

HNGG3: Hiform Nested Graph Grammar 3

by

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SIG-HCC 2002

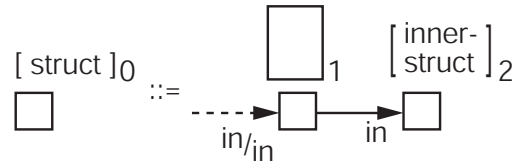
December, 2002

Chapter 1

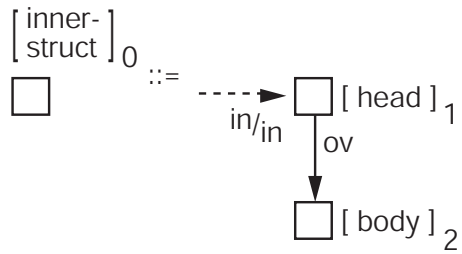
HNGG3: Hiform Nested Graph Grammar 3

1.1 Productions of HNGG3

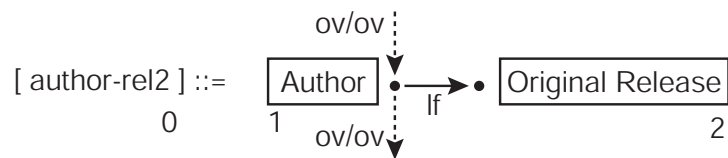
Production P1



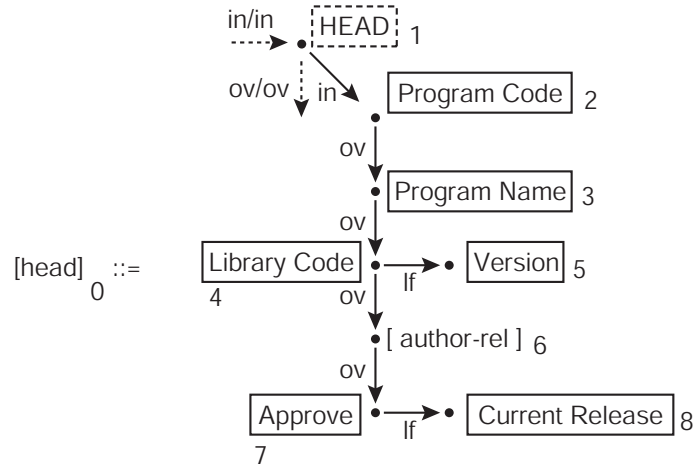
Production P2



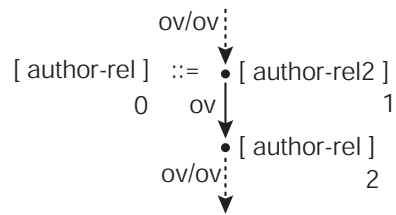
Production H4



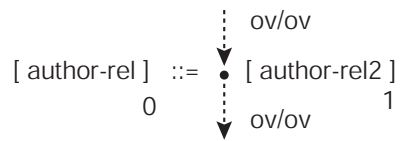
Production H1



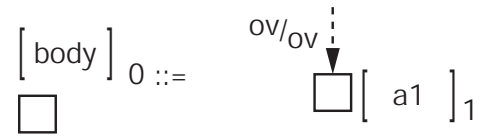
Production H2



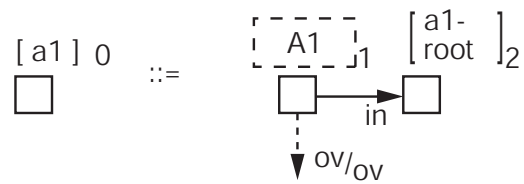
Production H3



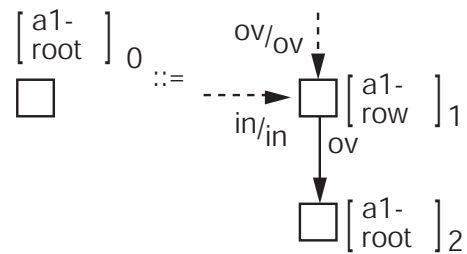
Production A1-0



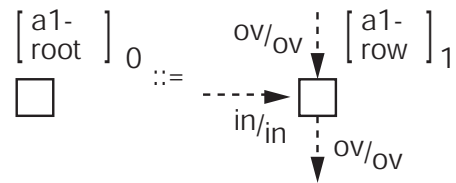
Production A1-1



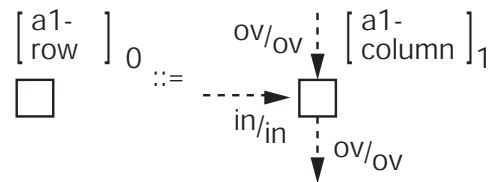
Production A1-2



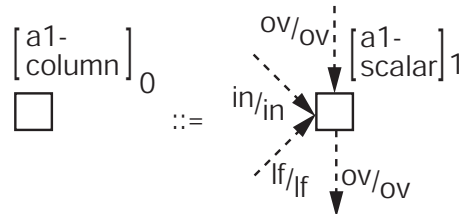
Production A1-3



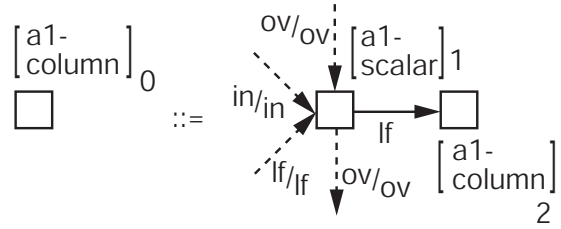
Production A1-4



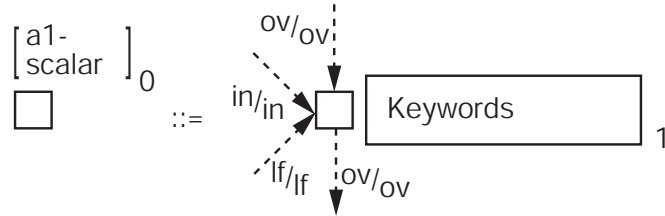
Production A1-5



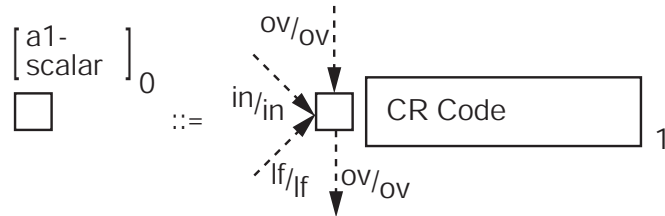
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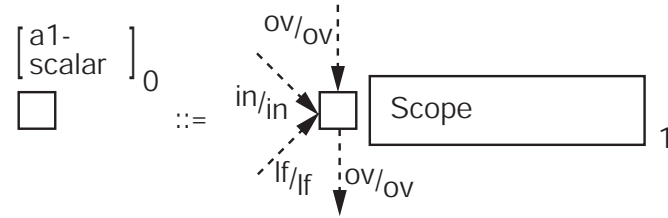
Production A1-7



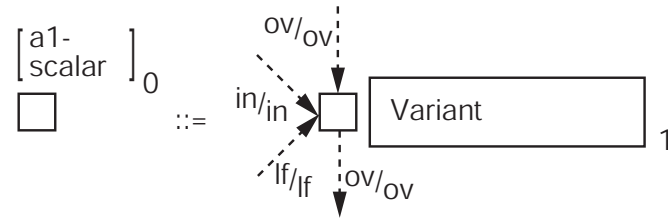
Production A1-8



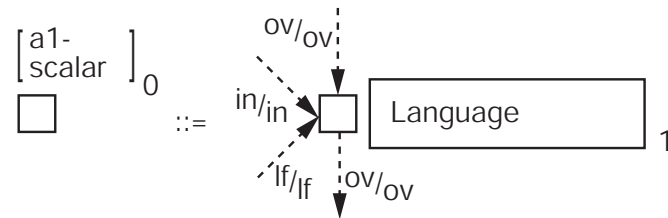
Production A1-9



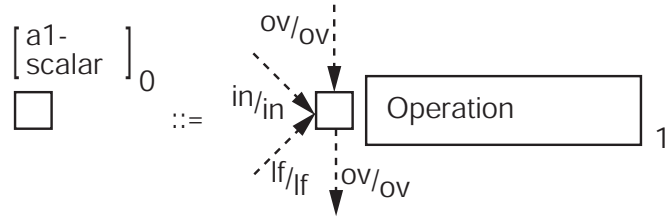
Production A1-10



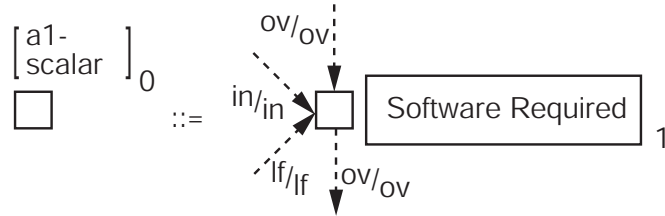
Production A1-11



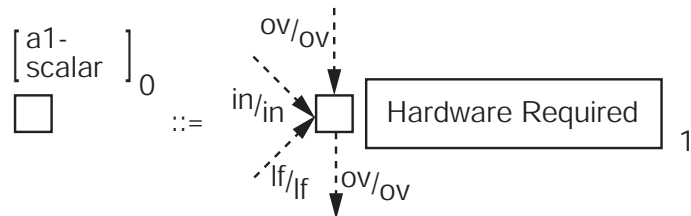
Production A1-12



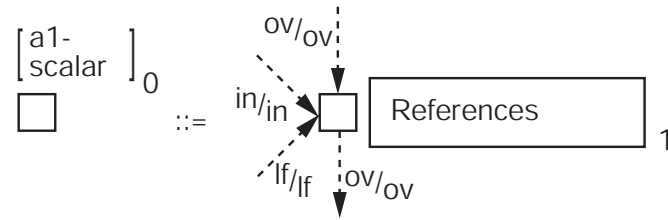
Production A1-13



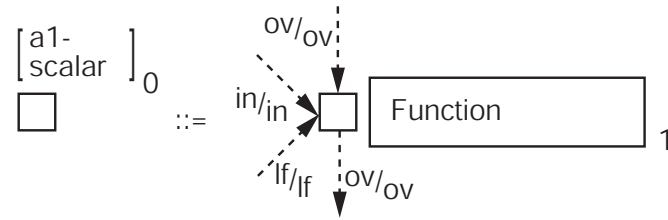
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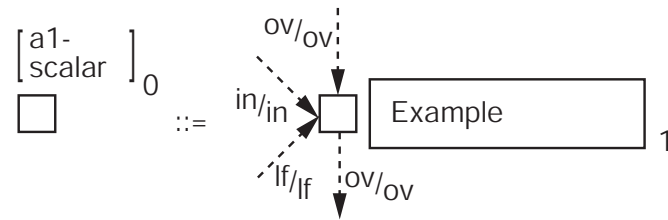
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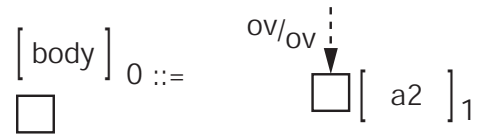
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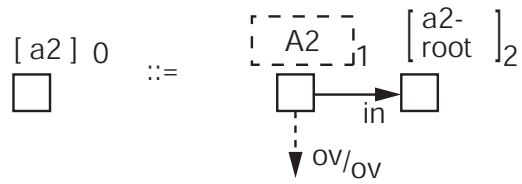
Production A1-17



