

roll_ap

Design Description

bpotter

roll_ap: Design Description

bpotter

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Table of Contents

1. Model Version	1
2. Root System	2
2.1. Interface	2
2.1.1. Input Signals	2
2.1.2. Output Signals	3
2.2. Blocks	4
2.2.1. Parameters	4
2.2.2. Block Execution Order	10
3. Subsystems	11
3.1. Latch Phi	11
3.1.1. Blocks	11
3.2. Roll Reference	14
3.2.1. Interface	14
3.2.2. Blocks	15
3.2.3. Block Execution Order	22
3.3. Angle_Diff	23
3.3.1. Blocks	23
3.4. Heading_Mode	29
3.4.1. Interface	30
3.4.2. Blocks	31
3.4.3. Block Execution Order	34
3.5. attitude_controller	34
3.5.1. Interface	34
3.5.2. Blocks	35
3.5.3. Block Execution Order	43
3.6. ResetIntegratorInternal	43
3.6.1. Blocks	43
4. System Design Variables	51
4.1. Design Variable Details	51
5. Requirements Traceability	55
5.1. Model Information for "roll_ap"	55
5.2. Document Summary for "roll_ap"	55
5.3. System - roll_ap	56
5.4. System - Roll Reference	66
5.5. System - Latch Phi	83
5.6. Systems in "roll_ap" that have no links to requirements	83
6. System Model Configuration	84
7. Glossary	101
8. About this Report	102
8.1. Report Overview	102
8.2. Root System Description	102
8.3. Subsystem Descriptions	103
8.4. State Chart Descriptions	103

List of Figures

2.1. roll_ap	2
3.1. roll_ap/Roll Reference/Latch Phi	11
3.2. roll_ap/Roll Reference	14
3.3. Heading_Mode/Angle_Diff	23
3.4. Heading_Mode	30
3.5. attitude_controller	34
3.6. attitude_controller/ResetIntegratorInternal	43

List of Tables

2.1.	2
2.2.	2
2.3.	3
2.4.	3
2.5.	3
2.6.	3
2.7.	3
2.8.	3
2.9.	3
2.10. "Ail Cmd" Parameters	4
2.11. "AP Eng" Parameters	4
2.12. "Basic Roll Mode" Parameters	5
2.13. "Eng switch" Parameters	5
2.14. "HDG Mode" Parameters	6
2.15. "HDG Ref" Parameters	6
2.16. "Heading Mode" Parameters	7
2.17. "Mode switch" Parameters	7
2.18. "p" Parameters	8
2.19. "Phi" Parameters	8
2.20. "Psi" Parameters	8
2.21. "TAS" Parameters	9
2.22. "Turn Knob" Parameters	9
2.23. "zero" Parameters	9
3.1. "E" Parameters	12
3.2. "Enable" Parameters	12
3.3. "FixPt Data Type Duplicate1" Parameters	13
3.4. "FixPt Unit Delay1" Parameters	13
3.5. "u" Parameters	13
3.6. "y" Parameters	13
3.7.	15
3.8.	15
3.9.	15
3.10.	15
3.11. "Abs" Parameters	15
3.12. "AP eng" Parameters	16
3.13. "minus six" Parameters	16
3.14. "Not engaged" Parameters	17
3.15. "or" Parameters	17
3.16. "Phi" Parameters	17
3.17. "Phi Ref" Parameters	18
3.18. "ref switch" Parameters	18
3.19. "Ref Threshold" Parameters	19
3.20. "Ref Threshold1" Parameters	19
3.21. "six" Parameters	20
3.22. "three" Parameters	20
3.23. "TK switch" Parameters	21
3.24. "TK Threshold" Parameters	21
3.25. "Turn Knob" Parameters	22
3.26. "zero" Parameters	22
3.27. "abs" Parameters	23
3.28. "constant" Parameters	24

