absolute Layout

- Disadvantages
 - Widgets retain their position and size when window is resized
 - Enlarging: too much empty space (more in Module 6, Evaluation)
 - Shrinking: components get lost (how might this instead be handled?)
 - Difficult to modify layout; need to modify many 'magic numbers'
- Advantages
 - Widgets retain their position and size when window is resized
 - Can be simple to specify layout

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Struts and Springs

- Idea: specify relative position of components
 - the specification is given in terms of constraints
 - the constraints specify geometric relationships between the components and the borders of container
 - the sizes and positions of the components are determined by layout manager
 - the layout manager calculates the (x,y) coordinates and component sizes so that the specified constraints relationships are maintained, *to the degree that is possible.*

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Struts and Springs

- Struts are regions of a fixed, inflexible size
 - represented by ■
- Springs are regions that have a certain size initially, but can be compressed or stretched as needed
 - represented by 🌀



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Struts and Springs

Advantages

- When the window is resized, components will automatically be repositioned
 - position is determined by layout manager's solution to constraint equations
- Easy to use
- Handles window resizing appropriately

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Variable Intrinsic Size

- Idea: specify intrinsic size values for widgets
 - *intrinsic* means pertaining to the inherent or essential nature of a thing (cf *extrinsic*, originating from the outside, external)
 - intrinsic values capture a range of acceptable values: preferred size, minimum size, maximum size
 - let layout manager determine which size value should be used
- During layout, components report their size properties to the layout manager (recursively, if necessary)
- Designers have limited control over this
 - Some layout managers respect size properties, while others do not!

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Variable Intrinsic Size

- Advantages
 - Layout manager determines appropriate values
- Disadvantages
 - Designers have limited control over this
 - Some layout managers respect size properties, while others do not!

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Java's Layout Managers

- | | |
|------------------|---------------|
| 1. BorderLayout* | spec. purpose |
| 2. BoxLayout | very flexible |
| 3. CardLayout | spec. purpose |
| 4. FlowLayout** | very simple |
| 5. GridBagLayout | very simple |
| 6. GridLayout | very simple |
| 7. SpringLayout | very flexible |

* default layout manager of content pane

** default layout manager of JPanel

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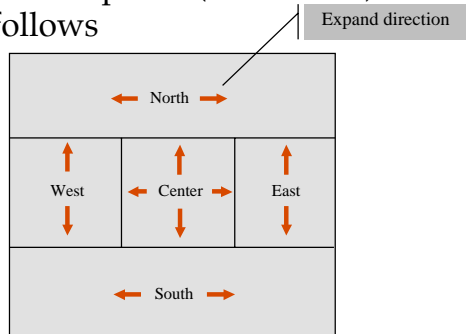
BorderLayout

- Places components in one of five regions
 - North, South, East, West, Center
 - all extra space is placed in center
- Support for struts and springs
 - Struts (YES)
 - Can specify 'hgap', 'vgap'
 - Springs (NO)
 - Inter-component space is fixed
- Support for variable intrinsic size (YES)
 - Components expand to fill space in region

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BorderLayout

- Components 'expand' (or 'stretch') to fill space as follows




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Example

DemoBorderLayout.java

```
usage: java DemoBorderLayout arg1  
where 'arg1' = strut size in pixels
```

Example (next 2 slides) 

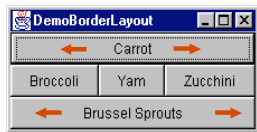
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Example

Invocation: java DemoBorderLayout 0

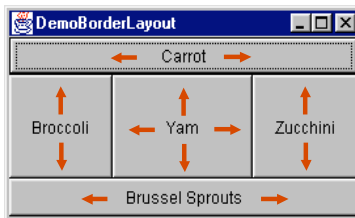
strut size=0

Launch



Variable intrinsic size

Resize



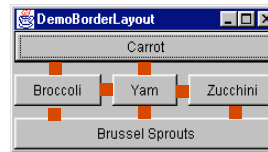
15

Example

Invocation: java DemoBorderLayout 10

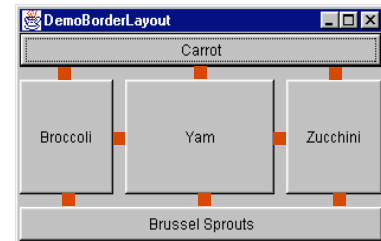
With struts : hgap = vgap = 10 pixels

Launch



Struts

Resize



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BoxLayout

- Components placed in a single row or column
- Alignment can be specified
- Components do not wrap
- Support for struts and springs
 - Struts (YES)
 - Can specify 'rigid areas'
 - Springs (YES)
 - Can specify 'horizontal glue' or 'vertical glue'
- Support for variable intrinsic size (YES)
 - Components expand if maximum size property is set