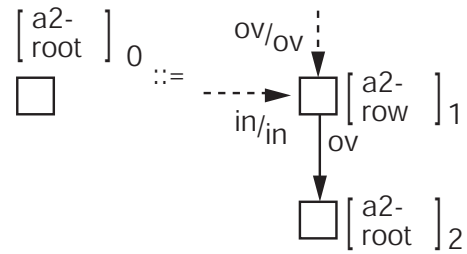
Production A2-0



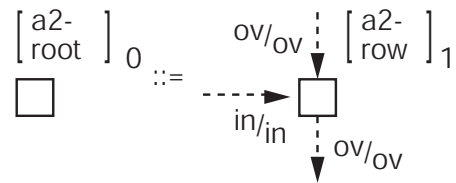
Production A2-1



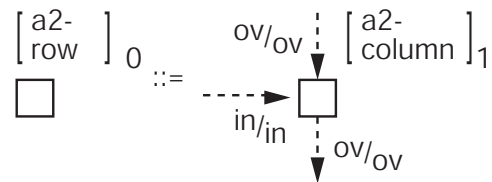
Production A2-2



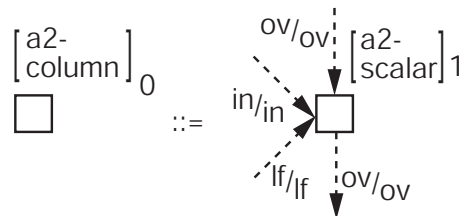
Production A2-3



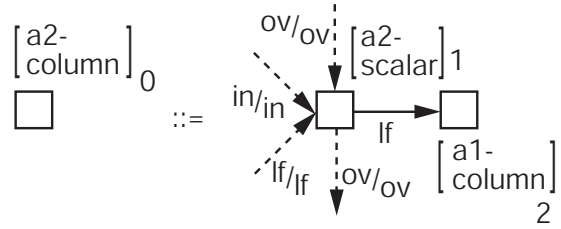
Production A2-4



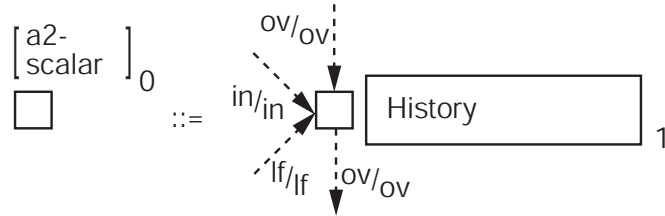
Production A2-5



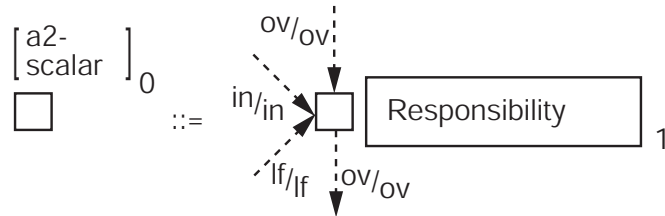
Production A2-6



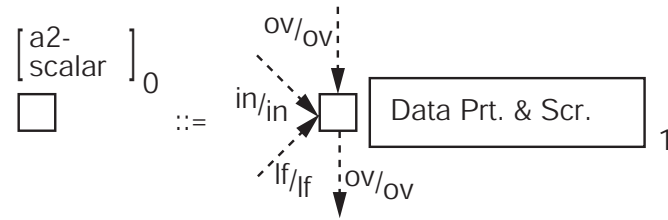
Production A2-7



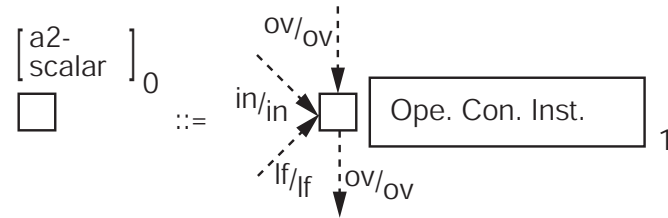
Production A2-8



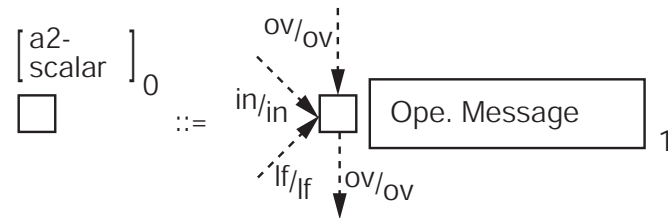
Production A2-9



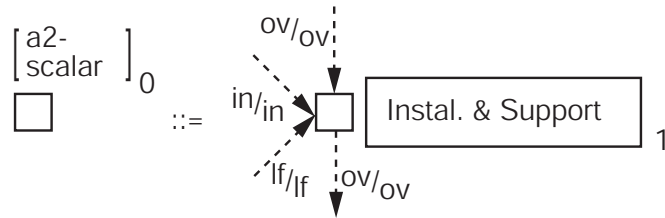
Production A2-10



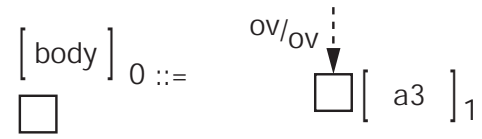
Production A2-11



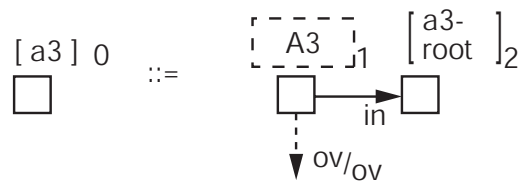
Production A2-12



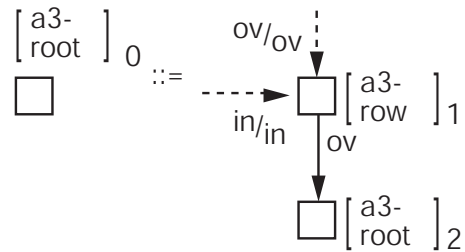
Production A3-0



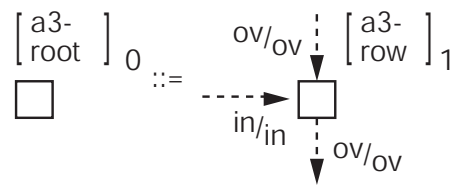
Production A3-1



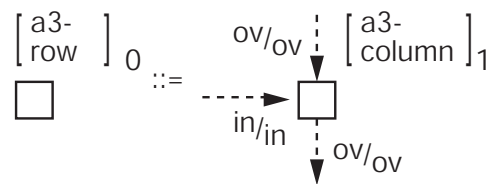
Production A3-2



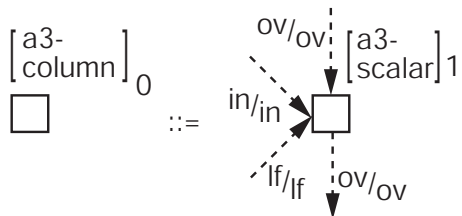
Production A3-3



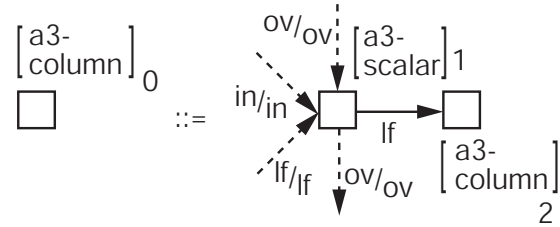
Production A3-4



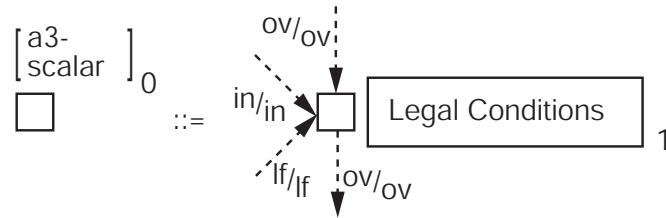
Production A3-5



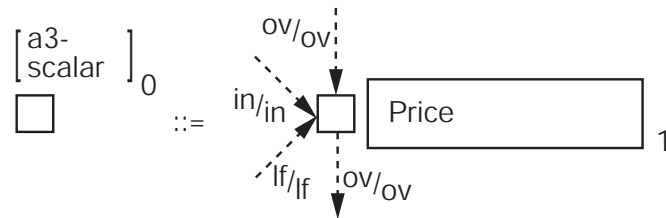
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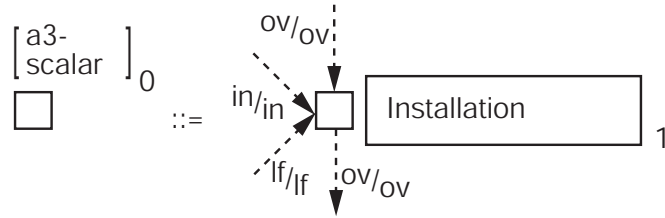
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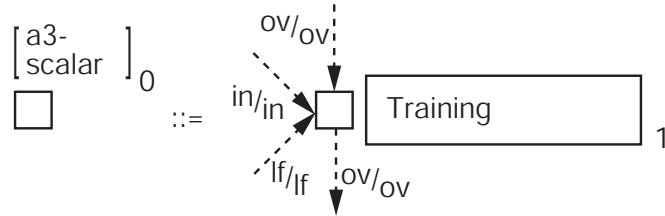
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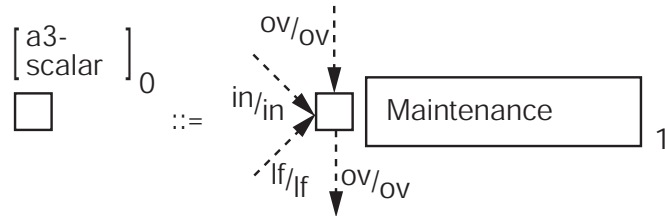
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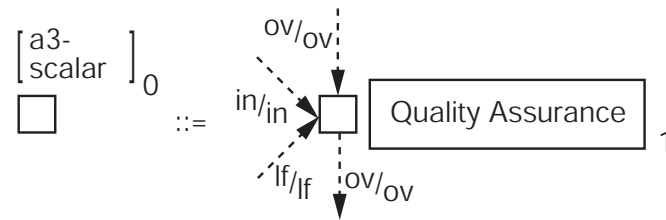
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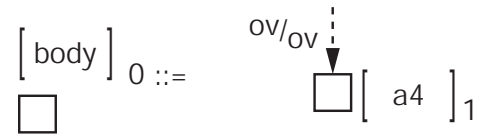
Production A3-11