3.29. "constant1" Parameters	24
3.30. "diff" Parameters	24
3.31. "floor" Parameters	25
3.32. "minus" Parameters	25
3.33. "plus" Parameters	26
3.34. "product" Parameters	26
3.35. "product1" Parameters	26
3.36. "product2" Parameters	27
3.37. "signum" Parameters	28
3.38. "sum" Parameters	28
3.39. "sum1" Parameters	28
3.40. "sum2" Parameters	29
3.41.	30
3.42.	30
3.43.	30
3.44.	31
3.45. "Disp Gain" Parameters	31
3.46. "Phi Cmd" Parameters	31
3.47. "Product" Parameters	32
3.48. "Psi" Parameters	33
3.49. "Psi Ref" Parameters	33
3.50. "TAS" Parameters	33
3.51.	34
3.52.	35
3.53.	35
3.54.	35
3.55.	35
3.56. "Cmd Limit" Parameters	35
3.57. "Disp Gain" Parameters	36
3.58. "Disp Limit" Parameters	36
3.59. "Disp_Cmd" Parameters	37
3.60. "Disp_FB " Parameters	37
3.61. "Engaged" Parameters	38
3.62. "Int Gain" Parameters	38
3.63. "Not engaged" Parameters	38
3.64. "Rate Gain" Parameters	39
3.65. "Rate Limit" Parameters	39
3.66. "Rate_FB" Parameters	40
3.67. "Sum" Parameters	40
3.68. "Sum1" Parameters	41
3.69. "Sum2" Parameters	41
3.70. "Surf_Cmd" Parameters	42
3.71. "Constant" Parameters	43
3.72. "Constant1" Parameters	44
3.73. "Constant2" Parameters	44
3.74. "Product" Parameters	45
3.75. "Product1" Parameters	45
3.76. "R" Parameters	46
3.77. "Saturation" Parameters	46
3.78. "Sum" Parameters	47
3.79. "Switch" Parameters	47
3.80. "Switch1" Parameters	48
3.81. "U" Parameters	49
3.82. "X" Parameters	49

3.83. "Y" Parameters	49
4.1. dispGain	51
4.2. dispGain.CoderInfo	51
4.3. hdgGain	52
4.4. hdgGain.CoderInfo	52
4.5. intGain	52
4.6. intGain.CoderInfo	53
4.7. rateGain	53
4.8. rateGain.CoderInfo	53
5.1. roll_ap Version Information	55
5.2. Requirements documents linked in model	55
5.3. Blocks in "roll_ap" that have requirements	56
5.4. Objects in "roll_ap" that are not linked to requirements	66
5.5. roll_ap/Roll Reference Requirements	67
5.6. Blocks in "Roll Reference" that have requirements	67
5.7. Objects in "Latch Phi" that are not linked to requirements	83
5.8. Systems and subsystem blocks in "roll_ap" that have no links to requirements	83
6.1. roll_ap Configuration Set	84
6.2. roll_ap Configuration Set.Components(1)	84
6.3. roll_ap Configuration Set.Components(2)	85
6.4. roll_ap Configuration Set.Components(3)	86
6.5. roll_ap Configuration Set.Components(4)	87
6.6. roll_ap Configuration Set.Components(5)	89
6.7. roll_ap Configuration Set.Components(6)	91
6.8. roll_ap Configuration Set.Components(7)	91
6.9. roll_ap Configuration Set.Components(8)	92
6.10. roll_ap Configuration Set.Components(9)	94
6.11. roll_ap Configuration Set.Components(10)	94
6.12. roll_ap Configuration Set.Components(1).SampleTimeProperty	96
6.13. roll_ap Configuration Set.Components(8).Components(1)	96
6.14. roll_ap Configuration Set.Components(8).Components(2)	97
6.15. roll_ap Configuration Set.Components(8).Components(2).ReplacementTypes	100

Chapter 1. Model Version

Version: 1.164

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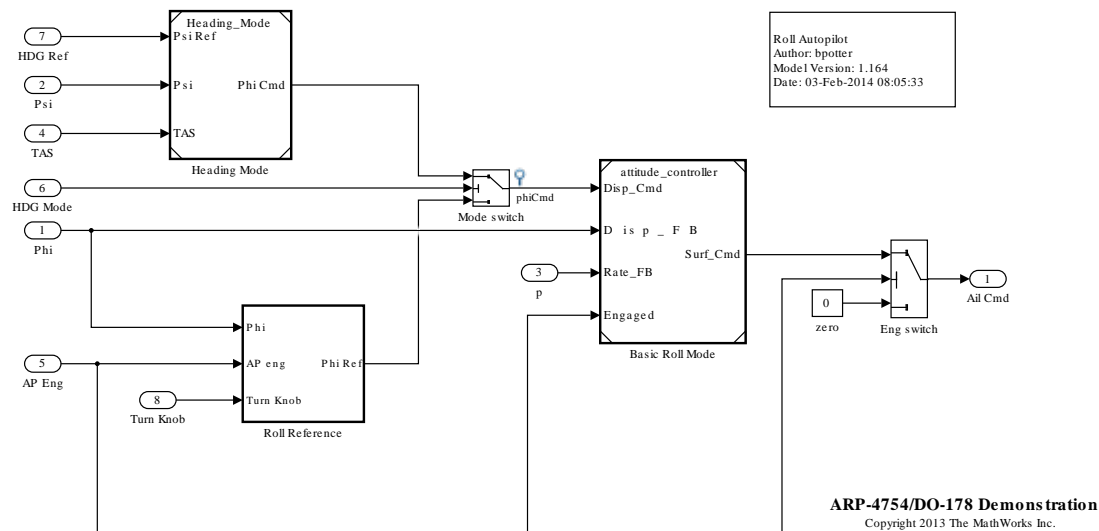
Checksum: 2694502046 3305692392 1986519701 1876337218

Chapter 2. Root System

Table of Contents

2.1. Interface	2
2.1.1. Input Signals	2
2.1.2. Output Signals	3
2.2. Blocks	4
2.2.1. Parameters	4
2.2.2. Block Execution Order	10

Figure 2.1. roll_ap



2.1. Interface

2.1.1. Input Signals

Table 2.1.