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Example

DemoBoxLayout.java

```
usage: java DemoBoxLayout arg1 arg2
```

where 'arg1' is one of
c = centre alignment
l = left alignment
r = right alignment

and 'arg2' is one of
e = enable struts and springs demo
d = disable struts and springs demo

Example (next 2 slides) →

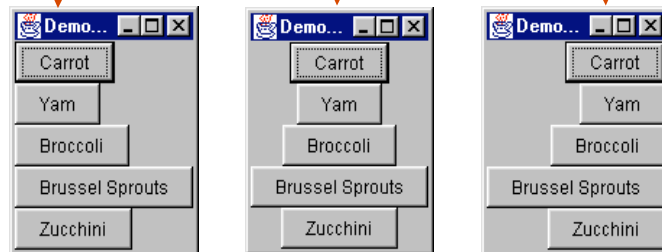
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Example

Invocation: java DemoBoxLayout l d

Invocation: java DemoBoxLayout r d

Invocation: java DemoBoxLayout c d



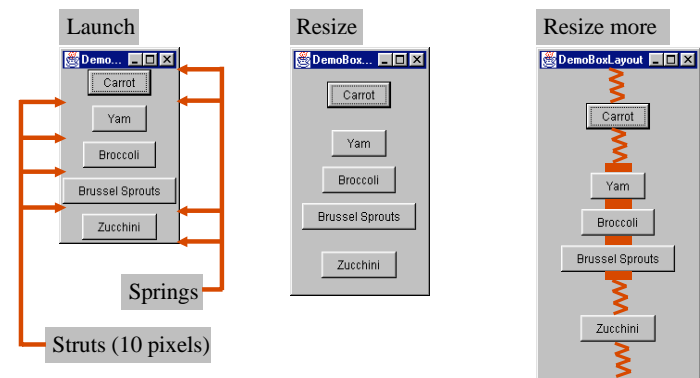
Default is left align

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Example

Enable struts and springs demo

Invocation: java DemoBoxLayout c e



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FlowLayout

- Components are placed one after another, from left to right
 - If container isn't wide enough, a new row is started
 - The group can be aligned: left, center, right
 - Space is added before/after/below the entire group of components to fill available space
- Support for struts and springs
 - Struts (YES)
 - Can specify 'hgap', 'vgap'
 - Springs (NO)
 - Inter-component space is fixed
- Support for variable intrinsic size (NO)
 - Component size is fixed

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Example

DemoFlowLayout.java

```
usage: java DemoFlowLayout arg1 arg2
```

where 'arg1' = strut size in pixels

and 'arg2' is one of
c = center alignment
l = left alignment
r = right alignment

Example (next 2 slides) 

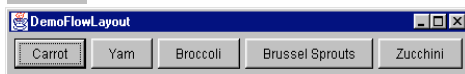
22

Example

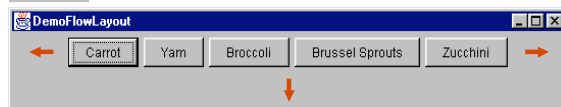
Default for FlowLayout...
struts : hgap = vgap = 5,
alignment = center

Invocation: java DemoFlowLayout 5 c

Launch



Resize



Fill available space before/after/below group of components

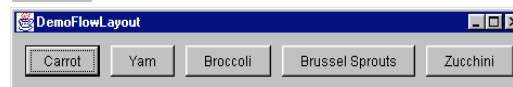
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Example

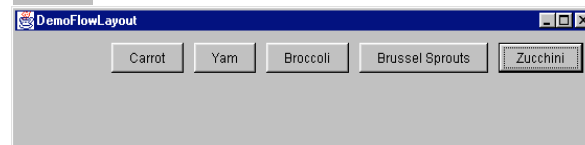
With struts : hgap = vgap = 10,
alignment = right

Invocation: java DemoFlowLayout 10 r

Launch



Resize



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GridLayout

- A number of rows and columns are requested
- Components are arranged in the grid
 - Components are made equal in size
- Support for struts and springs
 - Struts (YES)
 - Can specify 'hgap', 'vgap'
 - Springs (NO)
 - Inter-component space is fixed
- Support for variable intrinsic size (YES)
 - Components expand to fill rectangle