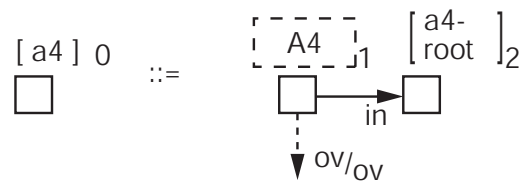
Production A3-12



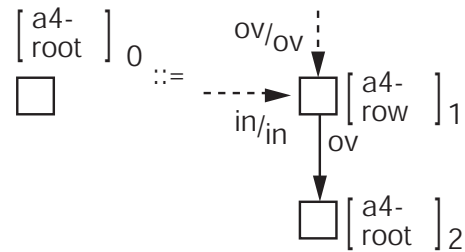
Production A4-0



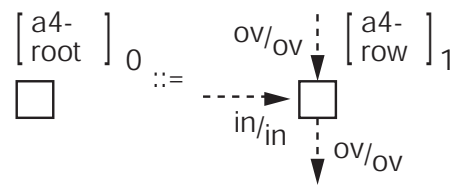
Production A4-1



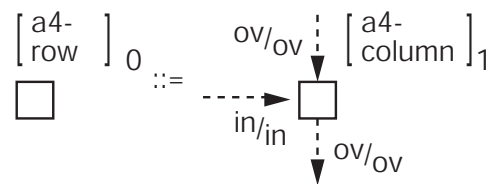
Production A4-2



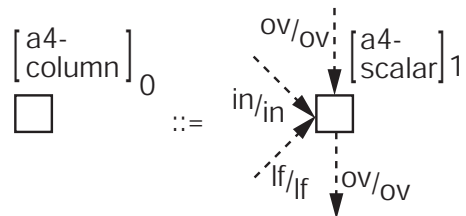
Production A4-3



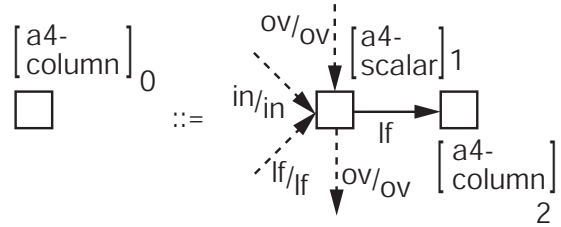
Production A4-4



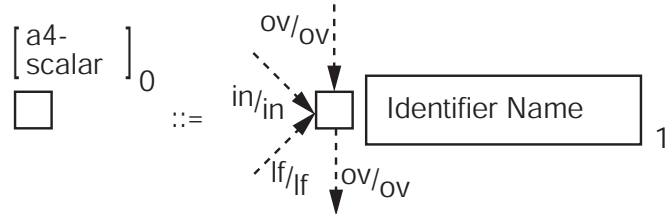
Production A4-5



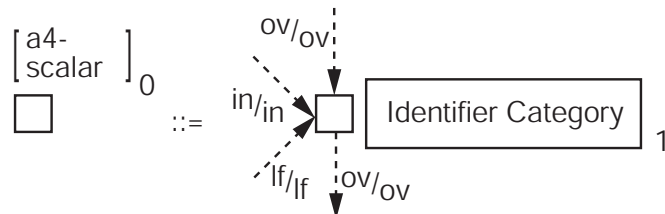
Production A4-6



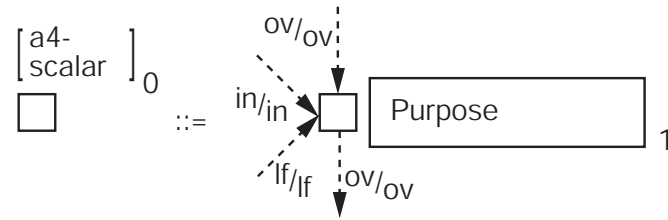
Production A4-7



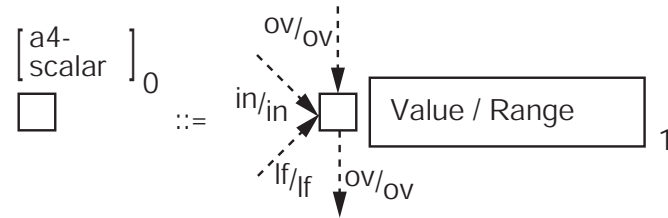
Production A4-8



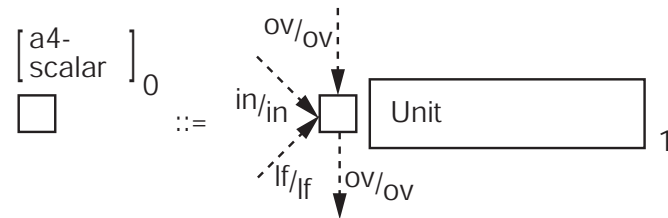
Production A4-9



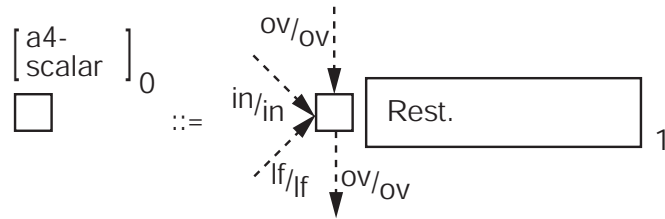
Production A4-10



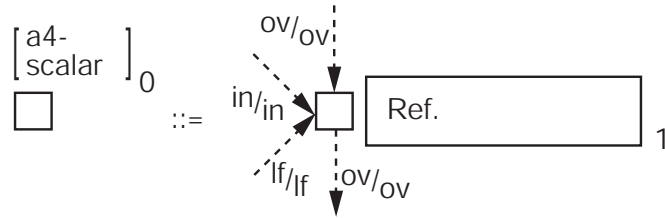
Production A4-11



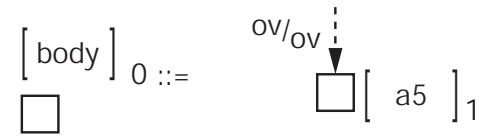
Production A4-12



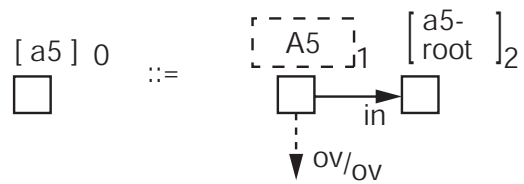
Production A4-13



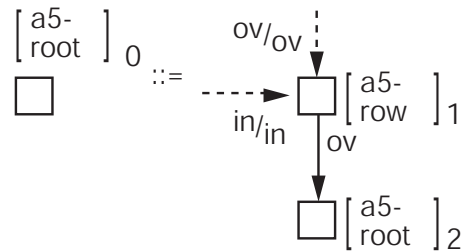
Production A5-0



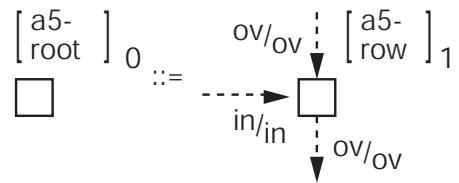
Production A5-1



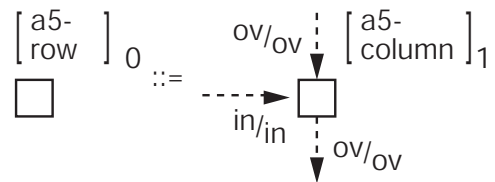
Production A5-2



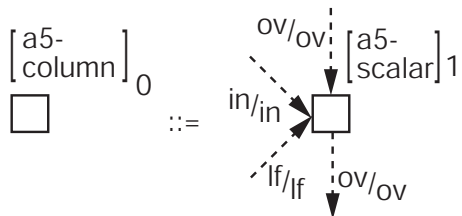
Production A5-3



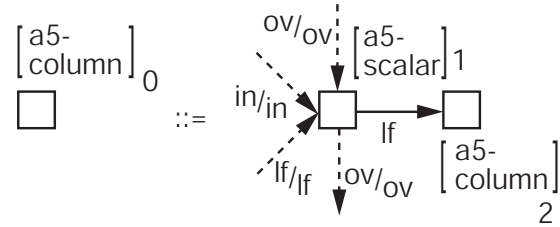
Production A5-4



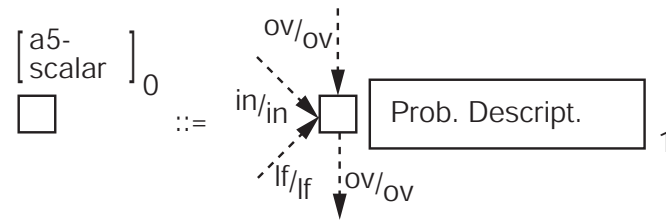
Production A5-5



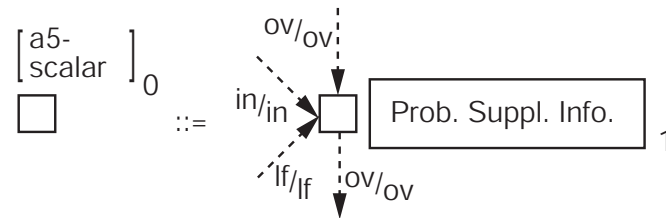
Production A5-6



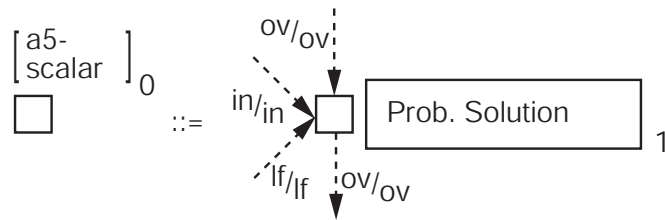
Production A5-7



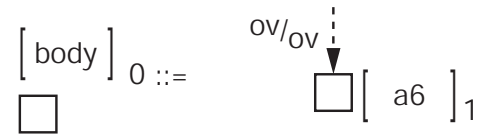
Production A5-8



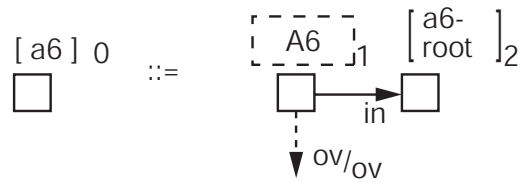
Production A5-9



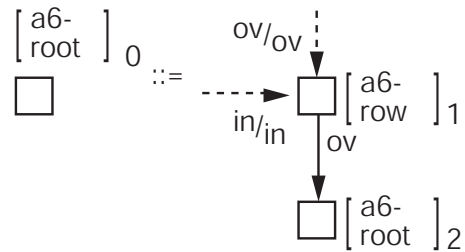
Production A6-0



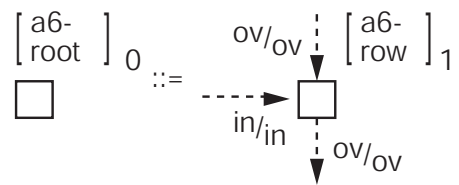
Production A6-1



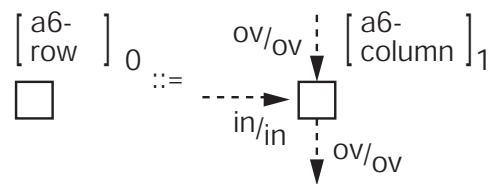
Production A6-2



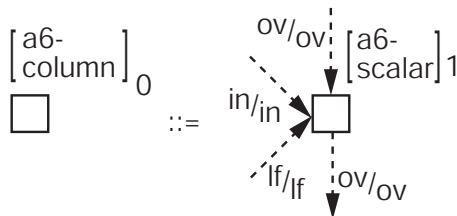
Production A6-3



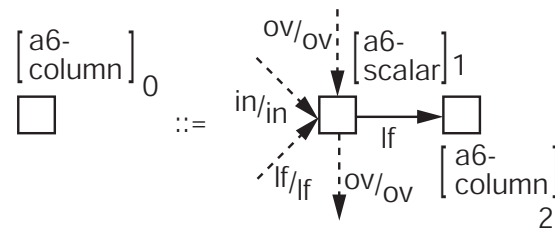
Production A6-4



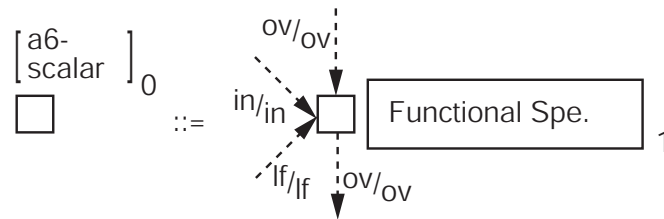
Production A6-5



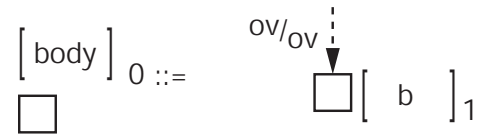
Production A6-6



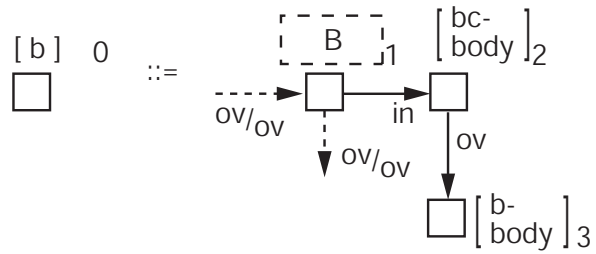
Production A6-7



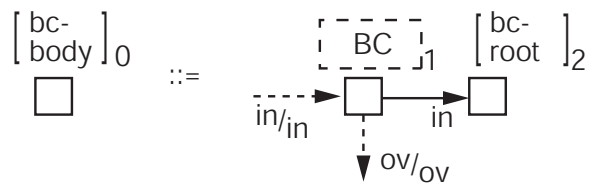
Production B-1



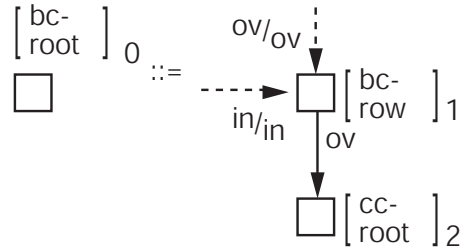
Production B-2



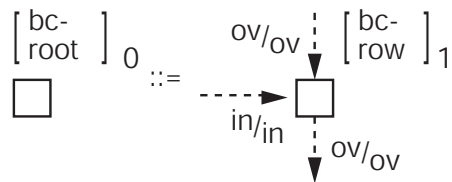
Production BC-1



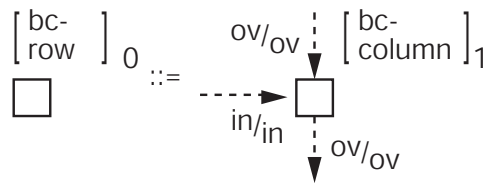
Production BC-2



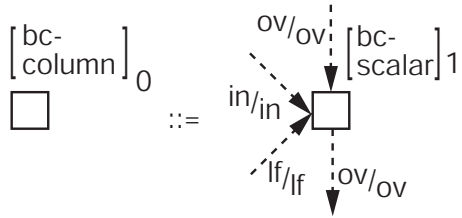
Production BC-3



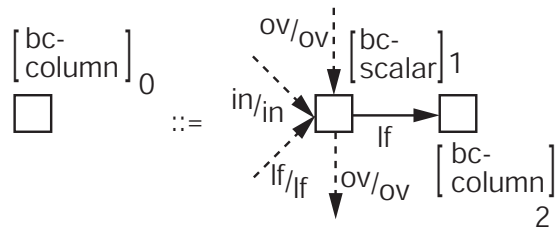
Production BC-4



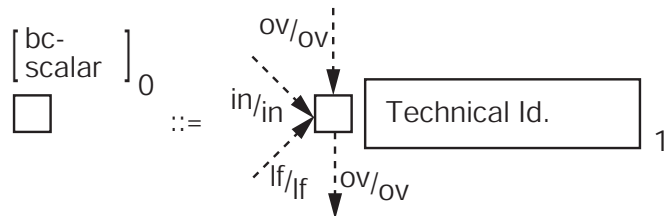
Production BC-5



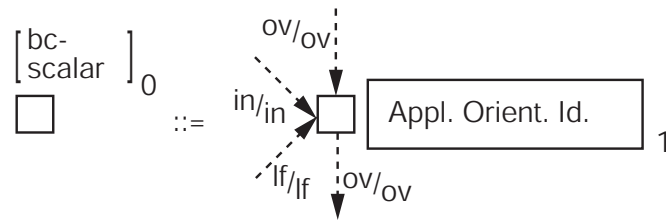
Production BC-6



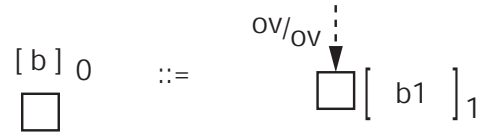
Production BC-7



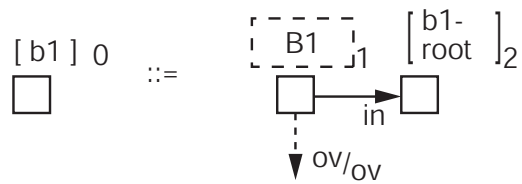
Production BC-8



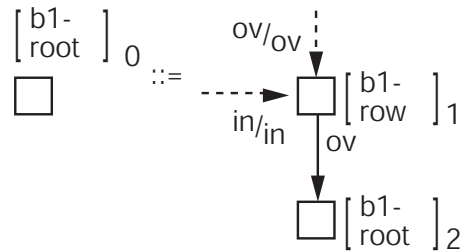
Production B1-0



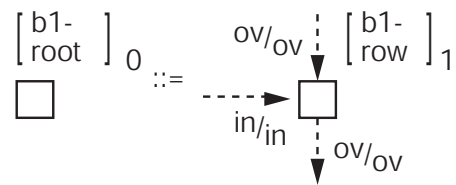
Production B1-1



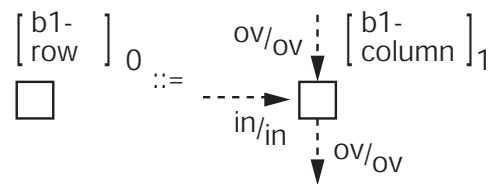
Production B1-2



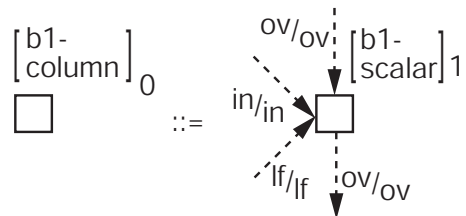
Production B1-3



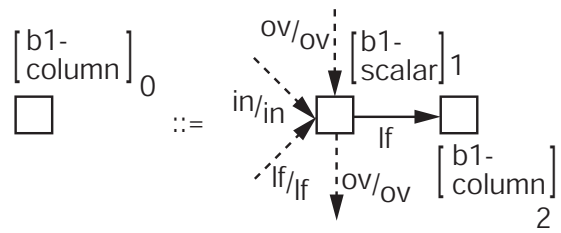
Production B1-4



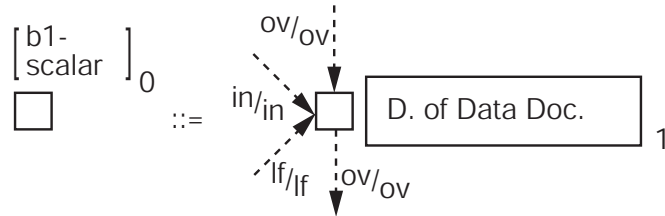
Production B1-5



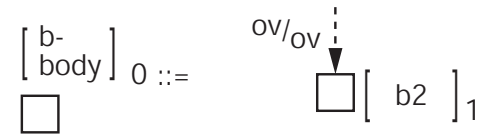
Production B1-6



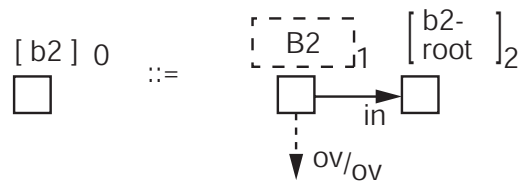
Production B1-7



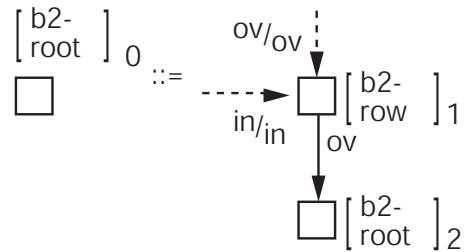
Production B2-0



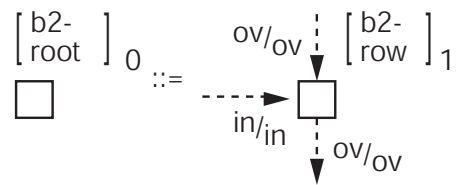
Production B2-1



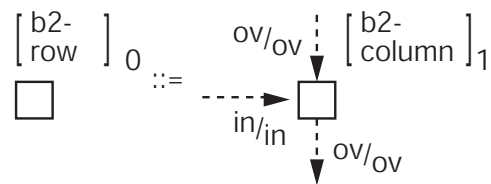
Production B2-2



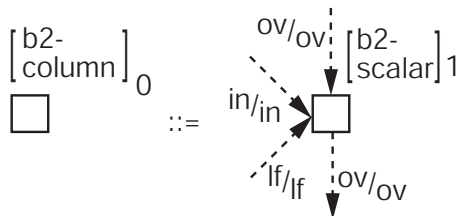
Production B2-3



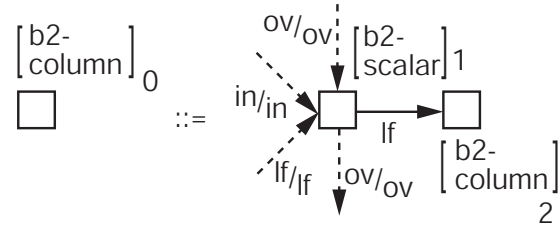
Production B2-4



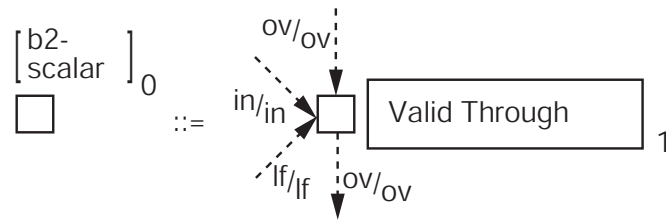
Production B2-5



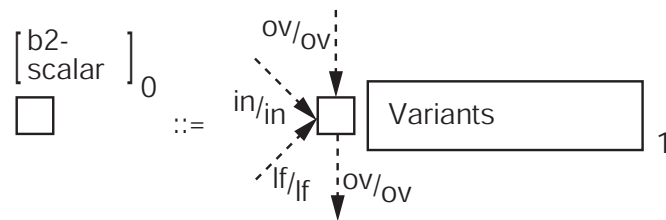
Production B2-6



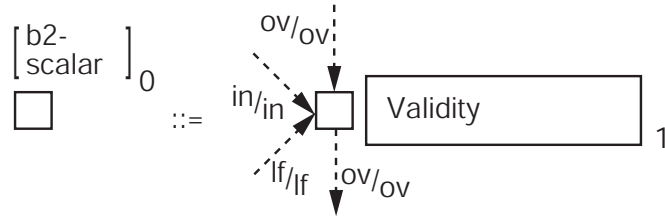
Production B2-7



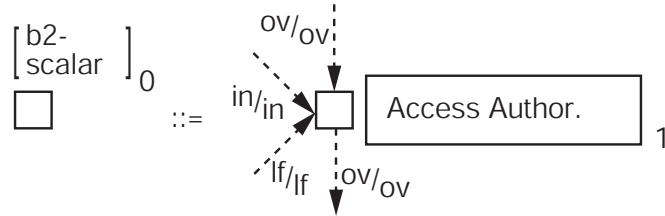
Production B2-8



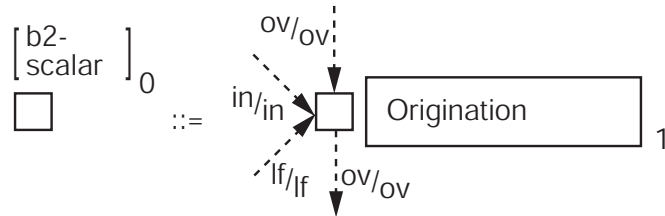
Production B2-9



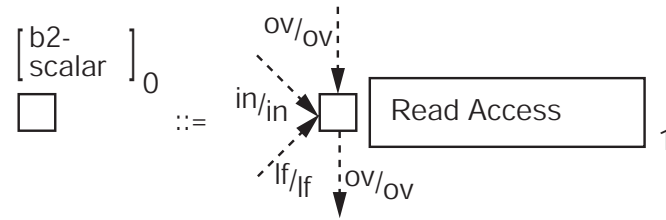
Production B2-10



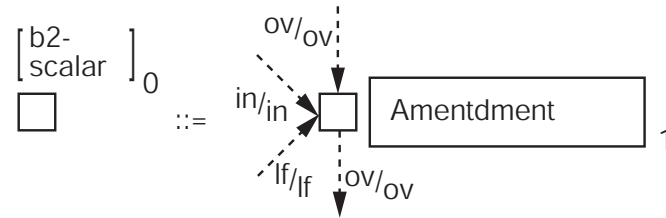
Production B2-11



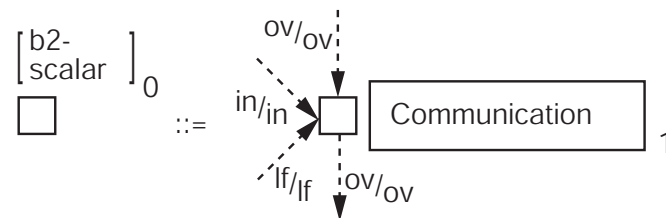
Production B2-12



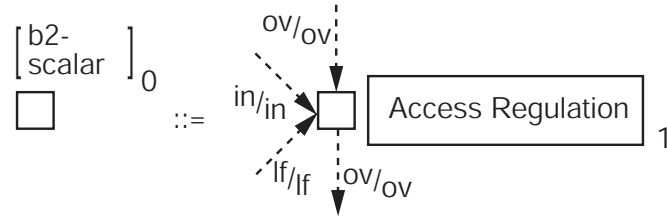
Production B2-13



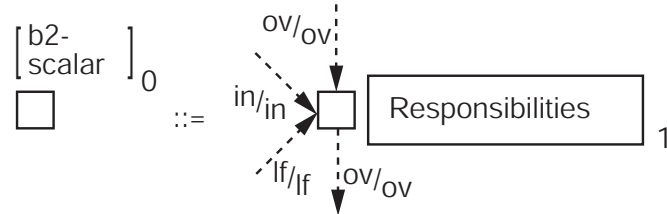
Production B2-14



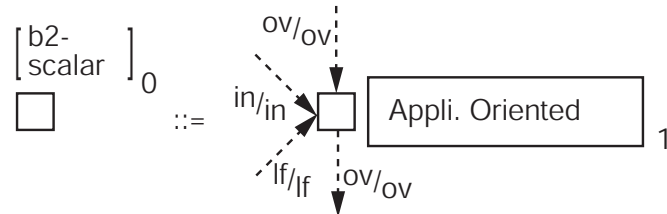
Production B2-15



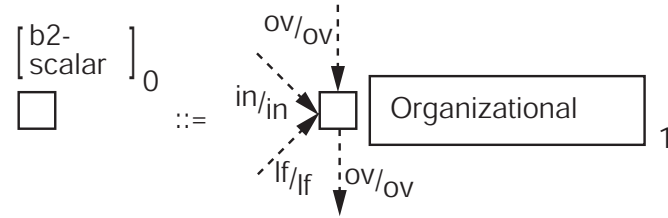
Production B2-16



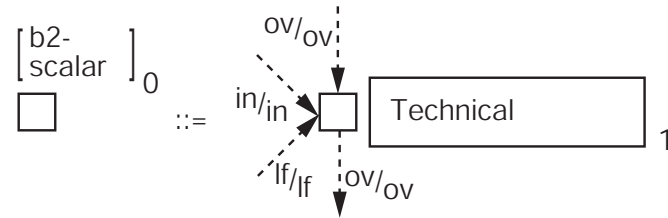
Production B2-17



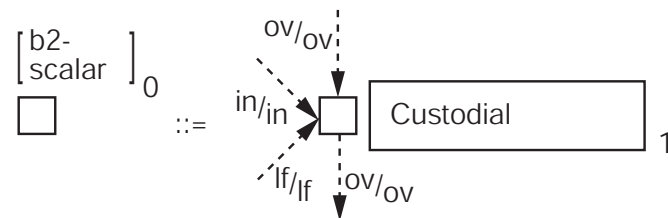
Production B2-18



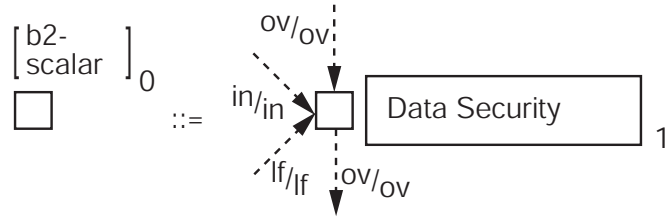
Production B2-19



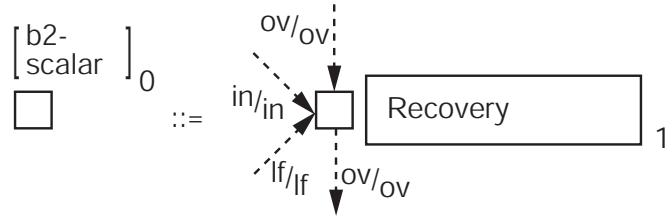
Production B2-20



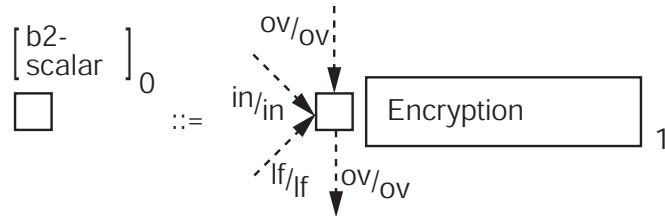
Production B2-21



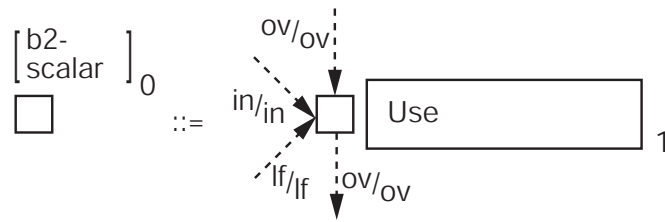
Production B2-22



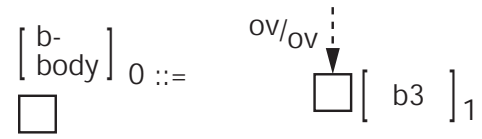
Production B2-23



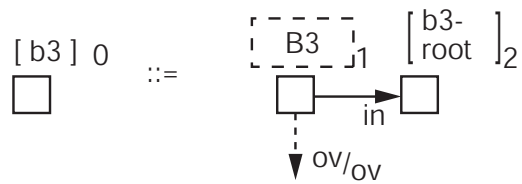
Production B2-24



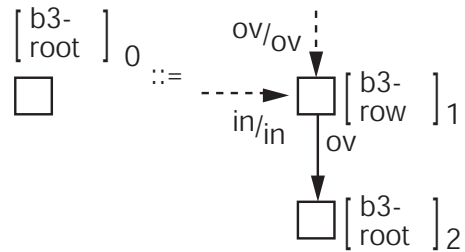
Production B3-0



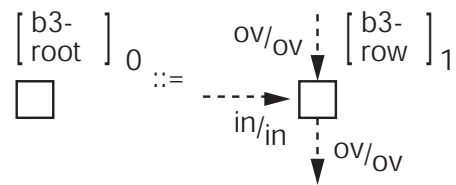
Production B3-1



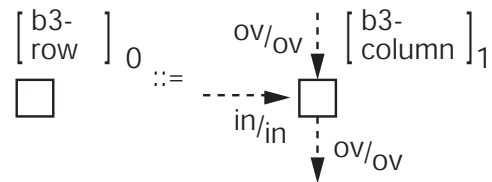
Production B3-2



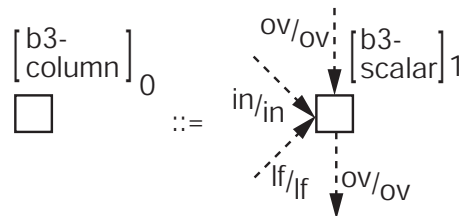