Description:
Data Type: boolean
Width: 1
Dimensions: [1 1]

Table 2.2.

Description:
Data Type: boolean
Width: 1
Dimensions: [1 1]

Table 2.3.

Description:

Data Type: double

Width: 1

Dimensions: [1 1]

Table 2.4.

Description:

Data Type: double

Width: 1

Dimensions: [1 1]

Table 2.5.

Description:

Data Type: double

Width: 1

Dimensions: [1 1]

Table 2.6.

Description:

Data Type: double

Width: 1

Dimensions: [1 1]

Table 2.7.

Description:

Data Type: double

Width: 1

Dimensions: [1 1]

Table 2.8.

Description:

Data Type: double

Width: 1

Dimensions: [1 1]

2.1.2. Output Signals

Table 2.9.

Description:

Data Type: double

Width: 1

Dimensions: [1 1]

2.2. Blocks

2.2.1. Parameters

2.2.1.1. "Ail Cmd" (Outport)

Table 2.10. "Ail Cmd" Parameters

Parameter	Value
Port number	1
Icon display	Port number
Minimum	[]
Maximum	[]
Data type	double
Lock output data type setting against changes by the fixed-point tools	off
Output as nonvirtual bus in parent model	off
Port dimensions (-1 for inherited)	1
Variable-size signal	Inherit
Sample time (-1 for inherited)	1/40
Signal type	real
Source of initial output value	Dialog
Output when disabled	held
Initial output	[]

2.2.1.2. "AP Eng" (Inport)

Table 2.11. "AP Eng" Parameters

Parameter	Value
Port number	5
Port dimensions (-1 for inherited)	1

Parameter	Value
Sample time (-1 for inherited)	1/40
Minimum	[]
Maximum	[]
Data type	boolean

2.2.1.3. "Basic Roll Mode" (ModelReference)

Table 2.12. "Basic Roll Mode" Parameters

Parameter	Value
Model name	attitude_controller
	attitude_controller.slx
	attitude_controller
Model arguments	dispGain,dispLim,rateGain,rateLim,intGain,intLim,cmdLim
Model argument values (for this instance)	dispGain,30,rateGain,6,intGain,5,15
Simulation mode	Normal
Variant	off
Generate Preprocessor Conditionals	off

2.2.1.4. "Eng switch" (Switch)

Table 2.13. "Eng switch" Parameters

Parameter	Value
Criteria for passing first input	u2 ~= 0
Threshold	0
Require all data port inputs to have the same data type	off
Output minimum	[]
Output maximum	[]
Output data type	Inherit: Inherit via internal rule
Lock output data type setting against changes by the fixed-point tools	off

Parameter	Value
Integer rounding mode	Floor
Saturate on integer overflow	off
Enable zero-crossing detection	on
Sample time (-1 for inherited)	-1
Allow different data input sizes (Results in variable-size output signal)	off

2.2.1.5. "HDG Mode" (Inport)

Table 2.14. "HDG Mode" Parameters

Parameter	Value
Port number	6
Port dimensions (-1 for inherited)	1
Sample time (-1 for inherited)	1/40
Minimum	[]
Maximum	[]
Data type	boolean

2.2.1.6. "HDG Ref" (Inport)

Table 2.15. "HDG Ref" Parameters

Parameter	Value
Port number	7
Port dimensions (-1 for inherited)	1
Sample time (-1 for inherited)	1/40
Minimum	-180
Maximum	180
Data type	double

2.2.1.7. "Heading Mode" (ModelReference)

Table 2.16. "Heading Mode" Parameters

Parameter	Value
Model name	Heading_Mode
	Heading_Mode.slx
	Heading_Mode
Model arguments	hdgGain
Model argument values (for this instance)	hdgGain
Simulation mode	Normal
Variant	off
Generate Preprocessor Conditionals	off

2.2.1.8. "Mode switch" (Switch)

Table 2.17. "Mode switch" Parameters

Parameter	Value
Criteria for passing first input	$u_2 \approx 0$
Threshold	0
Require all data port in- puts to have the same data type	off
Output minimum	[]
Output maximum	[]
Output data type	Inherit: Inherit via internal rule
Lock output data type se- tting against changes by the fixed-point tools	off
Integer rounding mode	Floor
Saturate on integer overf- low	off
Enable zero-crossing det- ection	on
Sample time (-1 for inhe- rited)	-1
Allow different data inp- ut sizes (Results in varia- ble-size output signal)	off