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Example

DemoGridLayout.java

```
usage: java DemoGridLayout arg1
```

```
where 'arg1' = strut size in pixels
```

Example (next 2 slides) →

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Example

No struts

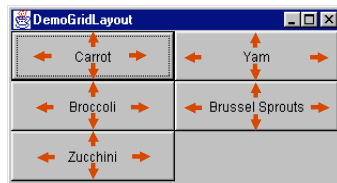
Invocation: java DemoGridLayout 0

Launch



Equal-size rectangles

Resize



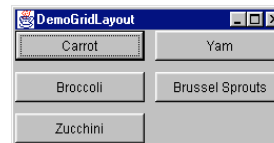
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Example

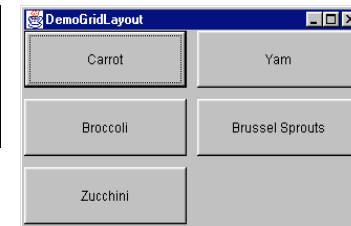
With struts : hgap = vgap = 10

Invocation: java DemoGridLayout 10

Launch



Resize



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Organization and Layout of Components

- General guidelines:
 - **Present** all components necessary for performing an action or making a decision in one window, whenever possible
 - **Organize** components into semantically-coherent groupings
 - **Place** groupings in window in a layout that:
 - is **balanced** and **aligned**
 - supports **flow of interaction**

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Flow of Interaction

- Important, frequently-used controls at the **top left**
- Maintain **top-to-bottom, left-to-right** flow
- Dependent controls should be **below** or **to the right** of their respective enabling controls
- Buttons that affect entire window should be grouped in an horizontal array
 - the grouping should be placed at the bottom and centered horizontally

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Alignment

- Alignment assists users' navigation of the screen
- Inter-group alignment **and** intra-group alignment must be considered
- A group is
 - a (labeled) set of radio buttons
 - a (labeled) set of semantically-related check-boxes
 - a (labeled) set of two or more related fields or controls

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The 5° Heuristic

- Create groups whose size is a "visual chunk" that corresponds to 5° of visual angle
- Visual acuity is best at *center of fixation*; relative acuity is halved at 2.5° from center
 - Diameter of circle that corresponds to 5° of visual angle depends on distance between eye and screen
 - With a distance of 19" (475mm) from eyes to screen, diameter of "visual chunk" is 1.67" (42mm)

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Guidelines for Borders

- Groupings can be enhanced by the addition of borders
- Do not place borders around:
 - single entry fields
 - single combo boxes, spin boxes, sliders
 - command buttons

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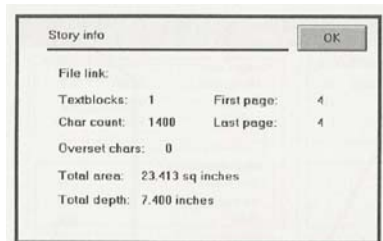
Examples

- Ex 1 “Story Info”
- Ex 2 “Customer Personal Details”
- Ex 3 “Footnote Options”
- Ex 4 “Location of Files”

Galitz, W. O., *The Essential Guide to User Interface Design*, Wiley, 2002. pp. 235-248, 684-700

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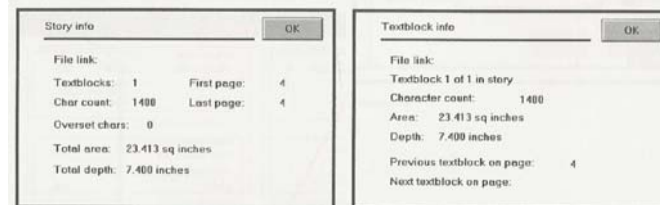
Example 1 – “Story Info”



Screen 6.1A
Version 0

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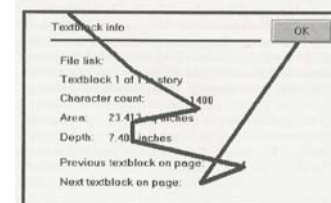
Example 1 – “Story Info”