Production B3-3



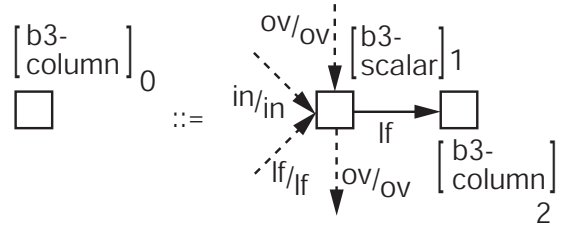
Production B3-4



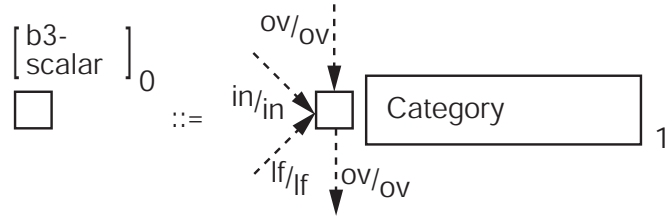
Production B3-5



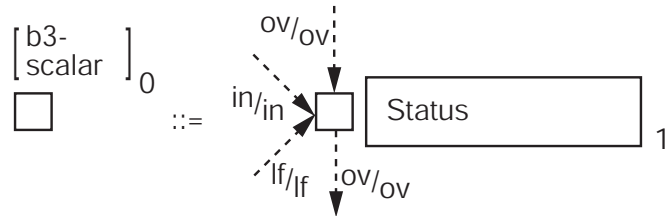
Production B3-6



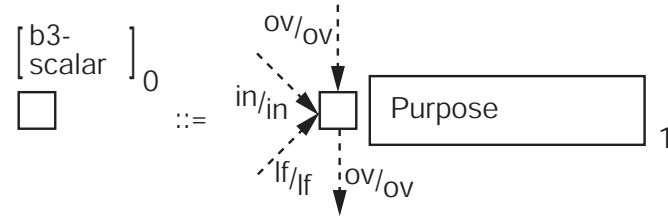
Production B3-7



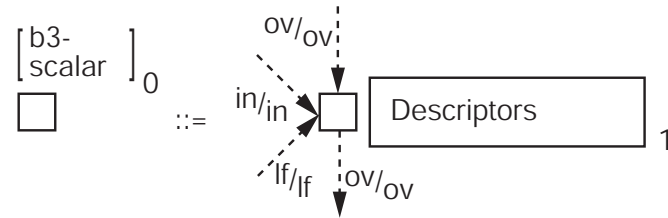
Production B3-8



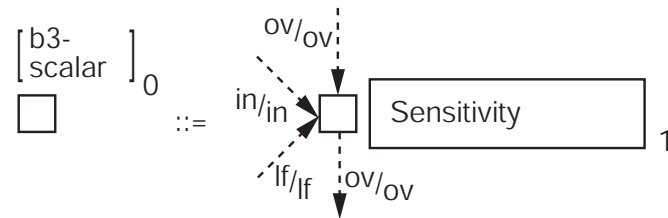
Production B3-9



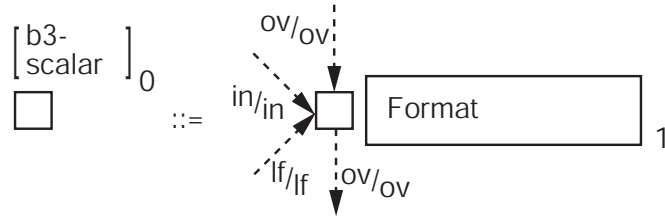
Production B3-10



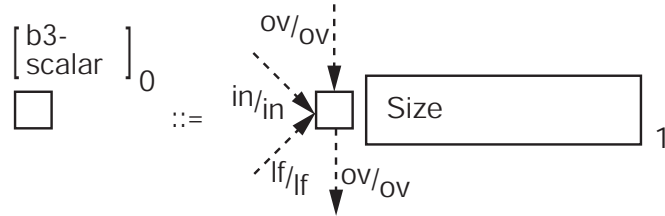
Production B3-11



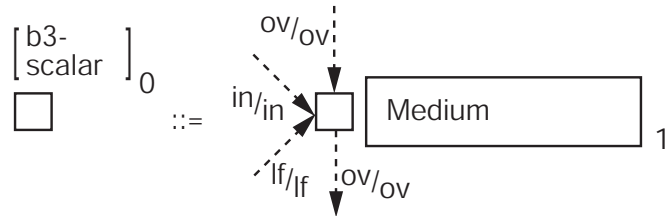
Production B3-12



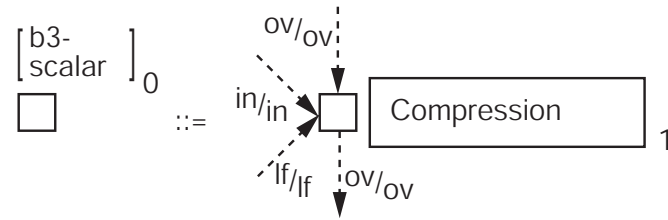
Production B3-13



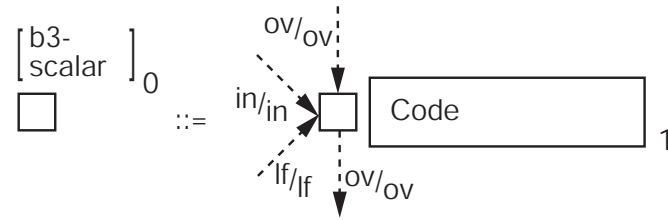
Production B3-14



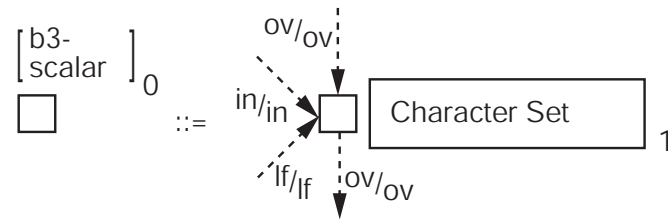
Production B3-15



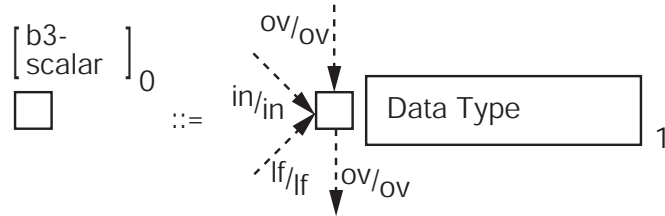
Production B3-16



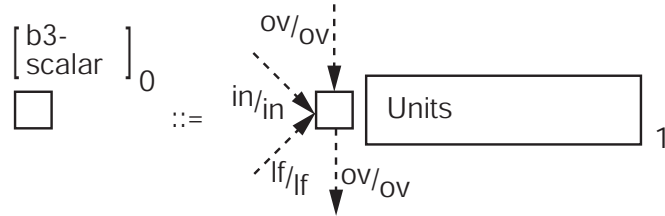
Production B3-17



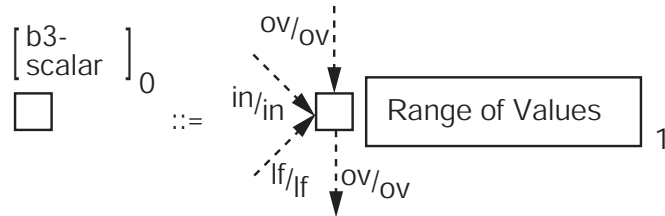
Production B3-18



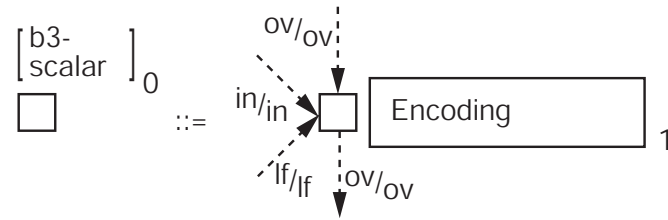
Production B3-19



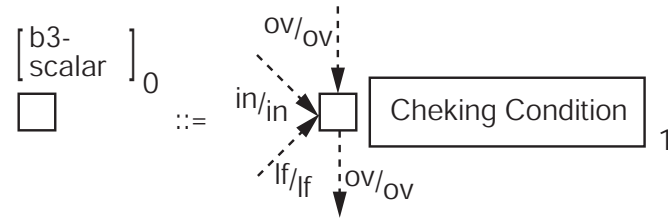
Production B3-20



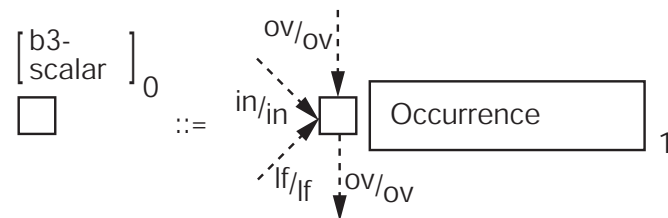
Production B3-21



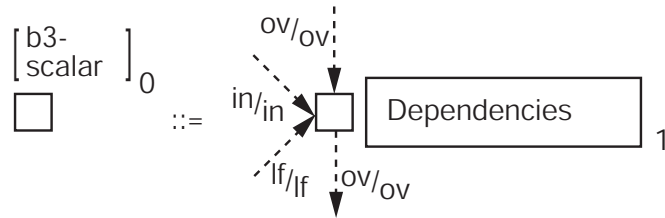
Production B3-22



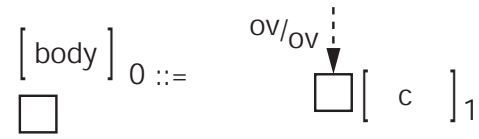
Production B3-23



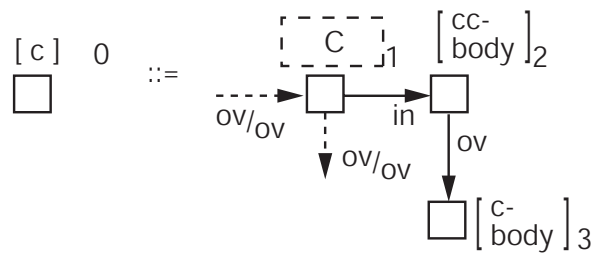
Production B3-24



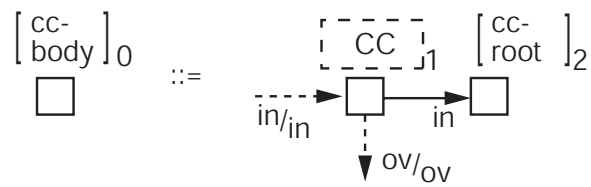
Production C-1



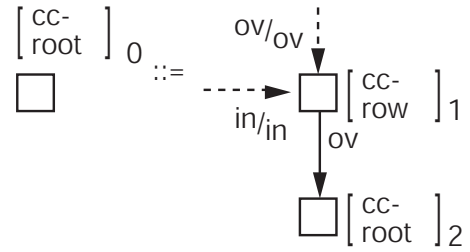
Production C-2



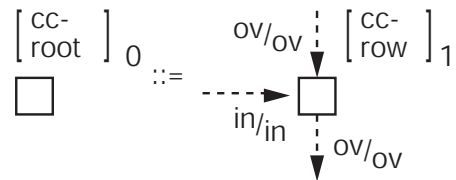
Production CC-1



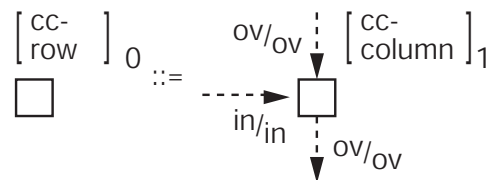
Production CC-2



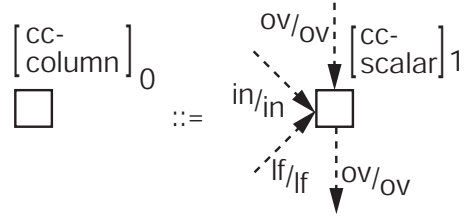
Production CC-3



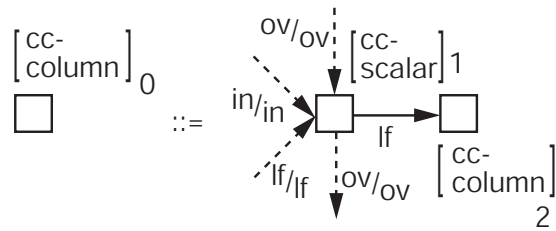
Production CC-4



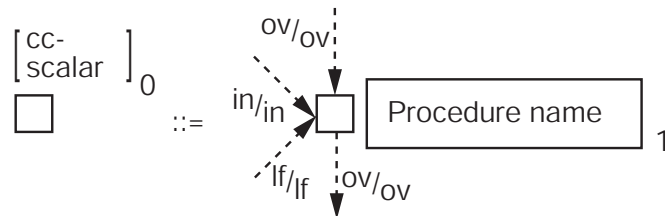
Production CC-5



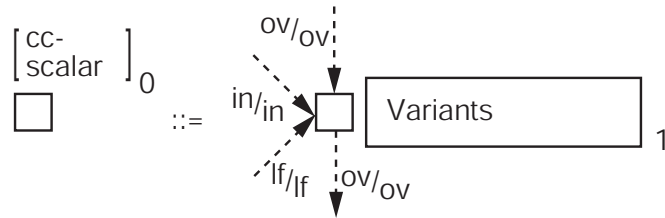
Production CC-6



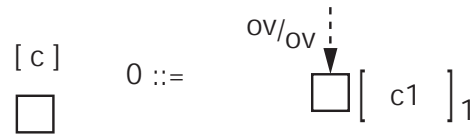
Production CC-7



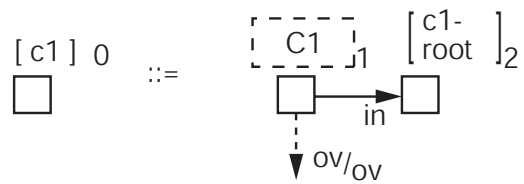
Production CC-8



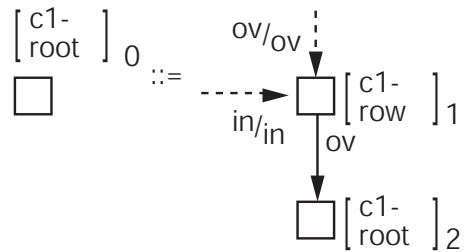
Production C1-0



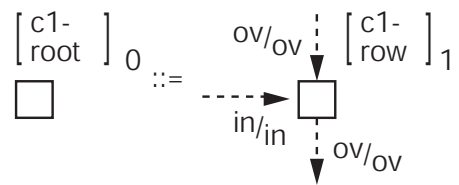
Production C1-1



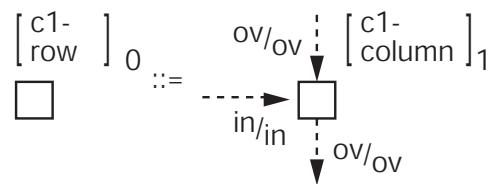
Production C1-2



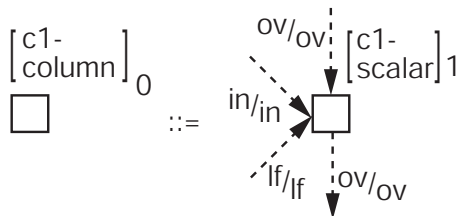
Production C1-3



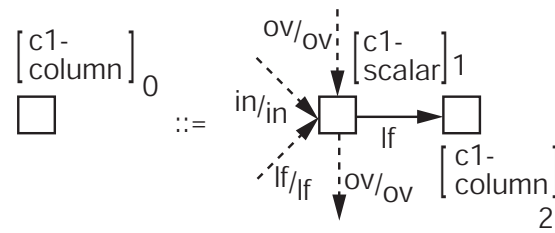
Production C1-4



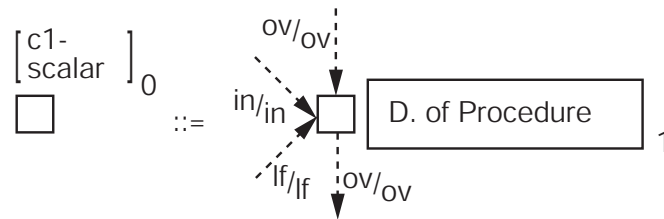
Production C1-5



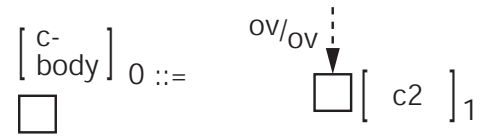
Production C1-6



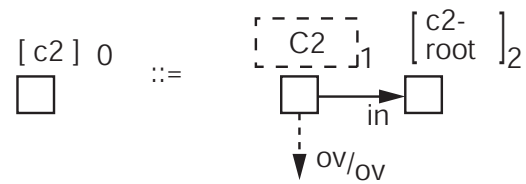
Production C1-7



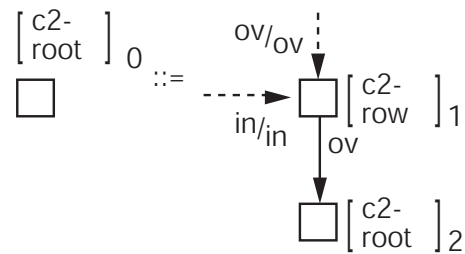
Production C2-0



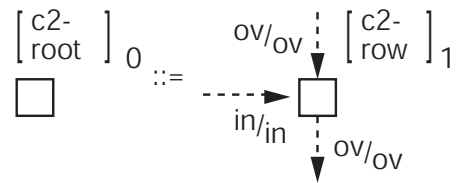
Production C2-1



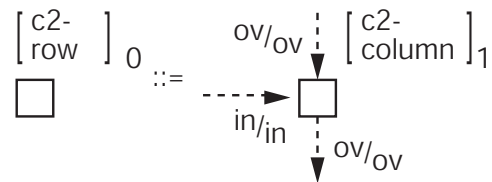
Production C2-2



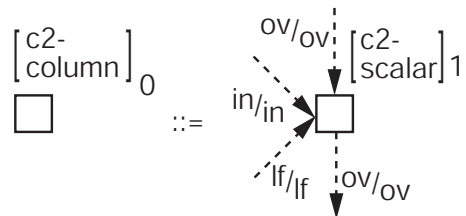
Production C2-3



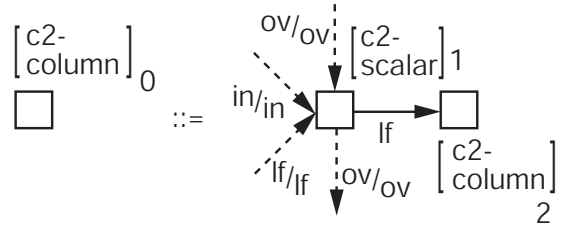
Production C2-4



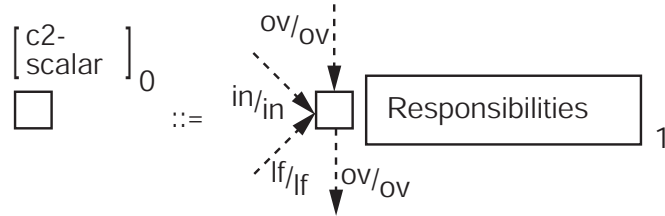
Production C2-5



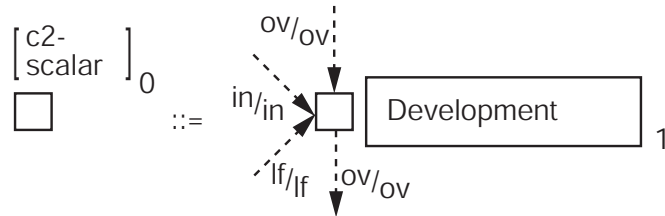
Production C2-6



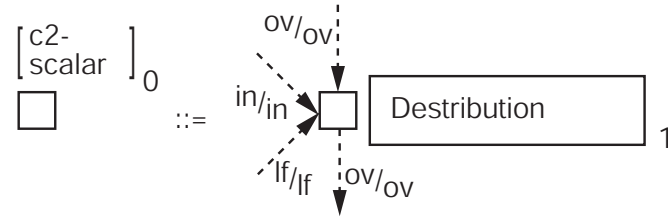
Production C2-7



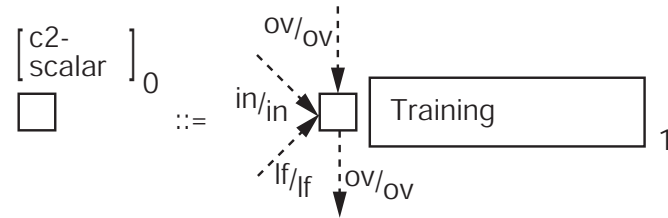
Production C2-8



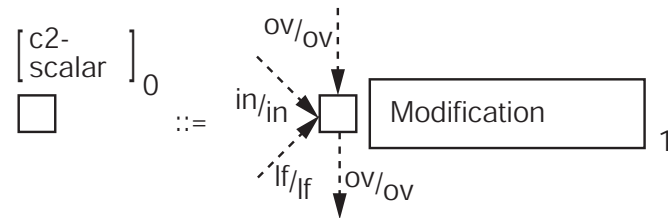
Production C2-9



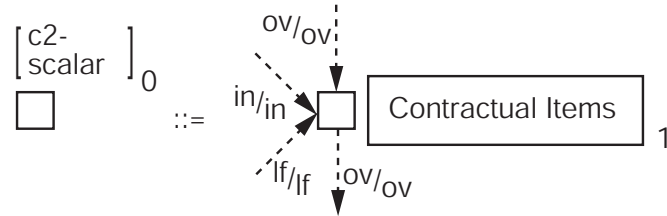
Production C2-10



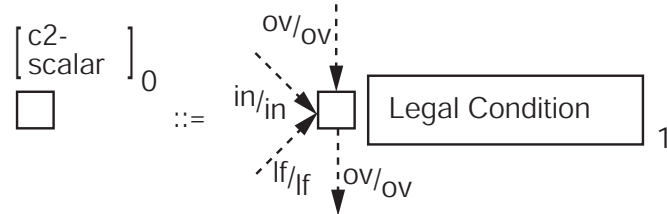
Production C2-11



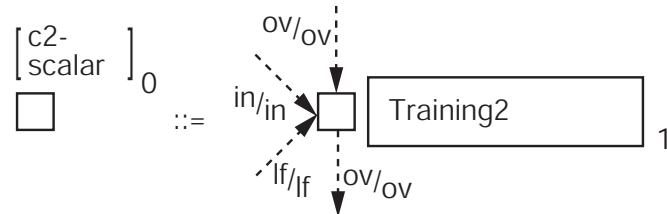
Production C2-12



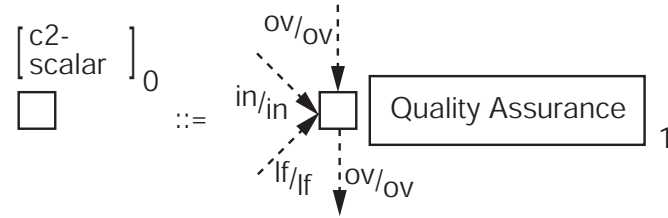
Production C2-13



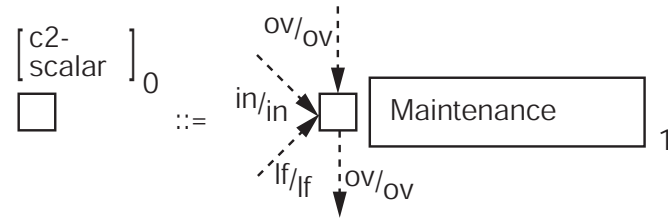
Production C2-14



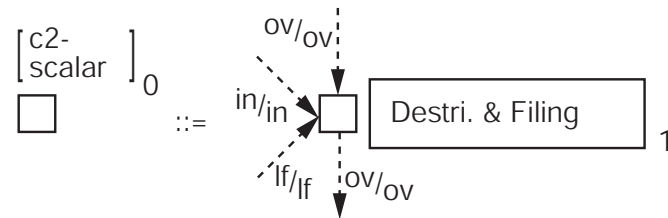
Production C2-15



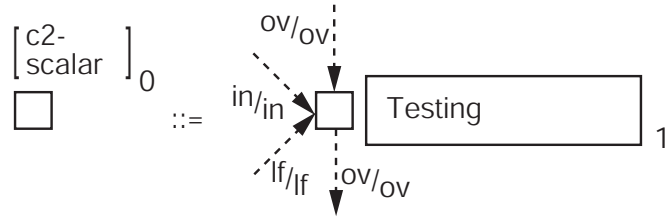
Production C2-16



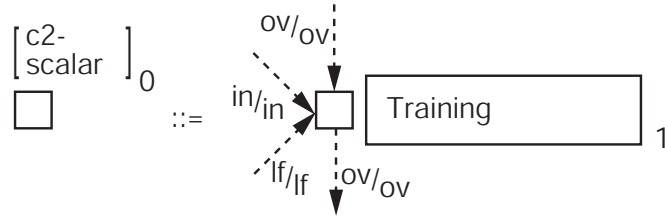
Production C2-17



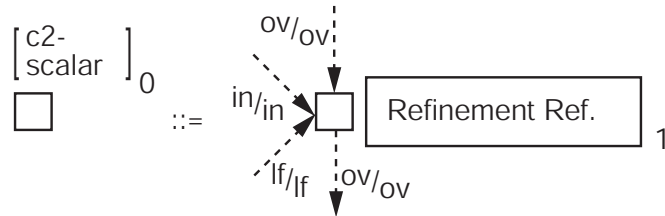
Production C2-18



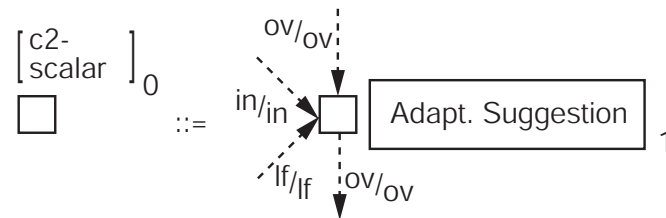
Production C2-19



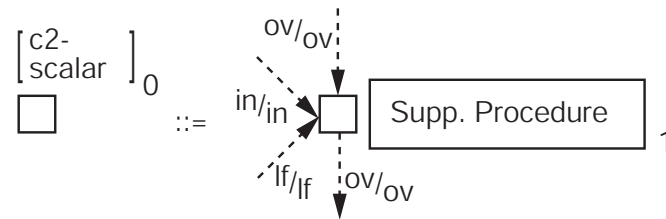
Production C2-20



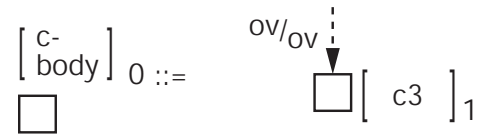
Production C2-21



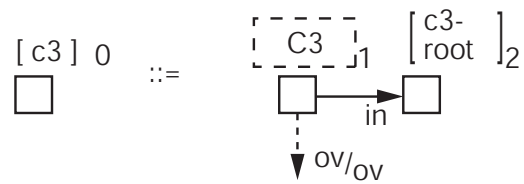
Production C2-22



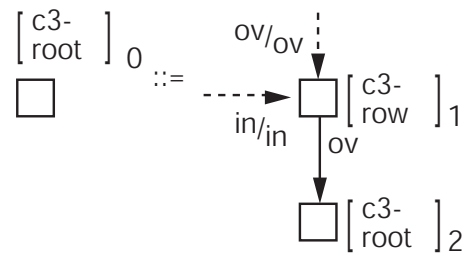
Production C3-0



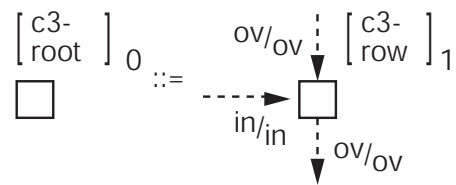
Production C3-1



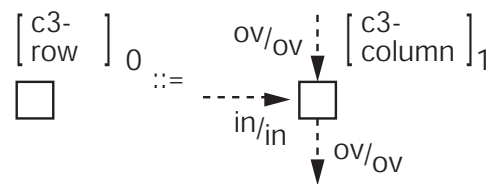
Production C3-2



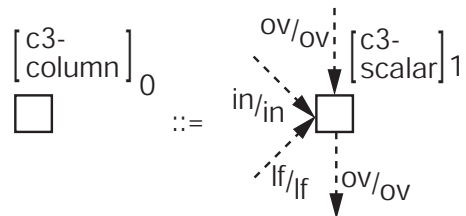
Production C3-3



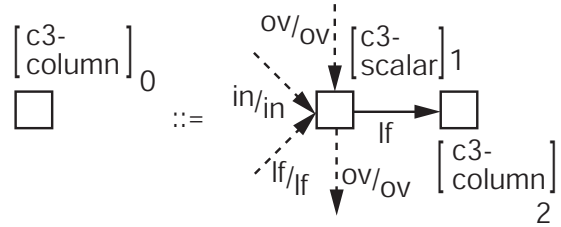
Production C3-4



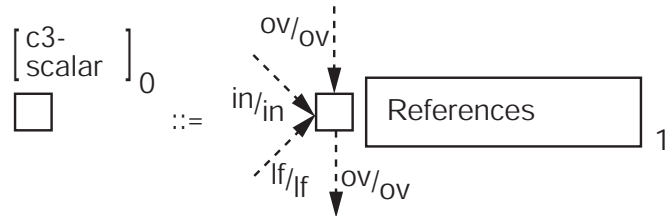
Production C3-5



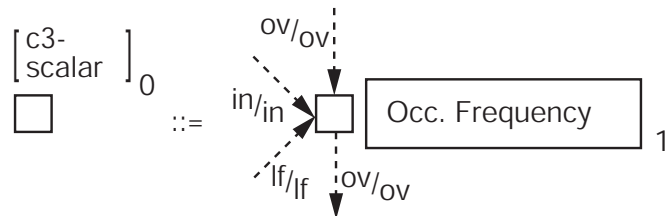
Production C3-6



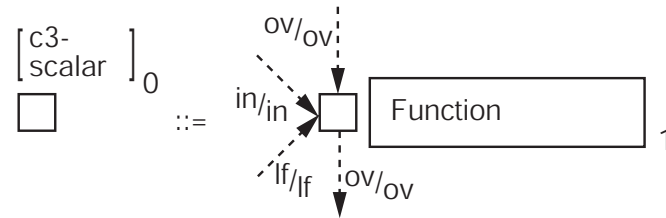
Production C3-7



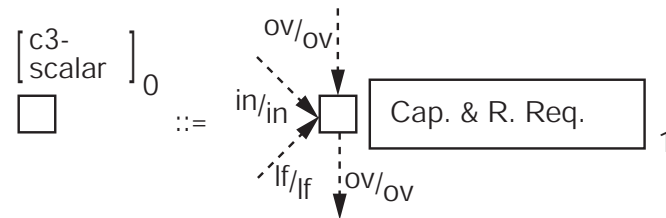
Production C3-8



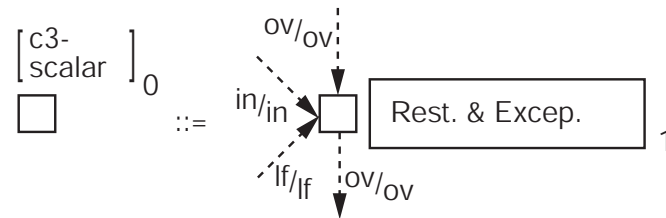
Production C3-9



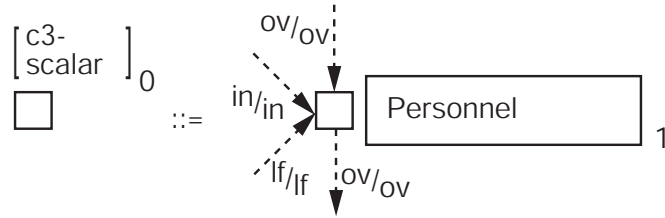
Production C3-10



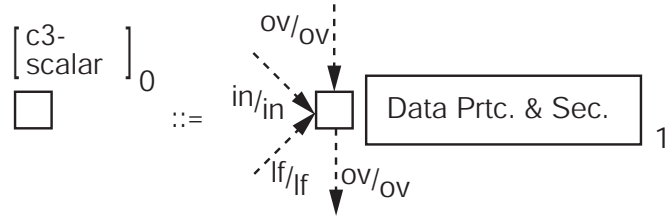
Production C3-11



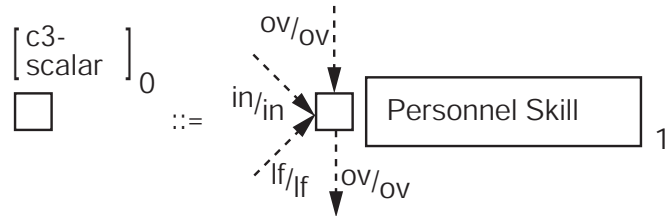
Production C3-12



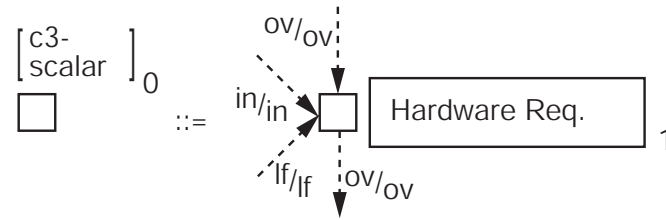
Production C3-13



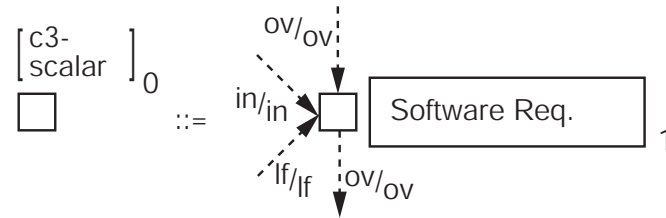
Production C3-14



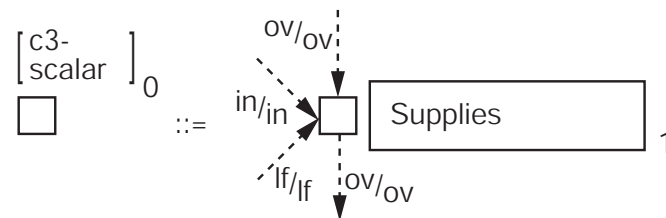
Production C3-15



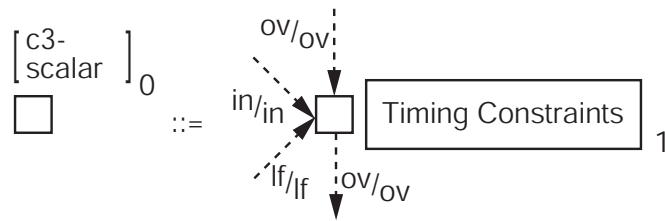
Production C3-16