2.2.1.9. "p" (Inport)

Table 2.18. "p" Parameters

Parameter	Value
Port number	3
Port dimensions (-1 for inherited)	1
Sample time (-1 for inherited)	1/40
Minimum	-180
Maximum	180
Data type	double

2.2.1.10. "Phi" (Inport)

Table 2.19. "Phi" Parameters

Parameter	Value
Port number	1
Port dimensions (-1 for inherited)	1
Sample time (-1 for inherited)	1/40
Minimum	-180
Maximum	180
Data type	double

2.2.1.11. "Psi" (Inport)

Table 2.20. "Psi" Parameters

Parameter	Value
Port number	2
Port dimensions (-1 for inherited)	1
Sample time (-1 for inherited)	1/40
Minimum	-180
Maximum	180

Parameter	Value
Data type	double

2.2.1.12. "TAS" (Inport)

Table 2.21. "TAS" Parameters

Parameter	Value
Port number	4
Port dimensions (-1 for inherited)	1
Sample time (-1 for inherited)	1/40
Minimum	0
Maximum	1000
Data type	double

2.2.1.13. "Turn Knob" (Inport)

Table 2.22. "Turn Knob" Parameters

Parameter	Value
Port number	8
Port dimensions (-1 for inherited)	1
Sample time (-1 for inherited)	1/40
Minimum	-45
Maximum	45
Data type	double

2.2.1.14. "zero" (Constant)

Table 2.23. "zero" Parameters

Parameter	Value
Constant value	0
Interpret vector parameters as 1-D	on
Sampling mode	Sample based

Parameter	Value
Output minimum	[]
Output maximum	[]
Output data type	double
Lock output data type setting against changes by the fixed-point tools	off
Sample time	inf
Frame period	inf

2.2.2. Block Execution Order

1. Heading Mode [6] (ModelReference)
2. *Roll Reference* [66]
3. Mode switch [7] (Switch)
4. Basic Roll Mode [5] (ModelReference)
5. zero [9] (Constant)
6. Eng switch [5] (Switch)
7. Ail Cmd [4] (Outport)

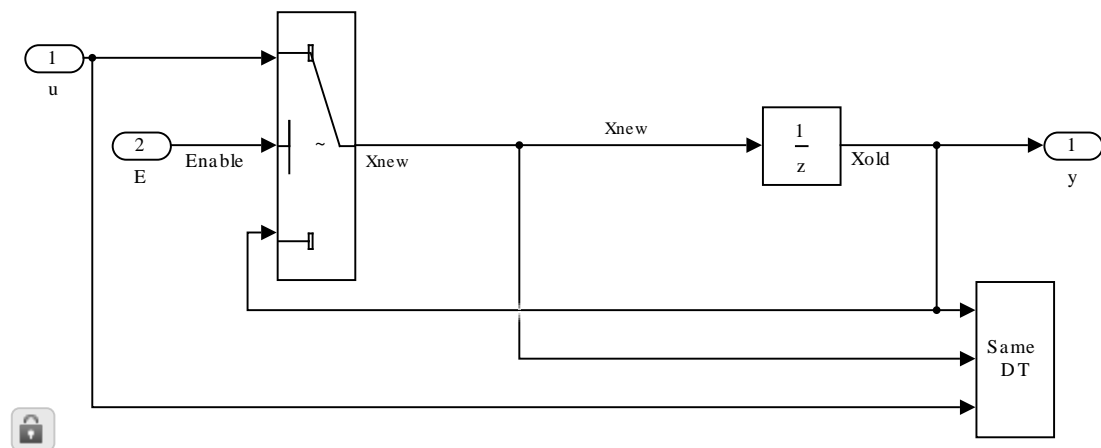
Chapter 3. Subsystems

Table of Contents

3.1. Latch Phi	11
3.1.1. Blocks	11
3.2. Roll Reference	14
3.2.1. Interface	14
3.2.2. Blocks	15
3.2.3. Block Execution Order	22
3.3. Angle_Diff	23
3.3.1. Blocks	23
3.4. Heading_Mode	29
3.4.1. Interface	30
3.4.2. Blocks	31
3.4.3. Block Execution Order	34
3.5. attitude_controller	34
3.5.1. Interface	34
3.5.2. Blocks	35
3.5.3. Block Execution Order	43
3.6. ResetIntegratorInternal	43
3.6.1. Blocks	43

3.1. Latch Phi

Figure 3.1. roll_ap/Roll Reference/Latch Phi



3.1.1. Blocks

3.1.1.1. Parameters

3.1.1.1.1. "E" (Inport)

