

1. Grammar symbols: Used cross reference.

Reference of each grammar's symbol used within each rule's productions. The index uses the triple: rule name, its subrule no, and the symbol's position within the symbol string.

2. # file-name::

Rfilename 1.2

3. # lrk-sufx::

Rsym_def 3.2 Rsym_def1 3.2

4. # name-space::

Rnamespace 1.2

5. # terminals-refs::

Rsym_def 4.2 Rsym_def1 4.2

6. # terminals-sufx::

Rsym_def 5.2 Rsym_def1 5.2

7. (:

Ropen_par 2.1

8.)::

Rclose_par 2.1

9. ,::

Rnamespace_phrase 1.1

10. NS_identifier::TH_identifier::

Rfilename 1.3 Rfilename_id 1.3 Rnamespace 1.3 Rnamespace_id 1.3

11. NS_lint_balls::TH_lint_balls::

Rlint 1.3

12. NS_term_def_ph::TH_term_def_ph::

Rsym_def 1.3 Rsym_def1 1.3

13. NULL thread::

Rfilename 2.3 Rnamespace 2.3 Rsym_def 2.3 Rsym_def 3.3 Rsym_def 4.3 Rsym_def 5.3 Rsym_def1 2.3
Rsym_def1 3.3 Rsym_def1 4.3 Rsym_def1 5.3

14. Rclose_brace::
Rsym_defs_phrase 1.4

15. Rclose_par::
Rrc_phrase 1.6

16. Rfilename::
Rfilename_phrase 1.1

17. Rfilename_id::
Rfilename_phrase 1.3

18. Rfilename_phrase::
Rparameters 1.1

19. Rlint::
Rrc_phrase 1.1 Rrc_phrase 1.3 Rrc_phrase 1.5 Rrc_phrase 1.7 Rrc_phrase 1.9 Rparameters 1.2 Rfilename_phrase 1.2 Rnamespace_phrase 1.2 Rnamespace_phrase 1.4 Rsym_defs_phrase 1.2 Rsym_defs 1.2 Rsym_defs 2.3

20. Rnamespace::
Rnamespace_phrase 1.3

21. Rnamespace_id::
Rnamespace_phrase 1.5

22. Rnamespace_phrase::
Rparameters 1.3

23. Ropen_brace::
Rsym_defs_phrase 1.1

24. Ropen_par::
Rrc_phrase 1.2

25. Rparameters::
Rrc_phrase 1.4

26. Rsym_def::
Rsym_defs 1.1

27. Rsym_def1::

Rsym_defs 2.2

28. Rsym_defs::

Rsym_defs_phrase 1.3 Rsym_defs 2.1

29. Rsym_defs_phrase::

Rrc_phrase 1.8

30. ε ::

Rlint 2.1

31. identifier::

Rfilename_id 1.2 Rnamespace_id 1.2

32. lint::

Rlint 1.2

33. terminal-def::

Rsym_def 1.2 Rsym_def1 1.2

34. {::.

Ropen_brace 2.1

35. |+|::.

Rsym_def1 2.2

36. |?|::.

Ropen_par 1.1 Rclose_par 1.1 Rfilename 2.2 Rfilename 3.1 Rfilename_id 2.1 Rnamespace_phrase 2.1 Rnamespace 2.2 Rnamespace 3.1 Rnamespace_id 2.1 Rsym_def 2.2 Rsym_def 6.1 Ropen_brace 1.1 Rcclose_brace 1.1

37. |||::.

Rfilename 1.1 Rfilename 2.1 Rfilename_id 1.1 Rnamespace 1.1 Rnamespace 2.1 Rnamespace_id 1.1 Rsym_def 1.1 Rsym_def 2.1 Rsym_def 3.1 Rsym_def 4.1 Rsym_def 5.1 Rsym_def1 1.1 Rsym_def1 2.1 Rsym_def1 3.1 Rsym_def1 4.1 Rsym_def1 5.1 Rlint 1.1

38. }::.

Rclose_brace 2.1

39. Grammar Rules's First Sets.**40. *Rrc_phrase* # in set: 3.**

(|?| |||

41. *Ropen_par* # in set: 2.

(|?|

42. *Rclose_par* # in set: 2.

) |?|

43. *Rparameters* # in set: 2.

|?| |||

44. *Rfilename_phrase* # in set: 2.

|?| |||

45. *Rfilename* # in set: 2.

|?| |||

46. *Rfilename_id* # in set: 2.

|?| |||

47. *Rnamespace_phrase* # in set: 2.