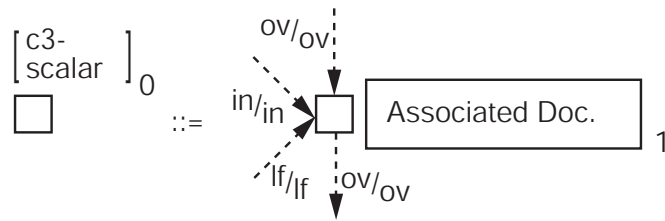
Production C3-17



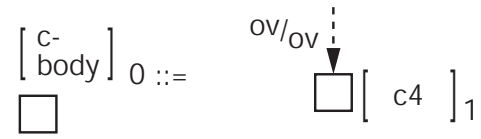
Production C3-18



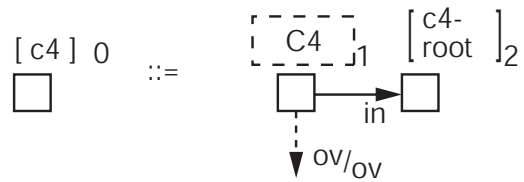
Production C3-19



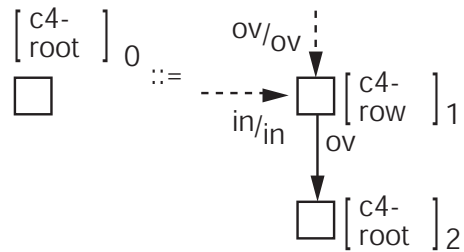
Production C4-0



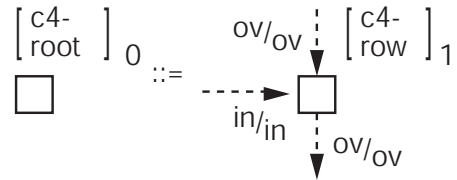
Production C4-1



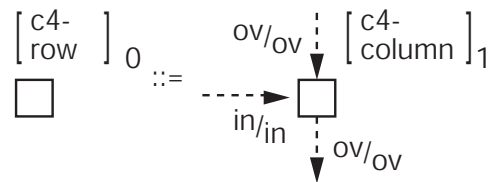
Production C4-2



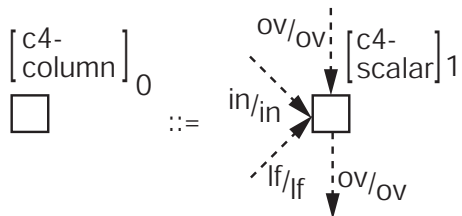
Production C4-3



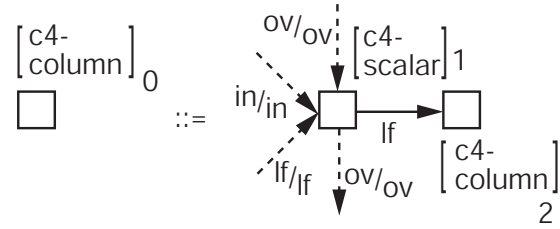
Production C4-4



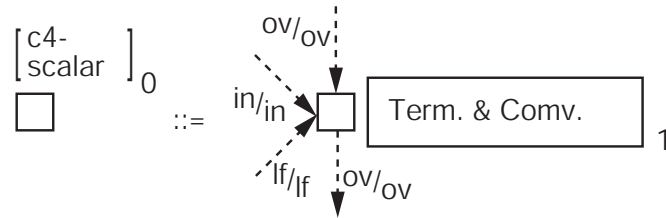
Production C4-5



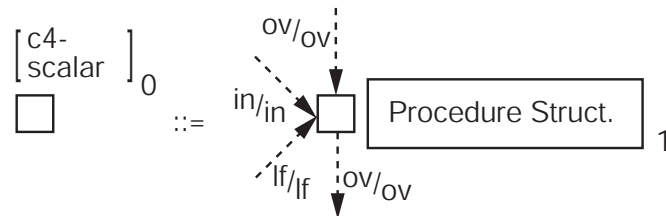
Production C4-6



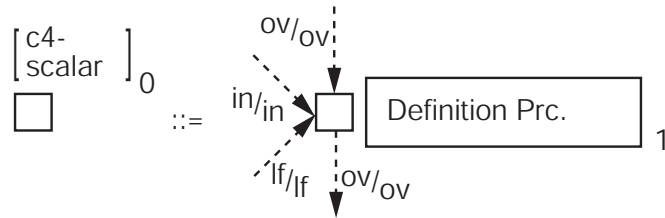
Production C4-7



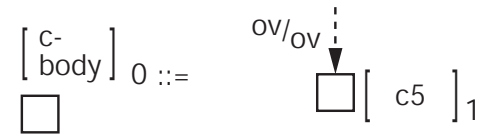
Production C4-8



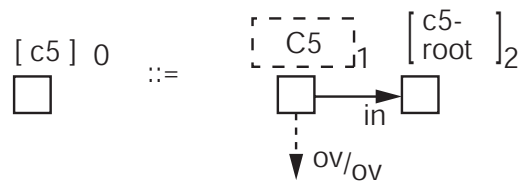
Production C4-9



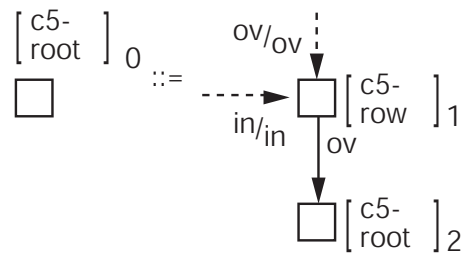
Production C5-0



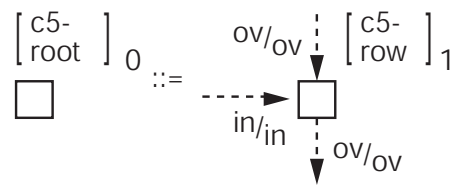
Production C5-1



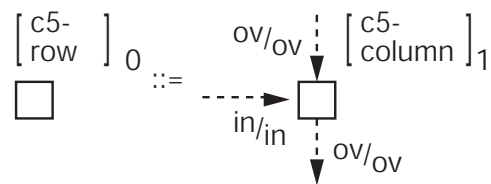
Production C5-2



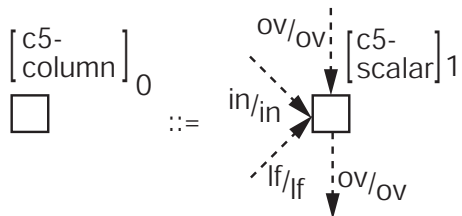
Production C5-3



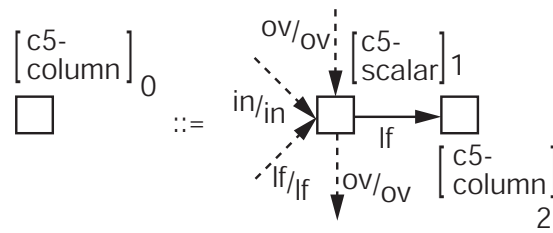
Production C5-4



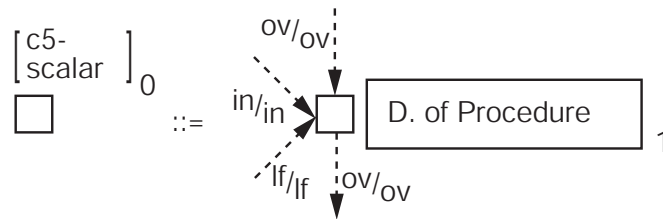
Production C5-5



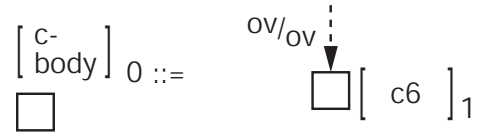
Production C5-6



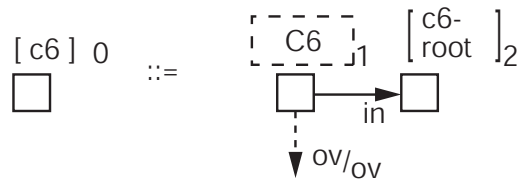
Production C5-7



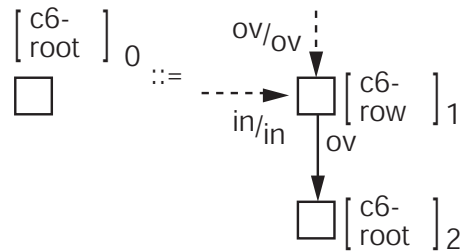
Production C6-0



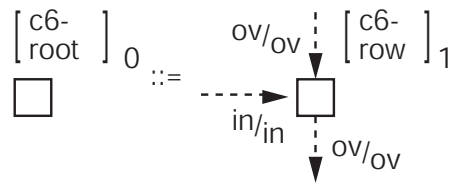
Production C6-1



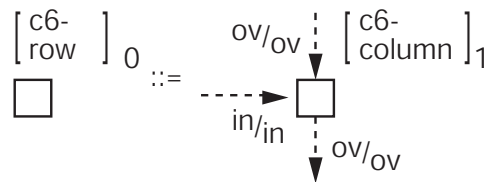
Production C6-2



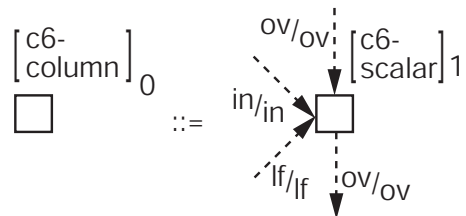
Production C6-3



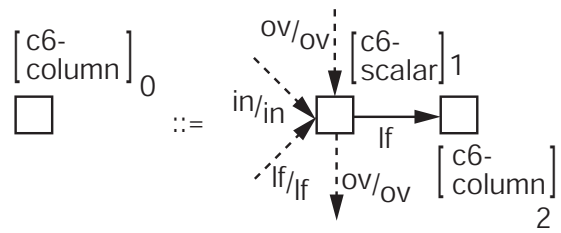
Production C6-4



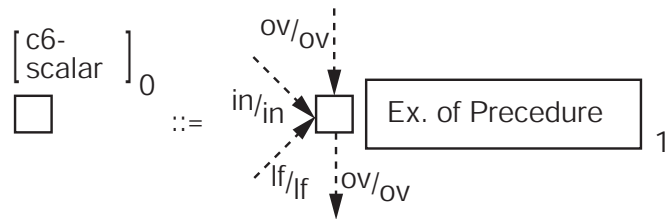
Production C6-5



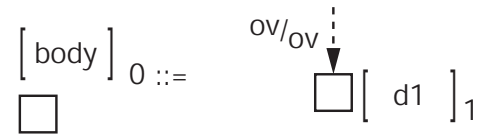
Production C6-6



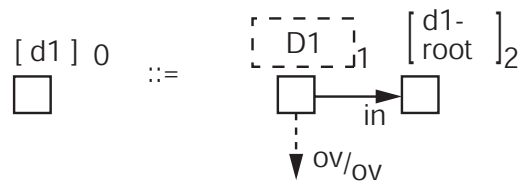
Production C6-7



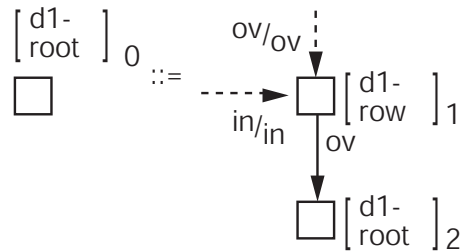
Production D1-0



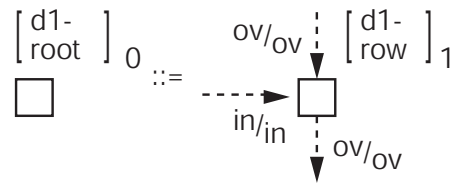
Production D1-1



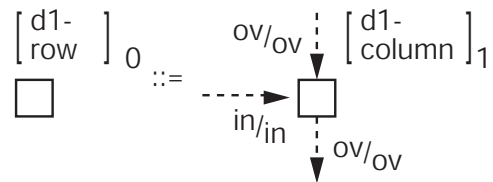
Production D1-2



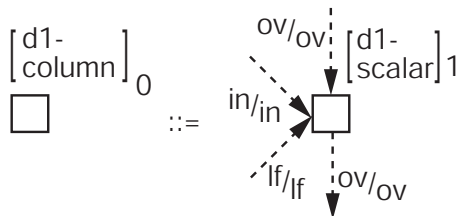
Production D1-3



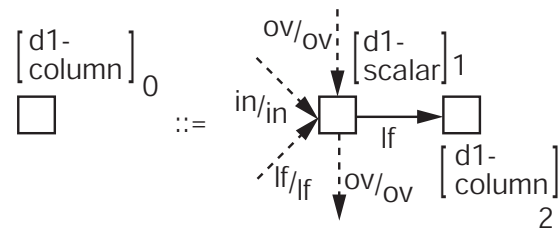
Production D1-4



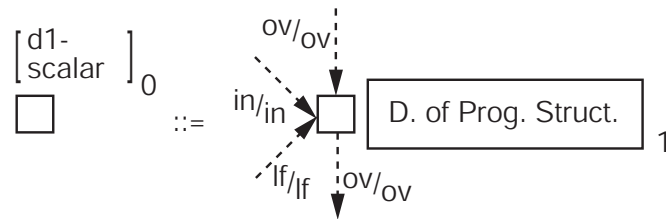
Production D1-5



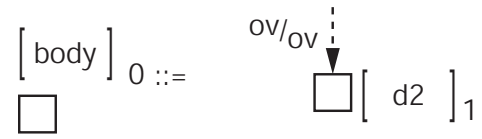
Production D1-6



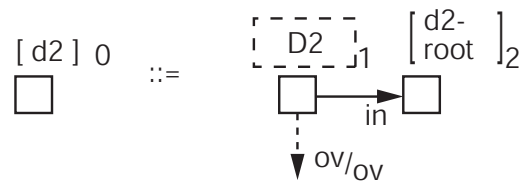
Production D1-7



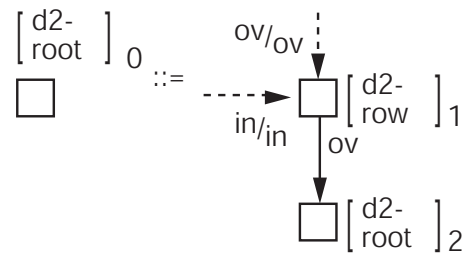
Production D2-0



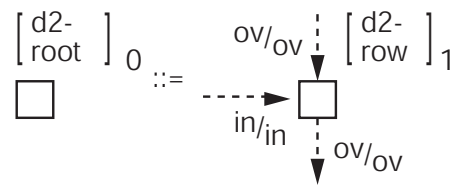
Production D2-1



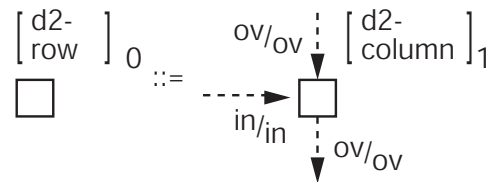
Production D2-2



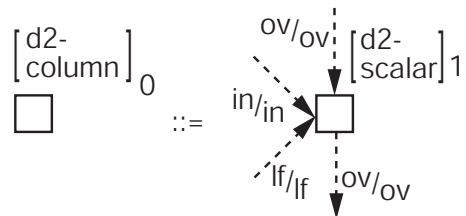
Production D2-3



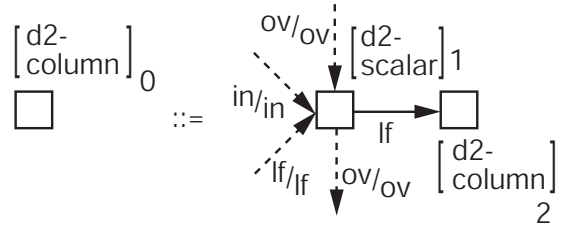
Production D2-4



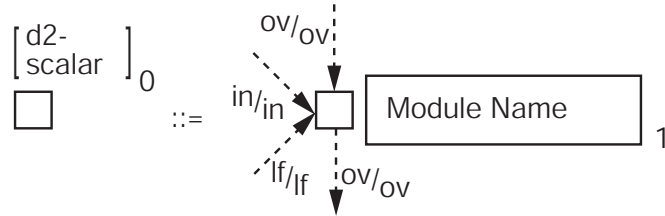
Production D2-5



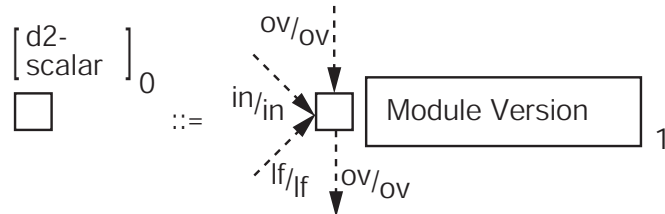
Production D2-6



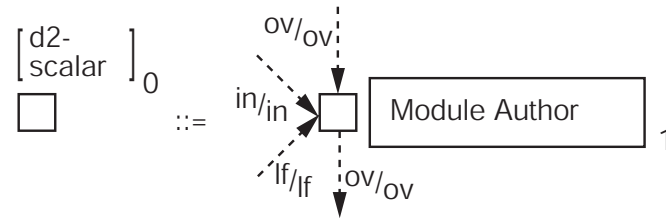
Production D2-7



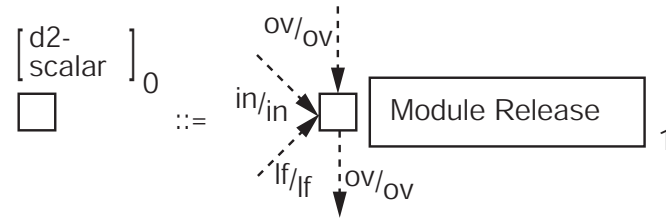
Production D2-8



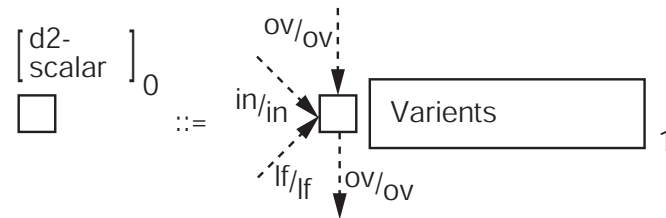
Production D2-9



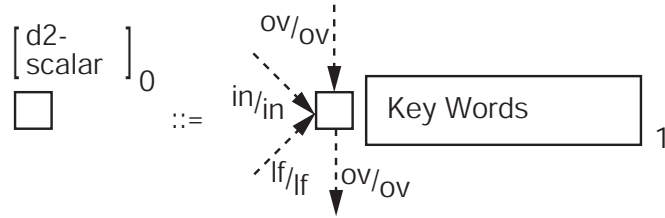
Production D2-10



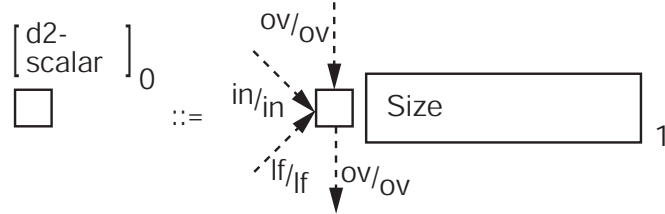
Production D2-11



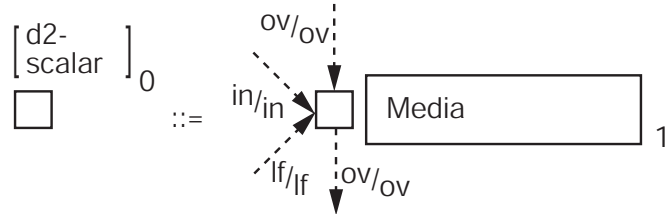
Production D2-12



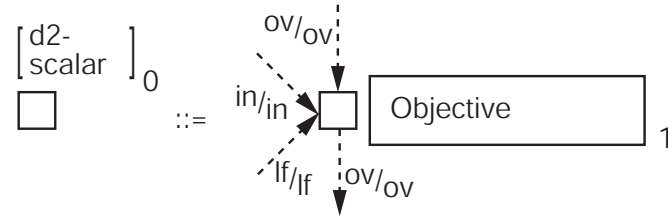
Production D2-13



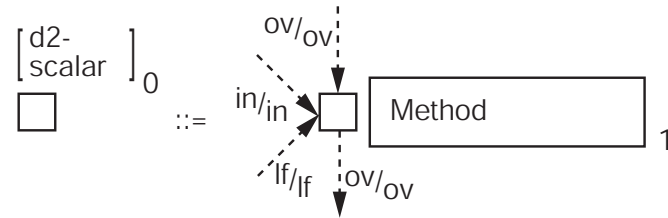
Production D2-14



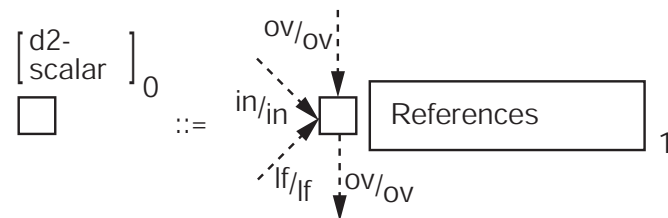
Production D2-15



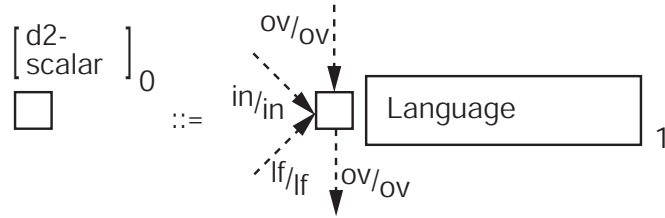
Production D2-16



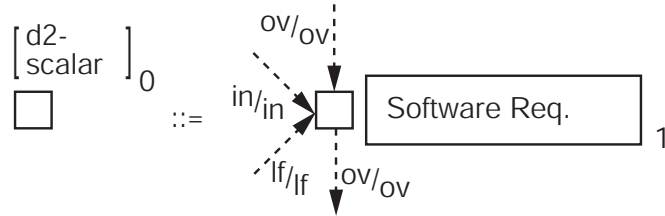
Production D2-17



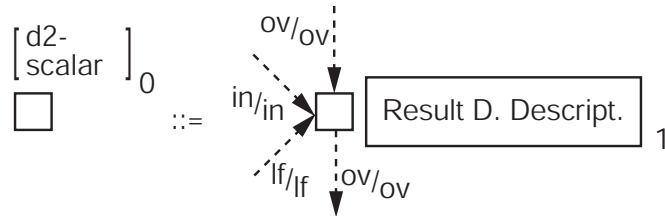
Production D2-18



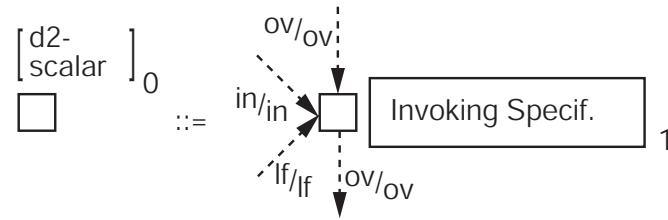
Production D2-19



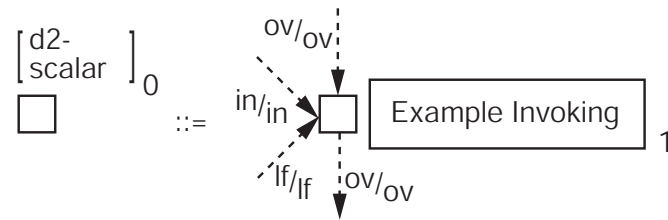
Production D2-20



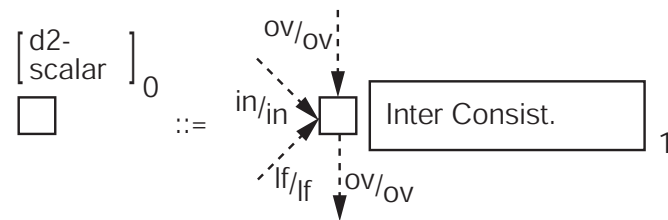
Production D2-21



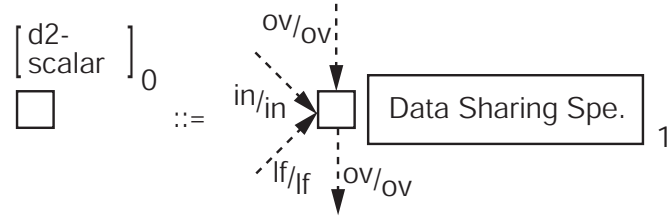
Production D2-22



Production D2-23



Production D2-24



1.2 Semantic Rules of Productions in HNGG3

Semantic Rules of P1
$id(1) = 1, id(2) = id(1) + 1, x(1) = 0, y(1) = 0, x(2) = x(1), y(2) = y(1),$ $width(1) = A1_WIDTH, width(2) = width(1),$ $Cellw(1) = width(0), Cellw(2) = width(0), height(0) = height(2),$ $NumCell(0) = NumCell(2) + 1,$ $Cellh(1) = height(0), Cellh(2) = height(0)$
Semantic Rules of P2
$id(1) = id(0), id(2) = id(1) + NumCell(1), x(1) = x(0), y(1) = y(0),$ $x(2) = x(0) + height(1), y(2) = y(1), width(1) = width(0), width(2) = width(0),$ $Cellw(1) = width(0), Cellw(2) = width(0), height(0) = height(1) + height(2),$ $NumCell(0) = NumCell(1) + NumCell(2),$ $Cellh(1) = height(1), Cellh(2) = height(2)$
Semantic Rules of H1