Table 3.1. "E" Parameters

Parameter	Value
Port number	2
Port dimensions (-1 for inherited)	-1
Sample time (-1 for inherited)	-1
Minimum	[]
Maximum	[]
Data type	Inherit: auto

3.1.1.1.2. "Enable" (Switch)

Table 3.2. "Enable" Parameters

Parameter	Value
Criteria for passing first input	u2 ~= 0
Threshold	0
Require all data port inputs to have the same data type	off
Output minimum	[]
Output maximum	[]
Output data type	Inherit: Inherit via back propagation
Lock output data type setting against changes by the fixed-point tools	off
Integer rounding mode	Floor
Saturate on integer overflow	off
Enable zero-crossing detection	off
Sample time (-1 for inherited)	-1
Allow different data input sizes (Results in variable-size output signal)	off

3.1.1.1.3. "FixPt Data Type Duplicate1" (DataTypeDuplicate)**Table 3.3. "FixPt Data Type Duplicate1" Parameters**

Parameter	Value
Number of input ports	3

3.1.1.1.4. "FixPt Unit Delay1" (UnitDelay)**Table 3.4. "FixPt Unit Delay1" Parameters**

Parameter	Value
Initial condition	vinit
Input processing	Inherited
Sample time (-1 for inherited)	tsamp
State name must resolve to Simulink signal object	off

3.1.1.1.5. "u" (Inport)**Table 3.5. "u" Parameters**

Parameter	Value
Port number	1
Port dimensions (-1 for inherited)	-1
Sample time (-1 for inherited)	-1
Minimum	[]
Maximum	[]
Data type	Inherit: auto

3.1.1.1.6. "y" (Outport)**Table 3.6. "y" Parameters**

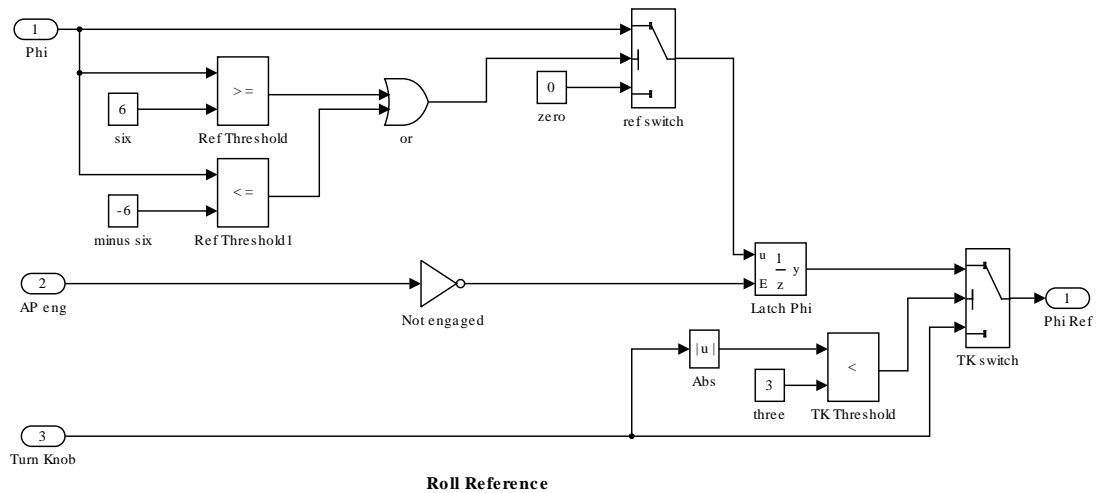
Parameter	Value
Port number	1
Icon display	Port number
Minimum	[]

Parameter	Value
Maximum	[]
Data type	Inherit: auto
Lock output data type setting against changes by the fixed-point tools	off
Output as nonvirtual bus in parent model	off
Port dimensions (-1 for inherited)	-1
Variable-size signal	Inherit
Sample time (-1 for inherited)	-1
Source of initial output value	Dialog
Output when disabled	held
Initial output	[]

3.2. Roll Reference

Checksum: 3428552710 1173909168 369841669 1732812115

Figure 3.2. roll_ap/Roll Reference



3.2.1. Interface

3.2.1.1. Input Signals

The following tables describe external signals used to compute the subsystem's inputs. The name of the input signal is the name of the input port that accepts the signal. The number in angle brackets is the number of the input port. A dimension of [1 1] indicates a scalar signal.

Table 3.7.

Description:
Data Type: boolean
Width: 1
Dimensions: [1 1]

Table 3.8.

Description:
Data Type: double
Width: 1
Dimensions: [1 1]

Table 3.9.

Description:
Data Type: double
Width: 1
Dimensions: [1 1]

3.2.1.2. Output Signals

The following tables describe the signals output by this system. The name of the output signal is the name of the signal's parent block, i.e., the block that computes the signal. The number in angle brackets is the number of the port that emits the signal.