Screen 6.1A

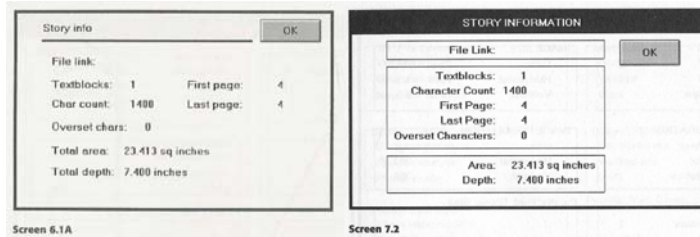
Screen 6.1B

Eye Movements



Screen 6.1C

Example 1 – “Story Info”

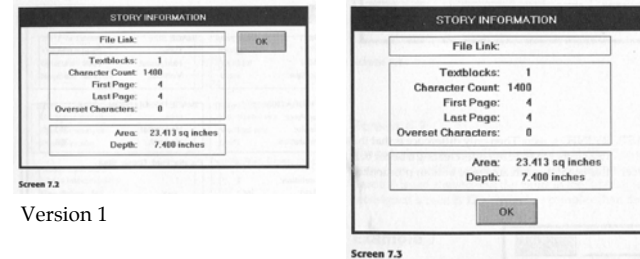


Version 0

After redesign, Version 1

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Example 1 – “Story Info”

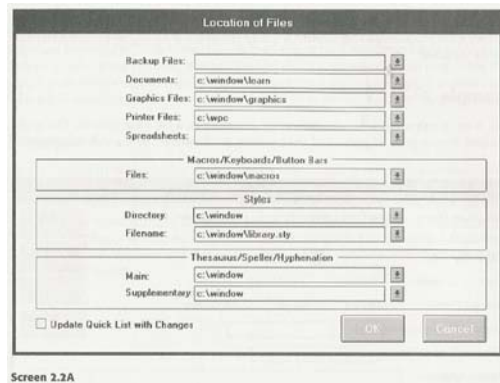


Version 1

After further modification, Version 2

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Example 4 – “Location of Files”

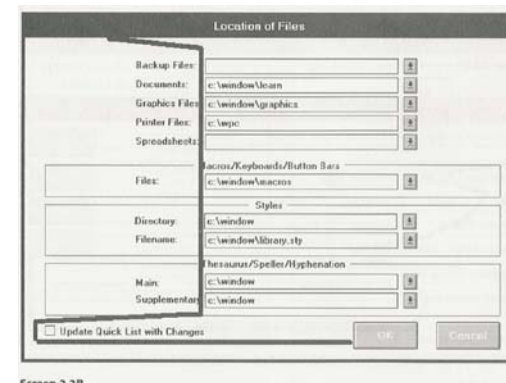


Screen 2.2A

Version 0

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Example 4 – “Location of Files”

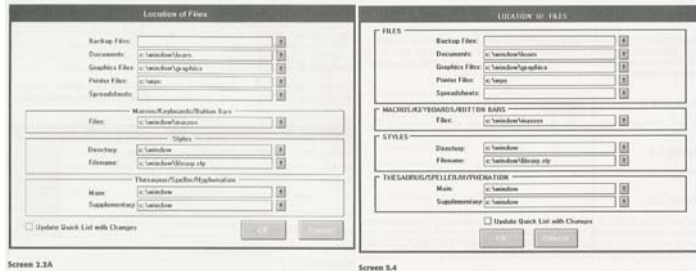


Screen 2.2B

Eye Movements

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Example 4 – “Location of Files”

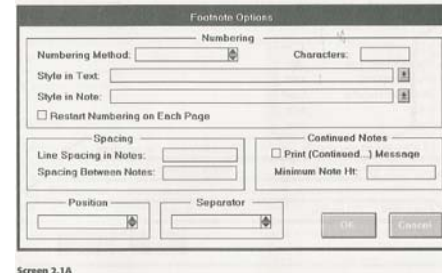


Version 0

After improvement, Version 1

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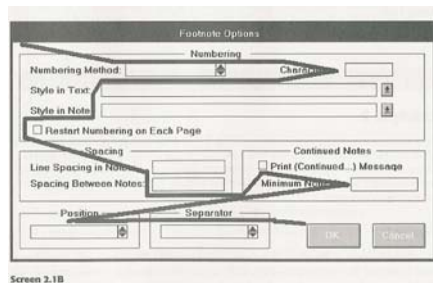
Example 3 – “Footnote Options”



Version 0

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Example 3 – “Footnote Options”