$id(1) = id(0), id(2) = id(0) + 1, id(3) = id(0) + 2, id(4) = id(0) + 3,$ $id(5) = id(0) + 4, id(6) = id(0) + 7, id(7) = id(0) + 5, id(8) = id(0) + 6,$ $x(1) = x(0), y(1) = y(0), x(2) = x(0), y(2) = y(0),$ $x(3) = x(0), y(3) = y(2) + Cellh(2), x(4) = x(0), y(4) = y(3) + Cellh(3),$ $x(5) = x(0) + Cellw(0) / 2, y(5) = y(3) + Cellh(3),$ $x(6) = x(0), y(6) = y(4) + Cellh(4), x(7) = x(0), y(7) = y(6) + Cellh(6),$ $x(8) = x(0) + Cellw(0) / 2, y(8) = y(6) + Cellh(6),$ $width(1) = width(0), width(2) = width(0), width(3) = width(0),$ $width(4) = width(0) / 2, width(5) = width(0) / 2, width(6) = width(0),$ $width(7) = width(0) / 2, width(8) = width(0) / 2,$ $Cellw(1) = Cellw(0), Cellw(2) = Cellw(0), Cellw(3) = Cellw(0),$ $Cellw(4) = Cellw(0) / 2, Cellw(5) = Cellw(0) / 2, Cellw(6) = Cellw(0),$ $Cellw(7) = Cellw(0) / 2, Cellw(8) = Cellw(0) / 2,$ $height(0) = getHeight(2) + getHeight(3) + \max(getHeight(4), getHeight(5))$ $+ height(6) + \max(getHeight(7), getHeight(8)),$ $NumCell(0) = NumCell(6) + 7$ $Cellh(1) = Cellh(0), Cellh(2) = getHeight(2),$ $Cellh(3) = getHeight(3), Cellh(4) = \max(getHeight(4), getHeight(5)),$ $Cellh(5) = \max(getHeight(4), getHeight(5)), Cellh(6) = height(6),$ $Cellh(7) = \max(getHeight(7), getHeight(8)),$ $Cellh(8) = \max(getHeight(7), getHeight(8))$

Semantic Rules of H2
$id(1) = id(0), id(2) = id(0) + NumCell(1), x(1) = x(0), y(1) = y(0),$ $x(2) = x(0), y(2) = y(0) + Cellh(1), width(1) = width(0), width(2) = width(0),$ $Cellw(1) = Cellw(0) / NumCell(1), Cellw(2) = Cellw(0),$ $height(0) = height(1) + height(2), NumCell(0) = NumCell(1) + NumCell(2),$ $Cellh(1) = height(1), Cellh(2) = height(2)$
Semantic Rules of H3
$id(1) = id(0), x(1) = x(0), y(1) = y(0),$ $width(1) = width(0), Cellw(1) = Cellw(0) / NumCell(1),$ $height(0) = height(1), NumCell(0) = NumCell(1),$ $Cellh(1) = height(0),$
Semantic Rules of H4
$id(1) = id(0), id(2) = id(0) + 1, id(2) = id(0) + 2, x(1) = x(0), y(1) = y(0),$ $x(2) = x(0) + Cellw(0) / 2, y(2) = y(0), width(1) = Cellw(0) / 2,$ $width(2) = Cellw(0) / 2, Cellw(1) = Cellw(0) / 2, Cellw(2) = Cellw(0) / 2,$ $height(0) = \max(\text{getHeight}(1), \text{getHeight}(2)),$ $NumCell(0) = 2, Cellh(1) = Cellh(0), Cellh(2) = Cellh(0)$
Semantic Rules of A1-0, A2-0, A3-0, ... , and A6-0
$id(1) = id(0), x(1) = x(0), y(1) = y(0),$ $width(1) = width(0), Cellw(1) = Cellw(0),$ $height(0) = height(1), NumCell(0) = NumCell(1),$ $Cellh(1) = height(0),$
Semantic Rules of A1-1, A2-1, A3-1, ... , and A6-1
$id(1) = id(0), id(2) = id(1) + 1, x(1) = 0, y(1) = 0, x(2) = x(1), y(2) = y(1),$ $width(1) = width(0), width(2) = width(1),$ $Cellw(1) = width(0), Cellw(2) = width(0), height(0) = height(2),$ $NumCell(0) = NumCell(2) + 1,$ $Cellh(1) = height(0), Cellh(2) = height(0)$
Semantic Rules of A1-2, A2-2, A3-2, ... , and A6-2
$id(1) = id(0), id(2) = id(1) + NumCell(1), x(1) = x(0), y(1) = y(0),$ $x(2) = x(0), y(2) = y(1) + height(1), width(1) = width(0), width(2) = width(0),$ $Cellw(1) = Cellw(0), Cellw(2) = Cellw(0), height(0) = height(1) + height(2),$ $NumCell(0) = NumCell(1) + NumCell(2),$ $Cellh(1) = height(1), Cellh(2) = height(2)$

Semantic Rules of A1-3, A2-3, A3-3, ... , and A6-3
$id(1) = id(0), x(1) = x(0), y(1) = y(0),$ $width(1) = width(0), Cellw(1) = Cellw(0),$ $height(0) = height(1), NumCell(0) = NumCell(1),$ $Cellh(1) = height(0)$
Semantic Rules of A1-4, A2-4, A3-4, ... , and A6-4
$id(1) = id(0), x(1) = x(0), y(1) = y(0),$ $width(1) = width(0), Cellw(1) = Cellw(0) / NumCell(1),$ $height(0) = height(1), NumCell(0) = NumCell(1),$ $Cellh(1) = Cellh(0)$
Semantic Rules of A1-5, A2-5, A3-5, ... , and A6-5
$id(1) = id(0), x(1) = x(0), y(1) = y(0),$ $width(1) = width(0), Cellw(1) = Cellw(0),$ $height(0) = height(1), NumCell(0) = NumCell(1),$ $Cellh(1) = height(0)$
Semantic Rules of A1-6, A2-6, A3-6, ... , and A6-6
$id(1) = id(0), id(2) = id(0) + 1, x(1) = x(0), y(1) = y(0), x(2) = x(0) + Cellw(0),$ $y(2) = y(0), width(1) = Cellw(0), width(2) = width(0) - Cellw(0),$ $Cellw(1) = Cellw(0), Cellw(2) = Cellw(0),$ $height(0) = \max(height(1), height(2)), NumCell(0) = NumCell(1) + NumCell(2),$ $Cellh(1) = Cellh(0), Cellh(2) = Cellh(0)$
Semantic Rules of A1-7, A1-8, A1-9, ... , A1-17, A2-7, A2-8, ... , A2-12, A3-7, A3-8, A3-9, ... , A3-12, A4-7, A4-8, A4-9, ... , A4-13, A5-7, A5-8, A5-9, and A6-7
$id(1) = id(0), x(1) = x(0), y(1) = y(0),$ $width(1) = width(0), Cellw(1) = Cellw(0),$ $height(0) = getHeight(1), NumCell(0) = NumCell(1),$ $Cellh(1) = height(0)$

Semantic Rules of B1-0, B2-0, and B3-0
$id(1) = id(0), x(1) = x(0), y(1) = y(0),$ $width(1) = width(0), Cellw(1) = Cellw(0),$ $height(0) = height(1), NumCell(0) = NumCell(1),$ $Cellh(1) = height(0),$
Semantic Rules of BC-1, B1-1, B2-1, and B3-1
$id(1) = id(0), id(2) = id(1) + 1, x(1) = 0, y(1) = 0, x(2) = x(1), y(2) = y(1),$ $width(1) = width(0), width(2) = width(1),$ $Cellw(1) = width(0), Cellw(2) = width(0), height(0) = height(2),$ $NumCell(0) = NumCell(2) + 1,$ $Cellh(1) = height(0), Chellh(2) = height(0)$
Semantic Rules of BC-2, B1-2, B2-2, and B3-2
$id(1) = id(0), id(2) = id(1) + NumCell(1), x(1) = x(0), y(1) = y(0),$ $x(2) = x(0), y(2) = y(1) + height(1), width(1) = width(0), width(2) = width(0),$ $Cellw(1) = Cellw(0), Cellw(2) = Cellw(0), height(0) = height(1) + height(2),$ $NumCell(0) = NumCell(1) + NumCell(2),$ $Cellh(1) = height(1), Chellh(2) = height(2)$