Table 3.10.

Description:
Data Type: double
Width: 1
Dimensions: [1 1]

3.2.2. Blocks

3.2.2.1. Parameters

3.2.2.1.1. "Abs" (Abs)

Table 3.11. "Abs" Parameters

Parameter	Value
Enable zero-crossing detection	on

Parameter	Value
Sample time (-1 for inherited)	-1
Output minimum	[]
Output maximum	[]
Output data type	Inherit: Same as input
Lock output data type setting against changes by the fixed-point tools	off
Integer rounding mode	Floor
Saturate on integer overflow	off

3.2.2.1.2. "AP eng" (Inport)

Table 3.12. "AP eng" Parameters

Parameter	Value
Port number	2
Port dimensions (-1 for inherited)	-1
Sample time (-1 for inherited)	-1
Minimum	[]
Maximum	[]
Data type	Inherit: auto

3.2.2.1.3. "minus six" (Constant)

Table 3.13. "minus six" Parameters

Parameter	Value
Constant value	-6
Interpret vector parameters as 1-D	on
Sampling mode	Sample based
Output minimum	[]
Output maximum	[]
Output data type	Inherit: Inherit from 'Constant value'
Lock output data type setting against changes by the fixed-point tools	off

Parameter	Value
Sample time	inf
Frame period	inf

3.2.2.1.4. "Not engaged" (Logic)

Table 3.14. "Not engaged" Parameters

Parameter	Value
Operator	NOT
Number of input ports	2
Icon shape	distinctive
Require all inputs and output to have the same data type	off
Output data type	boolean
Sample time (-1 for inherited)	-1

3.2.2.1.5. "or" (Logic)

Table 3.15. "or" Parameters

Parameter	Value
Operator	OR
Number of input ports	2
Icon shape	distinctive
Require all inputs and output to have the same data type	on
Output data type	boolean
Sample time (-1 for inherited)	-1

3.2.2.1.6. "Phi" (Inport)

Table 3.16. "Phi" Parameters

Parameter	Value
Port number	1

Parameter	Value
Port dimensions (-1 for inherited)	-1
Sample time (-1 for inherited)	-1
Minimum	[]
Maximum	[]
Data type	Inherit: auto

3.2.2.1.7. "Phi Ref" (Outport)

Table 3.17. "Phi Ref" Parameters

Parameter	Value
Port number	1
Icon display	Port number
Minimum	[]
Maximum	[]
Data type	Inherit: auto
Lock output data type setting against changes by the fixed-point tools	off
Output as nonvirtual bus in parent model	off
Port dimensions (-1 for inherited)	-1
Variable-size signal	Inherit
Sample time (-1 for inherited)	-1
Source of initial output value	Dialog
Output when disabled	held
Initial output	[]

3.2.2.1.8. "ref switch" (Switch)

Table 3.18. "ref switch" Parameters

Parameter	Value
Criteria for passing first input	u2 ~= 0
Threshold	0

Parameter	Value
Require all data port inputs to have the same data type	off
Output minimum	[]
Output maximum	[]
Output data type	Inherit: Inherit via internal rule
Lock output data type setting against changes by the fixed-point tools	off
Integer rounding mode	Floor
Saturate on integer overflow	off
Enable zero-crossing detection	on
Sample time (-1 for inherited)	-1
Allow different data input sizes (Results in variable-size output signal)	off

3.2.2.1.9. "Ref Threshold" (RelationalOperator)

Table 3.19. "Ref Threshold" Parameters

Parameter	Value
Relational operator	>=
Require all inputs to have the same data type	on
Output data type	boolean
Enable zero-crossing detection	on
Sample time (-1 for inherited)	-1

3.2.2.1.10. "Ref Threshold1" (RelationalOperator)

Table 3.20. "Ref Threshold1" Parameters

Parameter	Value
Relational operator	<=
Require all inputs to have the same data type	on

Parameter	Value
Output data type	boolean
Enable zero-crossing detection	on
Sample time (-1 for inherited)	-1

3.2.2.1.11. "six" (Constant)

Table 3.21. "six" Parameters

Parameter	Value
Constant value	6
Interpret vector parameters as 1-D	on
Sampling mode	Sample based
Output minimum	[]
Output maximum	[]
Output data type	Inherit: Inherit from 'Constant value'
Lock output data type setting against changes by the fixed-point tools	off
Sample time	inf
Frame period	inf

3.2.2.1.12. "three" (Constant)

Table 3.22. "three" Parameters

Parameter	Value
Constant value	3
Interpret vector parameters as 1-D	on
Sampling mode	Sample based
Output minimum	[]
Output maximum	[]
Output data type	double
Lock output data type setting against changes by the fixed-point tools	off
Sample time	inf
Frame period	inf