, |?|

48. *Rnamespace* # in set: 2.

|?| |||

49. *Rnamespace_id* # in set: 2.

|?| |||

50. *Rsym_defs_phrase* # in set: 2.

{ |?|

51. *Rsym_defs* # in set: 2.

|?| |||

52. *Rsym_def* # in set: 2.

|?| |||

53. *Rsym_def1* # in set: 1.

|||

54. *Ropen_brace* # in set: 2.

{ |?|

55. *Rclose_brace* # in set: 2.

|?| }

56. *Rlint^ε* # in set: 1.

|||

57. LR State Network.

List of productions with their derived LR state lists. Their subrule number and symbol string indicates the specific production being derived. The “ \triangleright ” symbol indicates the production’s list of derived states from its closure state. Multiple lists within a production indicate 1 of 2 things:

- 1) derived string that could not be merged due to a lr(1) conflict
- 2) partially derived string merged into another derived lr states

A partially derived string is indicated by the “merged into” symbol \nearrow used as a superscript along with the merged into state number.

58. Rrc_phrase.

```
1 Rlint  Ropen_par  Rlint  Rparameters  Rlint  Rclose_par  Rlint  Rsym_defs_phrase  Rlint
  ▷ 1  4  5  6  7  8  9  10  13  14
```

59. Ropen_par.

```
1 |?|
  ▷ 4  27
2 (
  ▷ 4  28
```

60. Rclose_par.

```
1 |?|
  ▷ 8  51
2 )
  ▷ 8  52
```

61. Rparameters.

```
1 Rfilename_phrase  Rlint  Rnamespace_phrase
  ▷ 6  33  34  44
```

62. Rfilename_phrase.

```
1 Rfilename  Rlint  Rfilename_id
  ▷ 6  45  46  50
```

63. Rfilename.

```
1 |||  # file-name  NS_identifier::TH_identifier
  ▷ 6  30  32
2 |||  |?|  NULL
  ▷ 6  30  31
3 |?|
  ▷ 6  29
```

64. Rfilename_id.

```
1 ||| identifier NS_identifier::TH_identifier
  ▷ 46 48 49
2 |?|
  ▷ 46 47
```

65. Rnamespace_phrase.

```
1 , Rlint Rnamespace Rlint Rnamespace_id
  ▷ 34 36 37 38 39 43
2 |?|
  ▷ 34 35
```

66. Rnamespace.

```
1 ||| # name-space NS_identifier::TH_identifier
  ▷ 37 65 67
2 ||| |?| NULL
  ▷ 37 65 66
3 |?|
  ▷ 37 64
```

67. Rnamespace_id.

```
1 ||| identifier NS_identifier::TH_identifier
  ▷ 39 41 42
2 |?|
  ▷ 39 40
```

68. Rsym_defs_phrase.

```
1 Ropen_brace Rlint Rsym_defs Rclose_brace
  ▷ 10 15 16 17 26
```

69. Rsym_defs.

```
1 Rsym_def Rlint
  ▷ 16 62 63
2 Rsym_defs Rsym_def1 Rlint
  ▷ 16 17 60 61
```

70. Rsym_def.

```

1 ||| terminal-def NS_term_def_ph::TH_term_def_ph
  ▷ 16 54 59
2 ||| |?| NULL
  ▷ 16 54 55
3 ||| # lrk-sufx NULL
  ▷ 16 54 58
4 ||| # terminals-refs NULL
  ▷ 16 54 56
5 ||| # terminals-sufx NULL
  ▷ 16 54 57
6 |?|
  ▷ 16 53

```

71. Rsym_def1.

```

1 ||| terminal-def NS_term_def_ph::TH_term_def_ph
  ▷ 17 19 24
2 ||| |+| NULL
  ▷ 17 19 20
3 ||| # lrk-sufx NULL
  ▷ 17 19 23
4 ||| # terminals-refs NULL
  ▷ 17 19 21
5 ||| # terminals-sufx NULL
  ▷ 17 19 22

```

72. Ropen_brace.

```

1 |?|
  ▷ 10 11
2 {
  ▷ 10 12

```

73. Rclose_brace.

```

1 |?|
  ▷ 17 18
2 }
  ▷ 17 25

```

74. Rlint.

```

1 ||| lint NS.lint_balls::TH.lint_balls
  ▷ 1 2 3
  ▷ 5↗2
  ▷ 7↗2
  ▷ 9↗2
  ▷ 13↗2
  ▷ 15↗2
  ▷ 33↗2
  ▷ 36↗2
  ▷ 38↗2
  ▷ 45↗2
  ▷ 60↗2
  ▷ 62↗2
2 ∈
  ▷ 1
  ▷ 5
  ▷ 7
  ▷ 9
  ▷ 13
  ▷ 15
  ▷ 33
  ▷ 36
  ▷ 38
  ▷ 45
  ▷ 60
  ▷ 62

```

75. List of reducing states.

The following legend indicates the type of reducing state.