Semantic Rules of BC-3, B1-3, B2-3, and B3-3
$id(1) = id(0), x(1) = x(0), y(1) = y(0),$ $width(1) = width(0), Cellw(1) = Cellw(0),$ $height(0) = height(1), NumCell(0) = NumCell(1),$ $Cellh(1) = height(0)$
Semantic Rules of BC-4, B1-4, B2-4, and B3-4
$id(1) = id(0), x(1) = x(0), y(1) = y(0),$ $width(1) = width(0), Cellw(1) = Cellw(0) / NumCell(1),$ $height(0) = height(1), NumCell(0) = NumCell(1),$ $Cellh(1) = Cellh(0)$
Semantic Rules of BC-5, B1-5, B2-5, and B3-5
$id(1) = id(0), x(1) = x(0), y(1) = y(0),$ $width(1) = width(0), Cellw(1) = Cellw(0),$ $height(0) = height(1), NumCell(0) = NumCell(1),$ $Cellh(1) = height(0)$

Semantic Rules of B-1

$id(1) = id(0)$, $x(1) = x(0)$, $y(1) = y(0)$,
 $width(1) = width(0)$, $Cellw(1) = Cellw(0)$,
 $height(0) = height(1)$, $NumCell(0) = NumCell(1)$,
 $Cellh(1) = height(0)$

Semantic Rules of B-2

$id(1) = id(0)$, $id(2) = id(1) + 1$, $id(3) = id(2) + NumCell(1)$ $x(1) = x(0)$,
 $y(1) = y(0)$, $x(2) = x(0)$, $y(2) = y(0)$, $x(3) = x(0)$, $y(3) = y(1) + height(1)$,
 $width(1) = width(0)$, $width(2) = width(0)$, $width(3) = width(0)$,
 $Cellw(1) = Cellw(0)$, $Cellw(2) = Cellw(0)$, $Cellw(3) = Cellw(0)$,
 $height(0) = height(2) + height(3)$, $NumCell(0) = NumCell(2) + NumCell(3) + 1$,
 $Cellh(2) = height(2)$, $Cellh(3) = height(3)$

Semantic Rules of BC-6, B1-6, B2-6, and B3-6

$id(1) = id(0)$, $id(2) = id(0) + 1$, $x(1) = x(0)$, $y(1) = y(0)$, $x(2) = x(0) + Cellw(0)$,
 $y(2) = y(0)$, $width(1) = Cellw(0)$, $width(2) = width(0) - Cellw(0)$,
 $Cellw(1) = Cellw(0)$, $Cellw(2) = Cellw(0)$,
 $height(0) = \max(height(1), height(2))$, $NumCell(0) = NumCell(1) + NumCell(2)$,
 $Cellh(1) = Cellh(0)$, $Cellh(2) = Cellh(0)$

Semantic Rules of BC-7, BC-8, B1-7, B2-7, B2-8, ... , B2-24, B3-7,
B3-8, B3-9, ... , B3-24

$id(1) = id(0)$, $x(1) = x(0)$, $y(1) = y(0)$,
 $width(1) = width(0)$, $Cellw(1) = Cellw(0)$,
 $height(0) = getHeight(1)$, $NumCell(0) = NumCell(1)$,
 $Cellh(1) = height(0)$

Semantic Rules of C1-0, C2-0, C3-0, ..., and C6-0
$id(1) = id(0), x(1) = x(0), y(1) = y(0),$ $width(1) = width(0), Cellw(1) = Cellw(0),$ $height(0) = height(1), NumCell(0) = NumCell(1),$ $Cellh(1) = height(0),$
Semantic Rules of CC-1, C1-1, C2-1, C3-1, ... , and C6-1
$id(1) = id(0), id(2) = id(1) + 1, x(1) = 0, y(1) = 0, x(2) = x(1), y(2) = y(1),$ $width(1) = width(0), width(2) = width(1),$ $Cellw(1) = width(0), Cellw(2) = width(0), height(0) = height(2),$ $NumCell(0) = NumCell(2) + 1,$ $Cellh(1) = height(0), Chellh(2) = height(0)$
Semantic Rules of CC-2, C1-2, C2-2, C3-2, ... , and C6-2
$id(1) = id(0), id(2) = id(1) + NumCell(1), x(1) = x(0), y(1) = y(0),$ $x(2) = x(0), y(2) = y(1) + height(1), width(1) = width(0), width(2) = width(0),$ $Cellw(1) = Cellw(0), Cellw(2) = Cellw(0), height(0) = height(1) + height(2),$ $NumCell(0) = NumCell(1) + NumCell(2),$ $Cellh(1) = height(1), Chellh(2) = height(2)$
Semantic Rules of CC-3, C1-3, C2-3, C3-3, ... , and C6-3
$id(1) = id(0), x(1) = x(0), y(1) = y(0),$ $width(1) = width(0), Cellw(1) = Cellw(0),$ $height(0) = height(1), NumCell(0) = NumCell(1),$ $Cellh(1) = height(0)$
Semantic Rules of CC-4, C1-4, C2-4, C3-4, ... , and C6-4
$id(1) = id(0), x(1) = x(0), y(1) = y(0),$ $width(1) = width(0), Cellw(1) = Cellw(0) / NumCell(1),$ $height(0) = height(1), NumCell(0) = NumCell(1),$ $Cellh(1) = Cellh(0)$
Semantic Rules of CC-5, C1-5, C2-5, C3-5, ... , and C6-5
$id(1) = id(0), x(1) = x(0), y(1) = y(0),$ $width(1) = width(0), Cellw(1) = Cellw(0),$ $height(0) = height(1), NumCell(0) = NumCell(1),$ $Cellh(1) = height(0)$

Semantic Rules of C-1

$id(1) = id(0)$, $x(1) = x(0)$, $y(1) = y(0)$,
 $width(1) = width(0)$, $Cellw(1) = Cellw(0)$,
 $height(0) = height(1)$, $NumCell(0) = NumCell(1)$,
 $Cellh(1) = height(0)$

Semantic Rules of C-2

$id(1) = id(0)$, $id(2) = id(1) + 1$, $id(3) = id(2) + NumCell(1)$ $x(1) = x(0)$,
 $y(1) = y(0)$, $x(2) = x(0)$, $y(2) = y(0)$, $x(3) = x(0)$, $y(3) = y(1) + height(1)$,
 $width(1) = width(0)$, $width(2) = width(0)$, $width(3) = width(0)$,
 $Cellw(1) = Cellw(0)$, $Cellw(2) = Cellw(0)$, $Cellw(3) = Cellw(0)$,
 $height(0) = height(2) + height(3)$, $NumCell(0) = NumCell(2) + NumCell(3) + 1$,
 $Cellh(2) = height(2)$, $Cellh(3) = height(3)$

Semantic Rules of CC-6, C1-6, C2-6, C3-6, ... , and C6-6

$id(1) = id(0)$, $id(2) = id(0) + 1$, $x(1) = x(0)$, $y(1) = y(0)$, $x(2) = x(0) + Cellw(0)$,
 $y(2) = y(0)$, $width(1) = Cellw(0)$, $width(2) = width(0) - Cellw(0)$,
 $Cellw(1) = Cellw(0)$, $Cellw(2) = Cellw(0)$,
 $height(0) = \max(height(1), height(2))$, $NumCell(0) = NumCell(1) + NumCell(2)$,
 $Cellh(1) = Cellh(0)$, $Cellh(2) = Cellh(0)$

Semantic Rules of CC-7, CC-8, C1-7, C2-7, C2-8, C2-9, ... , C2-22,
C3-7, C3-8, C3-9, ... , C3-19, C4-7, C4-8, C4-9, C5-7, and C6-7