3.2.2.1.13. "TK switch" (Switch)

Table 3.23. "TK switch" Parameters

Parameter	Value
Criteria for passing first input	u2 ~= 0
Threshold	0
Require all data port inputs to have the same data type	off
Output minimum	[]
Output maximum	[]
Output data type	Inherit: Inherit via internal rule
Lock output data type setting against changes by the fixed-point tools	off
Integer rounding mode	Floor
Saturate on integer overflow	off
Enable zero-crossing detection	on
Sample time (-1 for inherited)	-1
Allow different data input sizes (Results in variable-size output signal)	off

3.2.2.1.14. "TK Threshold" (RelationalOperator)

Table 3.24. "TK Threshold" Parameters

Parameter	Value
Relational operator	<
Require all inputs to have the same data type	on
Output data type	boolean
Enable zero-crossing detection	on
Sample time (-1 for inherited)	-1

3.2.2.1.15. "Turn Knob" (Inport)

Table 3.25. "Turn Knob" Parameters

Parameter	Value
Port number	3
Port dimensions (-1 for inherited)	-1
Sample time (-1 for inherited)	-1
Minimum	[]
Maximum	[]
Data type	Inherit: auto

3.2.2.1.16. "zero" (Constant)

Table 3.26. "zero" Parameters

Parameter	Value
Constant value	0
Interpret vector parameters as 1-D	on
Sampling mode	Sample based
Output minimum	[]
Output maximum	[]
Output data type	Inherit: Inherit from 'Constant value'
Lock output data type setting against changes by the fixed-point tools	off
Sample time	inf
Frame period	inf

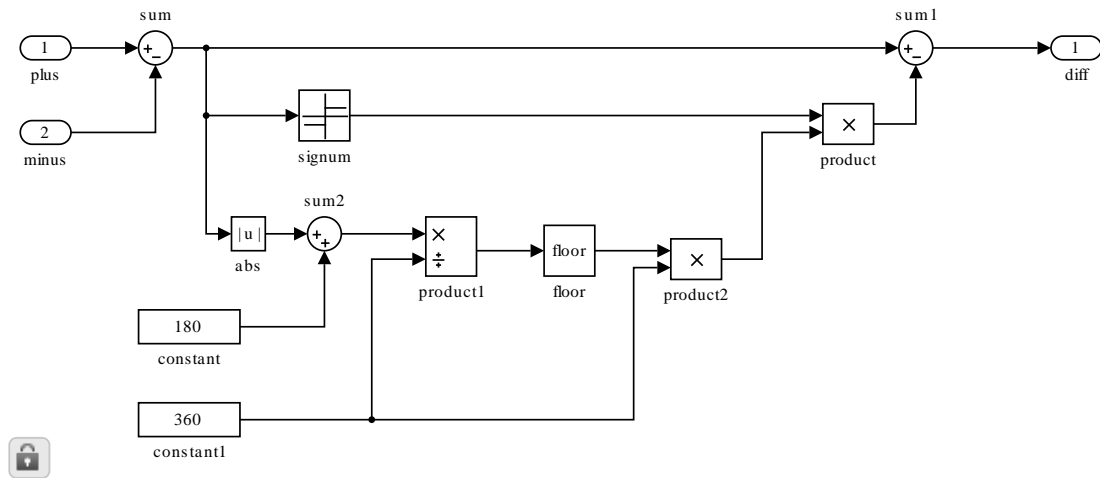
3.2.3. Block Execution Order

1. Abs [15] (Abs)
2. FixPt Data Type Duplicate1 [12] (DataTypeDuplicate)
3. six [20] (Constant)
4. Ref Threshold [19] (RelationalOperator)
5. minus six [16] (Constant)
6. Ref Threshold1 [19] (RelationalOperator)
7. or [17] (Logic)
8. zero [22] (Constant)
9. ref switch [18] (Switch)
10. Not engaged [17] (Logic)
11. FixPt Unit Delay1 [13] (UnitDelay)
12. Enable [12] (Switch)

- 13. three [20] (Constant)
- 14. TK Threshold [21] (RelationalOperator)
- 15. TK switch [21] (Switch)

3.3. Angle_Diff

Figure 3.3. Heading_Mode/Angle_Diff



3.3.1. Blocks

3.3.1.1. Parameters

3.3.1.1.1. "abs" (Abs)

Table 3.27. "abs" Parameters

Parameter	Value
Enable zero-crossing detection	off
Sample time (-1 for inherited)	-1
Output minimum	[]
Output maximum	[]
Output data type	Inherit: Same as input
Lock output data type setting against changes by the fixed-point tools	off
Integer rounding mode	Floor
Saturate on integer overflow	off

3.3.1.1.2. "constant" (Constant)