Points 2--4 are states that must meet the lr(1) condition:

- 1) r --- only 1 production reducing
- 2) r² --- 2 or more reducing productions
- 3) s/r --- shift and 1 reducing production
- 4) s/r² --- shift and multiple reducing productions

\subset	$1^{s/r}$	3^r	$5^{s/r}$	$7^{s/r}$	$9^{s/r}$	11^r	12^r	$13^{s/r}$	14^r	$15^{s/r}$	18^r	20^r	21^r	22^r
23^r	24^r	25^r	26^r	27^r	28^r	29^r	31^r	32^r	$33^{s/r}$	35^r	$36^{s/r}$	$38^{s/r}$	40^r	
42^r	43^r	44^r	$45^{s/r}$	47^r	49^r	50^r	51^r	52^r	53^r	55^r	56^r	57^r	58^r	59^r
$60^{s/r}$	61^r	$62^{s/r}$	63^r	64^r	66^r	67^r								

76. Lr1 State's Follow sets and reducing lookahead sets.

Notes on Follow set expressions:

1) The “follow set” for rule uses its literal name and tags its grammar rule rank number as a superscript. Due to space limitations, part of the follow set information uses the rule’s literal name while the follow set expressions refers to the rule’s rank number. This $\langle \text{rule name}, \text{rule rank number} \rangle$ tuple allows you the reader to decipher the expressions. Transitions are represented by $S_x R_z$ whereby S is the LR1 state identified by its ‘‘x’’ subscript where other transient calculations occur within the LR1 state network. R indicates the follow set rule with the subscript ‘‘z’’ as its grammar rank number that contributes to the follow set.

The \nearrow^x symbol indicates that a merge into state ‘‘x’’ has taken place. That is, the reduced subrule that depends on this follow set finds its follow set in 2 places: its birthing state that generated the sequence up to the merged into state, and the birthing state that generated the ‘‘merged into’’ state. So the rule’s ‘‘follow set’’ calculation must also continue its calculation within the birth state generating the ‘‘x merged into’’ state.

```

State: 1 Follow Set contributors, merges, and transitions
← Follow set Rule → ← follow set symbols contributors →
Rrc_phrase1

Local follow set yield:
eolr.

← Follow set Rule → ← follow set symbols contributors →
Rlint17 R1.1.1 ↗45 ↗38 ↗36 ↗33 ↗62 ↗60 ↗15 ↗9 ↗7 ↗5
          ↗13

Local follow set yield:
|?|, (. .

State: 4 Follow Set contributors, merges, and transitions
← Follow set Rule → ← follow set symbols contributors →
Ropen_par2 R1.1.2 R1.1.3

Local follow set yield:
|?|, |||.

State: 5 Follow Set contributors, merges, and transitions
← Follow set Rule → ← follow set symbols contributors →
Rlint17 R1.1.3

Local follow set yield:
|?|, |||.

State: 6 Follow Set contributors, merges, and transitions
← Follow set Rule → ← follow set symbols contributors →
Rparameters4 R1.1.4 R1.1.5

Local follow set yield:
|?|, |||, ).

← Follow set Rule → ← follow set symbols contributors →
Rfilename_phrase5 R4.1.1 R4.1.2

Local follow set yield:
|?|, |||, ,.

← Follow set Rule → ← follow set symbols contributors →

```

```

Rfilename6           R5.1.1 R5.1.2
Local follow set yield:
|?|, |||.

State: 7 Follow Set contributors, merges, and transitions
← Follow set Rule → ← follow set symbols contributors →
Rint17             R1.1.5
Local follow set yield:
|?|, ).

State: 8 Follow Set contributors, merges, and transitions
← Follow set Rule → ← follow set symbols contributors →
Rclose_par3        R1.1.6 R1.1.7
Local follow set yield:
|?|, |||, {.

State: 9 Follow Set contributors, merges, and transitions
← Follow set Rule → ← follow set symbols contributors →
Rint17             R1.1.7
Local follow set yield:
|?|, {.

State: 10 Follow Set contributors, merges, and transitions
← Follow set Rule → ← follow set symbols contributors →
Rsym_defs_phrase11  R1.1.8 R1.1.9 S1R1
Local follow set yield:
|||.
← Follow set Rule → ← follow set symbols contributors →
Ropen_brace15      R11.1.1 R11.1.2
Local follow set yield:
|?|, |||.

State: 13 Follow Set contributors, merges, and transitions
← Follow set Rule → ← follow set symbols contributors →
Rint17             R1.1.9 S1R1
Local follow set yield:

State: 15 Follow Set contributors, merges, and transitions
← Follow set Rule → ← follow set symbols contributors →
Rint17             R11.1.2
Local follow set yield:
|?|, |||.

State: 16 Follow Set contributors, merges, and transitions
← Follow set Rule → ← follow set symbols contributors →
Rsym_defs12        R11.1.3 R12.2.1
Local follow set yield:
|?|, |||, }.
← Follow set Rule → ← follow set symbols contributors →
Rsym_def13         R12.1.1 R12.1.2 S16R12
Local follow set yield:

```

|||.

State: 17 Follow Set contributors, merges, and transitions
 \leftarrow Follow set Rule $\rightarrow \leftarrow$ follow set symbols contributors \rightarrow
 $R_{sym_def1}^{14}$ $R_{12.2.2} R_{12.2.3} S_{16} R_{12}$

Local follow set yield:

|||.

\leftarrow Follow set Rule $\rightarrow \leftarrow$ follow set symbols contributors \rightarrow
 $R_{close_brace}^{16}$ $R_{11.1.4} S_{10} R_{11}$

Local follow set yield:

State: 33 Follow Set contributors, merges, and transitions
 \leftarrow Follow set Rule $\rightarrow \leftarrow$ follow set symbols contributors \rightarrow
 R_{lint}^{17} $R_{4.1.2}$

Local follow set yield:

|?|, ,.

State: 34 Follow Set contributors, merges, and transitions
 \leftarrow Follow set Rule $\rightarrow \leftarrow$ follow set symbols contributors \rightarrow
 $R_{namespace_phrase}^8$ $R_{4.1.3} S_6 R_4$

Local follow set yield:

State: 36 Follow Set contributors, merges, and transitions
 \leftarrow Follow set Rule $\rightarrow \leftarrow$ follow set symbols contributors \rightarrow
 R_{lint}^{17} $R_{8.1.2}$

Local follow set yield:

|?|, |||.

State: 37 Follow Set contributors, merges, and transitions
 \leftarrow Follow set Rule $\rightarrow \leftarrow$ follow set symbols contributors \rightarrow
 $R_{namespace}^9$ $R_{8.1.3} R_{8.1.4}$

Local follow set yield:

|?|, |||.

State: 38 Follow Set contributors, merges, and transitions
 \leftarrow Follow set Rule $\rightarrow \leftarrow$ follow set symbols contributors \rightarrow
 R_{lint}^{17} $R_{8.1.4}$

Local follow set yield:

|?|, |||.

State: 39 Follow Set contributors, merges, and transitions
 \leftarrow Follow set Rule $\rightarrow \leftarrow$ follow set symbols contributors \rightarrow
 $R_{namespace_id}^{10}$ $R_{8.1.5} S_{34} R_8$

Local follow set yield:

State: 45 Follow Set contributors, merges, and transitions
 \leftarrow Follow set Rule $\rightarrow \leftarrow$ follow set symbols contributors \rightarrow
 R_{lint}^{17} $R_{5.1.2}$

Local follow set yield:

|?|, |||.

State: 46 Follow Set contributors, merges, and transitions
← Follow set Rule → ← follow set symbols contributors →
Rfilename_id⁷ R_{5.1..3} S₆R₅

Local follow set yield:

State: 60 Follow Set contributors, merges, and transitions
← Follow set Rule → ← follow set symbols contributors →
Rlint¹⁷ R_{12..2..3} S₁₆R₁₂

Local follow set yield:

State: 62 Follow Set contributors, merges, and transitions
← Follow set Rule → ← follow set symbols contributors →
Rlint¹⁷ R_{12..1..2} S₁₆R₁₂

Local follow set yield:

77. Common Follow sets.

78. LA set: 1.

eolr.

79. LA set: 2.

$|?|, |r|.$

80. LA set: 3.

$|?|,).$

81. LA set: 4.

$|?|, \{.$

82. LA set: 5.

$|?|, |r|, \}.$

83. LA set: 6.

$|?|, ,.$

84. LA set: 7.

$|?|, |r|,).$

85. LA set: 8.

$|?|, |r|, ,.$

86. LA set: 9.

$|?|, |r|, \{.$

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rc_phrase_th_idx.w

Date: January 14, 2015 at 15:41

File: rc_phrase_th_idx.w

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