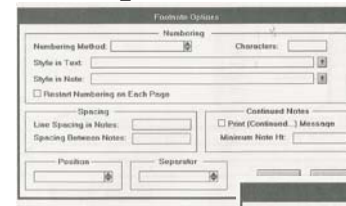


Screen 2.1B

Eye Movements

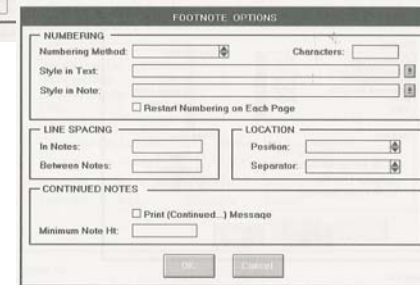
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Example 3 – “Footnote Options”



Version 0

After improvement, Version 1



Screen 5.3

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Example 2 – “Customer Personal Information”

Personal Details Customer

1st Given Name 2nd Given Name (if any) Surname

Courtesy Title: [dropdown]

Sex: Male Female Unknown

Marital Status: Married Single All Others

Date of Birth (dd/mm/yyyy): [text]

Daytime Phone No: [text]

Home Address: [text]

City/Town/Suburb: [text] Postcode: [text]

OK Apply Cancel Help

Screen 3.1A
Version 0

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Example 2 – “Customer Personal Information”

Personal Details Customer

1st Given Name 2nd Given Name (if any) Surname

Courtesy Title: [dropdown]

Sex: Male Female Unknown

Marital Status: Married Single All Others

Date of Birth (dd/mm/yyyy): [text]

Daytime Phone No: [text]

Home Address: [text]

City/Town/Suburb: [text] Postcode: [text]

OK Apply Cancel Help

Screen 3.1B
Eye Movements

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Example 2 – “Customer Personal Information”

Personal Details Customer

1st Given Name 2nd Given Name (if any) Surname

Courtesy Title: [dropdown]

Sex: Male Female Unknown

Marital Status: Married Single All Others

Date of Birth (dd/mm/yyyy): [text]

Daytime Phone No: [text]

Home Address: [text]

City/Town/Suburb: [text] Postcode: [text]

Screen 3.1A

Version 0

PERSONAL DETAILS - CUSTOMER

Name: [text] (1st) (2nd - if any) (Surname)

Courtesy Title: [dropdown]

Sex: Male Female Unknown

Marital Status: Married Single All Others

Date of Birth: [text] (dd/mm/yyyy)

Daytime Phone No: [text]

Home Address: [text]

City/Town/Suburb: [text] Postcode: [text]

OK Apply Cancel Help

Screen 3.2

After improvement, Version 1

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Example 2 – “Customer Personal Information”

PERSONAL DETAILS - CUSTOMER

Name: [text] (1st) (2nd - if any) (Surname)

Courtesy Title: [dropdown]

Sex: Male Female Unknown

Marital Status: Married Single All Others

Date of Birth: [text] (dd/mm/yyyy)

Daytime Phone No: [text]

Home Address: [text]

City/Town/Suburb: [text] Postcode: [text]

OK Apply Cancel Help

Screen 3.3

Version 1

PERSONAL DETAILS - CUSTOMER

Name: [text] (1st) (2nd - if any) (Surname)

Courtesy Title: [dropdown]

Sex: Male Female Unknown

Marital Status: Married Single All Others

Date of Birth: [text] (dd/mm/yyyy)

Daytime Phone No: [text]

Home Address: [text]

City/Town/Suburb: [text] Postcode: [text]

OK Apply Cancel Help

Screen 3.3

After further modification, Version 2

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Example 2 – “Customer Personal Information”

PERSONAL DETAILS - CUSTOMER

Name: (First) (Middle - if any) (Surname)

Courtesy Title:

Sex: Male Female Unknown

Marital Status: Married Single All Others

Date of Birth: / / (dd/mm/yyyy)

Daytime Phone No:

Home Address:

City/Town/Suburb: Postcode:

OK Apply Cancel Help

Screen 3.3

Version 2

PERSONAL DETAILS - CUSTOMER

CUSTOMER

Name: (First) (Middle - if any) (Surname)

Courtesy Title:

Home Address:

City/Town/Suburb: Postcode:

PERSONAL DETAILS

Sex: Male Female Unknown

Marital Status: Married Single All Others

Date of Birth: / / (dd/mm/yyyy)

Daytime Phone:

OK Apply Cancel Help

Screen 3.4

Another version (version 3)