$id(1) = id(0)$, $x(1) = x(0)$, $y(1) = y(0)$,
 $width(1) = width(0)$, $Cellw(1) = Cellw(0)$,
 $height(0) = getHeight(1)$, $NumCell(0) = NumCell(1)$,
 $Cellh(1) = height(0)$

Semantic Rules of D1-0 and D2-0
$id(1) = id(0), x(1) = x(0), y(1) = y(0),$ $width(1) = width(0), Cellw(1) = Cellw(0),$ $height(0) = height(1), NumCell(0) = NumCell(1),$ $Cellh(1) = height(0),$
Semantic Rules of D1-1 and D2-1
$id(1) = id(0), id(2) = id(1) + 1, x(1) = 0, y(1) = 0, x(2) = x(1), y(2) = y(1),$ $width(1) = width(0), width(2) = width(1),$ $Cellw(1) = width(0), Cellw(2) = width(0), height(0) = height(2),$ $NumCell(0) = NumCell(2) + 1,$ $Cellh(1) = height(0), Cellh(2) = height(0)$
Semantic Rules of D1-2 and D2-2
$id(1) = id(0), id(2) = id(1) + NumCell(1), x(1) = x(0), y(1) = y(0),$ $x(2) = x(0), y(2) = y(1) + height(1), width(1) = width(0), width(2) = width(0),$ $Cellw(1) = Cellw(0), Cellw(2) = Cellw(0), height(0) = height(1) + height(2),$ $NumCell(0) = NumCell(1) + NumCell(2),$ $Cellh(1) = height(1), Cellh(2) = height(2)$
Semantic Rules of D1-3 and D2-3
$id(1) = id(0), x(1) = x(0), y(1) = y(0),$ $width(1) = width(0), Cellw(1) = Cellw(0),$ $height(0) = height(1), NumCell(0) = NumCell(1),$ $Cellh(1) = height(0)$
Semantic Rules of D1-4 and D2-4
$id(1) = id(0), x(1) = x(0), y(1) = y(0),$ $width(1) = width(0), Cellw(1) = Cellw(0) / NumCell(1),$ $height(0) = height(1), NumCell(0) = NumCell(1),$ $Cellh(1) = Cellh(0)$
Semantic Rules of D1-5 and D2-5
$id(1) = id(0), x(1) = x(0), y(1) = y(0),$ $width(1) = width(0), Cellw(1) = Cellw(0),$ $height(0) = height(1), NumCell(0) = NumCell(1),$ $Cellh(1) = height(0)$

Semantic Rules of D1-6 and D2-6

$id(1) = id(0)$, $id(2) = id(0) + 1$, $x(1) = x(0)$, $y(1) = y(0)$, $x(2) = x(0) + Cellw(0)$,
 $y(2) = y(0)$, $width(1) = Cellw(0)$, $width(2) = width(0) - Cellw(0)$,
 $Cellw(1) = Cellw(0)$, $Cellw(2) = Cellw(0)$,
 $height(0) = \max(height(1), height(2))$, $NumCell(0) = NumCell(1) + NumCell(2)$,
 $Cellh(1) = Cellh(0)$, $Cellh(2) = Cellh(0)$

Semantic Rules of D1-7, D2-7, D2-8, D2-9, ... , and D2-24

$id(1) = id(0)$, $x(1) = x(0)$, $y(1) = y(0)$,
 $width(1) = width(0)$, $Cellw(1) = Cellw(0)$,
 $height(0) = getHeight(1)$, $NumCell(0) = NumCell(1)$,
 $Cellh(1) = height(0)$

1.3 Precedence Table of HNGG3

Table 1.1: A part of precedence relations of *HNGG3*: we illustrate precedence relations for (A, B) .

Label A	Label B	Relations
HEAD	Program Code	$\dot{=}_{in}$
Program Code	Program Name	$\dot{=}_{ov}$
Program Name	Library Code	$\dot{=}_{ov}$
Library Code	Version	$\dot{=}_{lf}$
Library Code	[author-rel]	$\dot{=}_{ov}$
[author-rel]	Approve	$\dot{=}_{ov}$
[author-rel2]	[author-rel]	$\dot{=}_{ov}$
Author	Original Release	$\dot{=}_{lf}$
Library Code	[author-rel2]	$\dot{<}_{ov}$
Library Code	Author	$\dot{<}_{ov}$
[author-rel2]	Approve	$\dot{>}_{ov}$
Author	Approve	$\dot{>}_{ov}$
[author-rel2]	[author-rel2]	$\dot{<}_{ov}$
[author-rel2]	Author	$\dot{<}_{ov}$
Author	[author-rel]	$\dot{>}_{ov}$
Author	[author-rel2]	$\dot{< \cdot >}_{ov}$
Author	Author	$\dot{< \cdot >}_{ov}$

Right \ Left		A1 Terminal Sym.			[a1 scalar]			[a1 column]			[a1 row]			[a1 root]			A1			[a1]		
		in	ov	lf	in	ov	lf	in	ov	lf	in	ov	lf	in	ov	lf	in	ov	lf	in	ov	lf
A1 Terminal Sym.			<.>	<.>		<.>	<.>		<.>	>		<.>			>		>					
[a1 scalar]			<.>	<		<.>	<		<.>	≐		<.>			>		>					
[a1 column]			<.>			<.>			<.>			<.>			>		>					
[a1 row]			<			<			<			<			≐		>					
[a1 root]																	≐					
[a1]																						
A1																						

Right \ Left		A2 Terminal Sym.			[a2 scalar]			[a2 column]			[a2 row]			[a2 root]			A2			[a2]		
		in	ov	lf	in	ov	lf	in	ov	lf	in	ov	lf	in	ov	lf	in	ov	lf	in	ov	lf
A2 Terminal Sym.			<.>	<.>		<.>	<.>		<.>	>		<.>			>		>					
[a2 scalar]			<.>	<		<.>	<		<.>	≐		<.>			>		>					
[a2 column]			<.>			<.>			<.>			<.>			>		>					
[a2 row]			<			<			<			<			≐		>					
[a2 root]																	≐					
[a2]																						
A2																						

Left \ Right	a3 Terminal Sym.			[a3 scalar]			[a3 column]			[a3 row]			[a3 root]			A3			[a3]		
	in	ov	lf	in	ov	lf	in	ov	lf	in	ov	lf	in	ov	lf	in	ov	lf	in	ov	lf
A3 Terminal Sym.		<.>	<.>		<.>	<.>		<.>	>		<.>			>		>					
[a3 scalar]		<.>	<.		<.>	<.		<.>	≡		<.>			>		>					
[a3 column]		<.>			<.>			<.>			<.>			>		>					
[a3 row]		<.			<.			<.			<.			≡		>					
[a3 root]																≡					
[a3]																					
A3																					

Left \ Right	A4 Terminal Sym.			[a4 scalar]			[a4 column]			[a4 row]			[a4 root]			A4			[a4]		
	in	ov	lf	in	ov	lf	in	ov	lf	in	ov	lf	in	ov	lf	in	ov	lf	in	ov	lf
A4 Terminal Sym.		<.>	<.>		<.>	<.>		<.>	>		<.>			>		>					
[a4 scalar]		<.>	<.		<.>	<.		<.>	≡		<.>			>		>					
[a4 column]		<.>			<.>			<.>			<.>			>		>					
[a4 row]		<.			<.			<.			<.			≡		>					
[a4 root]																≡					
[a4]																					
A4																					

Right Left		A5 Terminal Sym.			[a5 scalar]			[a5 column]			[a5 row]			[a5 root]			A5			[a5]		
		in	ov	lf	in	ov	lf	in	ov	lf	in	ov	lf	in	ov	lf	in	ov	lf	in	ov	lf
A5 Terminal Sym.			<.>	<.>		<.>	<.>		<.>	>		<.>			>			>				
[a5 scalar]			<.>	<		<.>	<		<.>	≡		<.>			>			>				
[a5 column]			<.>			<.>			<.>			<.>			>			>				
[a5 row]			<			<			<			<			≡			>				
[a5 root]																		≡				
[a5]																						
A5																						

Right Left		A6 Terminal Sym.			[a6 scalar]			[a6 column]			[a6 row]			[a6 root]			A6			[a6]		
		in	ov	lf	in	ov	lf	in	ov	lf	in	ov	lf	in	ov	lf	in	ov	lf	in	ov	lf
A6 Terminal Sym.			<.>	<.>		<.>	<.>		<.>	>		<.>			>			>				
[a6 scalar]			<.>	<		<.>	<		<.>	≡		<.>			>			>				
[a6 column]			<.>			<.>			<.>			<.>			>			>				
[a6 row]			<			<			<			<			≡			>				
[a6 root]																		≡				
[a6]																						
A6																						

Right \ Left	B			[bc body]			[b body]			[b2]			[b3]			BC			B2			B3				
	in	ov	lf	in	ov	lf	in	ov	lf	in	ov	lf	in	ov	lf	in	ov	lf	in	ov	lf	in	ov	lf	in	ov
B																										
[bc body]	≐							≐																		
[b body]																										
[b2]																										
[b3]																										
BC	⤵							⤵																		
B2																										
B3																										

Right \ Left	Technical Id.			Appli. Orient. Id.			[bc scalar]			[bc column]			[bc row]			[bc root]			BC					
	in	ov	lf	in	ov	lf	in	ov	lf	in	ov	lf	in	ov	lf	in	ov	lf	in	ov	lf	in	ov	lf
Technical Id.		<.>	<.>		<.>	<.>		<.>	<.>		<.>	>		<.>			>			>				
Appli. Orient. Id.		<.>	<.>		<.>	<.>		<.>	<.>		<.>	>		<.>			>			>				
[bc scalar]		<.>	<		<.>	<		<.>	<		<.>	≐		<.>			>			>				
[bc column]		<.>			<.>			<.>			<.>			<.>			>			>				
[bc row]		<			<			<			<			<			≐			>				
[bc root]																				≐				
BC																								

Right Left		D. of Data Doc.			[b1 scalar]			[b1 column]			[b1 row]			[b1 root]			B1			[b1]		
		in	ov	lf	in	ov	lf	in	ov	lf	in	ov	lf	in	ov	lf	in	ov	lf	in	ov	lf
D. of Data Doc.			<.>	<.>		<.>	<.>		<.>	>		<.>			>			>				
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[b1 row]			<			<			<			<			≐			>				
[b1root]																		≐				
[b1]																						
B1																						

Right Left		B2 Terminal Sym.			[b2 scalar]			[b2 column]			[b2 row]			[b2 root]			B2			[b2]		
		in	ov	lf	in	ov	lf	in	ov	lf	in	ov	lf	in	ov	lf	in	ov	lf	in	ov	lf
B2 Terminal Sym.			<.>	<.>		<.>	<.>		<.>	>		<.>			>			>				
[b2 scalar]			<.>	<		<.>	<		<.>	≐		<.>			>			>				
[b2 column]			<.>			<.>			<.>			<.>			>			>				
[b2 row]			<			<			<			<			≐			>				
[b2 root]																		≐				
[b2]																						
B2																						

Right Left		B3 Terminal Sym.			[b3 scalar]			[b3 column]			[b3 row]			[b3 root]			B3			[b3]		
		in	ov	lf	in	ov	lf	in	ov	lf	in	ov	lf	in	ov	lf	in	ov	lf	in	ov	lf
B3 Terminal Sym.			<.>	<.>		<.>	<.>		<.>	>		<.>			>			>				
[b3 scalar]			<.>	<		<.>	<		<.>	≐		<.>			>			>				
[b3 column]			<.>			<.>			<.>			<.>			>			>				
[b3 row]			<			<			<			<			≐			>				
[b3 root]																		≐				
[b3]																						
B3																						

Right Left		D. of Procedure			[c1 scalar]			[c1 column]			[c1 row]			[c1 root]			C1			[c1]		
		in	ov	lf	in	ov	lf	in	ov	lf	in	ov	lf	in	ov	lf	in	ov	lf	in	ov	lf
D. of Procedure			<.>	<.>		<.>	<.>		<.>	>		<.>			>			>				
[c1 scalar]			<.>	<		<.>	<		<.>	≐		<.>			>			>				
[c1 column]			<.>			<.>			<.>			<.>			>			>				
[c1 row]			<			<			<			<			≐			>				
[c1root]																		≐				
[c1]																						
C1																						

Right Left		C2 Terminal Sym.			[c2 scalar]			[c2 column]			[c2 row]			[c2 root]			C2			[c2]		
		in	ov	lf	in	ov	lf	in	ov	lf	in	ov	lf	in	ov	lf	in	ov	lf	in	ov	lf
C2 Terminal Sym.			<.>	<.>		<.>	<.>		<.>	>		<.>			>			>				
[c2 scalar]			<.>	<		<.>	<		<.>	≡		<.>			>			>				
[c2 column]			<.>			<.>			<.>			<.>			>			>				
[c2 row]			<			<			<			<			≡			>				
[c2 root]																		≡				
[c2]																						
C2																						

Right Left		C3 Terminal Sym.			[c3 scalar]			[c3 column]			[c3 row]			[c3 root]			C3			[c3]		
		in	ov	lf	in	ov	lf	in	ov	lf	in	ov	lf	in	ov	lf	in	ov	lf	in	ov	lf
C3 Terminal Sym.			<.>	<.>		<.>	<.>		<.>	>		<.>			>			>				
[c3 scalar]			<.>	<		<.>	<		<.>	≡		<.>			>			>				
[c3 column]			<.>			<.>			<.>			<.>			>			>				
[c3 row]			<			<			<			<			≡			>				
[c3 root]																		≡				
[c3]																						
C3																						

Left \ Right	C4 Terminal Sym.			[c4 scalar]			[c4 column]			[c4 row]			[c4 root]			C4			[c4]		
	in	ov	lf	in	ov	lf	in	ov	lf	in	ov	lf	in	ov	lf	in	ov	lf	in	ov	lf
C4 Terminal Sym.		<.>	<.>		<.>	<.>		<.>	>		<.>			>		>					
[c4 scalar]		<.>	<		<.>	<		<.>	≡		<.>			>		>					
[c4 column]		<.>			<.>			<.>			<.>			>		>					
[c4 row]		<			<			<			<			≡		>					
[c4 root]																≡					
[c4]																					
C4																					

Left \ Right	C5 Terminal Sym.			[c5 scalar]			[c5 column]			[c5 row]			[c5 root]			C5			[c5]		
	in	ov	lf	in	ov	lf	in	ov	lf	in	ov	lf	in	ov	lf	in	ov	lf	in	ov	lf
C5 Terminal Sym.		<.>	<.>		<.>	<.>		<.>	>		<.>			>		>					
[c5 scalar]		<.>	<		<.>	<		<.>	≡		<.>			>		>					
[c5 column]		<.>			<.>			<.>			<.>			>		>					
[c5 row]		<			<			<			<			≡		>					
[c5 root]																≡					
[c5]																					
C5																					

Right Left		C6 Terminal Sym.			[c6 scalar]			[c6 column]			[c6 row]			[c6 root]			C6			[c6]		
		in	ov	lf	in	ov	lf	in	ov	lf	in	ov	lf	in	ov	lf	in	ov	lf	in	ov	lf
C6 Terminal Sym.			<.>	<.>		<.>	<.>		<.>	>		<.>			>			>				
[c6 scalar]			<.>	<		<.>	<		<.>	≡		<.>			>			>				
[c6 column]			<.>			<.>			<.>			<.>			>			>				
[c6 row]			<			<			<			<			≡			>				
[c6 root]																		≡				
[c6]																						
C6																						

Right Left		Variants			Procedure name			[cc scalar]			[cc column]			[cc row]			[cc root]			CC		
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Variants			<.>	<.>		<.>	<.>		<.>	<.>		<.>	>		<.>			>			>	
Procedure name			<.>	<.>		<.>	<.>		<.>	<.>		<.>	>		<.>			>			>	
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[cc column]			<.>			<.>			<.>			<.>			<.>			>			>	
[cc row]			<			<			<			<			<			≡			>	
[cc root]																					≡	
CC																						

Left \ Right	C			[cc body]			[c body]			[c2]			[c3]			[c4]			[c5]			[c6]		
	in	ov	lf	in	ov	lf	in	ov	lf	in	ov	lf	in	ov	lf	in	ov	lf	in	ov	lf	in	ov	lf
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C2																								
C3																								
C4																								
C5																								
C6																								

Left \ Right	CC			C2			C3			C4			C5			C6		
	in	ov	lf	in	ov	lf	in	ov	lf	in	ov	lf	in	ov	lf	in	ov	lf
C																		
[cc body]					<			<			<			<			<	
[c body]																		
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[c4]																		
[c5]																		
[c6]																		
CC					<>			<>			<>			<>			<>	
C2																		
C3																		
C4																		
C5																		
C6																		

Left \ Right	D1 Terminal Sym.			[d1 scalar]			[d1 column]			[d1 row]			[d1 root]			D1			[d1]		
	in	ov	lf	in	ov	lf	in	ov	lf	in	ov	lf	in	ov	lf	in	ov	lf	in	ov	lf
D1 Terminal Sym.		<.>	<.>		<.>	<.>		<.>	>		<.>			>		>					
[d1 scalar]		<.>	<.		<.>	<.		<.>	≡		<.>			>		>					
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[d1 row]		<.			<.			<.			<.			≡		>					
[d1 root]																≡					
[d1]																					
D1																					

Left \ Right	D2 Terminal Sym.			[d2 scalar]			[d2 column]			[d2 row]			[d2 root]			D2			[d2]		
	in	ov	lf	in	ov	lf	in	ov	lf	in	ov	lf	in	ov	lf	in	ov	lf	in	ov	lf
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[d2 scalar]		<.>	<.		<.>	<.		<.>	≡		<.>			>		>					
[d2 column]		<.>			<.>			<.>			<.>			>		>					
[d2 row]		<.			<.			<.			<.			≡		>					
[d2 root]																≡					
[d2]																					
D2																					

Left \ Right	[]			[innerstruct]			[head]			HEAD			[body]			[a1]			[a2]				
	in	ov	lf	in	ov	lf	in	ov	lf	in	ov	lf	in	ov	lf	in	ov	lf	in	ov	lf	in	ov
[]																							
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C																							
C1																							
D1																							
D2																							

Right Left	[a3]			[a4]			[a5]			[a6]			[b]			[b1]			[c]			
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Left \ Right	[c1]			[d1]			[d2]			A1			A2			A3			A4		
	in	ov	lf	in	ov	lf	in	ov	lf	in	ov	lf	in	ov	lf	in	ov	lf	in	ov	lf
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D1																					
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Left \ Right	A5			A6			B			B1			C			C1			D1			D2		
	in	ov	lf	in	ov	lf	in	ov	lf	in	ov	lf	in	ov	lf	in	ov	lf	in	ov	lf	in	ov	lf
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