Table 3.28. "constant" Parameters

Parameter	Value
Constant value	180
Interpret vector parameters as 1-D	on
Sampling mode	Sample based
Output minimum	[]
Output maximum	[]
Output data type	Inherit: Inherit from 'Constant value'
Lock output data type setting against changes by the fixed-point tools	off
Sample time	inf
Frame period	inf

3.3.1.1.3. "constant1" (Constant)

Table 3.29. "constant1" Parameters

Parameter	Value
Constant value	360
Interpret vector parameters as 1-D	on
Sampling mode	Sample based
Output minimum	[]
Output maximum	[]
Output data type	Inherit: Inherit from 'Constant value'
Lock output data type setting against changes by the fixed-point tools	off
Sample time	inf
Frame period	inf

3.3.1.1.4. "diff" (Outport)

Table 3.30. "diff" Parameters

Parameter	Value
Port number	1
Icon display	Port number

Parameter	Value
Minimum	[]
Maximum	[]
Data type	Inherit: auto
Lock output data type setting against changes by the fixed-point tools	off
Output as nonvirtual bus in parent model	off
Port dimensions (-1 for inherited)	-1
Variable-size signal	Inherit
Sample time (-1 for inherited)	-1
Source of initial output value	Dialog
Output when disabled	held
Initial output	[]

3.3.1.1.5. "floor" (Rounding)

Table 3.31. "floor" Parameters

Parameter	Value
Function	floor
Sample time (-1 for inherited)	-1

3.3.1.1.6. "minus" (Inport)

Table 3.32. "minus" Parameters

Parameter	Value
Port number	2
Port dimensions (-1 for inherited)	-1
Sample time (-1 for inherited)	-1
Minimum	[]
Maximum	[]
Data type	double

3.3.1.1.7. "plus" (Inport)

Table 3.33. "plus" Parameters

Parameter	Value
Port number	1
Port dimensions (-1 for inherited)	-1
Sample time (-1 for inherited)	-1
Minimum	[]
Maximum	[]
Data type	double

3.3.1.1.8. "product" (Product)

Table 3.34. "product" Parameters

Parameter	Value
Number of inputs	2
Multiplication	Element-wise(.*)
Multiply over	All dimensions
Dimension	1
Require all inputs to have the same data type	on
Output minimum	[]
Output maximum	[]
Output data type	Inherit: Same as first input
Lock output data type setting against changes by the fixed-point tools	off
Integer rounding mode	Zero
Saturate on integer overflow	off
Sample time (-1 for inherited)	-1

3.3.1.1.9. "product1" (Product)

Table 3.35. "product1" Parameters

Parameter	Value
Number of inputs	*/

Parameter	Value
Multiplication	Element-wise(.*)
Multiply over	All dimensions
Dimension	1
Require all inputs to have the same data type	on
Output minimum	[]
Output maximum	[]
Output data type	Inherit: Same as first input
Lock output data type setting against changes by the fixed-point tools	off
Integer rounding mode	Zero
Saturate on integer overflow	off
Sample time (-1 for inherited)	-1

3.3.1.1.10. "product2" (Product)

Table 3.36. "product2" Parameters

Parameter	Value
Number of inputs	2
Multiplication	Element-wise(.*)
Multiply over	All dimensions
Dimension	1
Require all inputs to have the same data type	on
Output minimum	[]
Output maximum	[]
Output data type	Inherit: Same as first input
Lock output data type setting against changes by the fixed-point tools	off
Integer rounding mode	Zero
Saturate on integer overflow	off
Sample time (-1 for inherited)	-1

3.3.1.1.11. "signum" (Signum)

Table 3.37. "signum" Parameters

Parameter	Value
Enable zero-crossing detection	off
Sample time (-1 for inherited)	-1

3.3.1.1.12. "sum" (Sum)

Table 3.38. "sum" Parameters

Parameter	Value
Icon shape	round
List of signs	+-
Sum over	All dimensions
Dimension	1
Require all inputs to have the same data type	on
Accumulator data type	Inherit: Same as first input
Output minimum	[]
Output maximum	[]
Output data type	Inherit: Same as first input
Lock data type settings against changes by the fixed-point tools	off
Integer rounding mode	Zero
Saturate on integer overflow	off
Sample time (-1 for inherited)	-1

3.3.1.1.13. "sum1" (Sum)

Table 3.39. "sum1" Parameters

Parameter	Value
Icon shape	round
List of signs	+-
Sum over	All dimensions
Dimension	1

Parameter	Value
Require all inputs to have the same data type	on
Accumulator data type	Inherit: Same as first input
Output minimum	[]
Output maximum	[]
Output data type	Inherit: Same as first input
Lock data type settings against changes by the fixed-point tools	off
Integer rounding mode	Zero
Saturate on integer overflow	off
Sample time (-1 for inherited)	-1

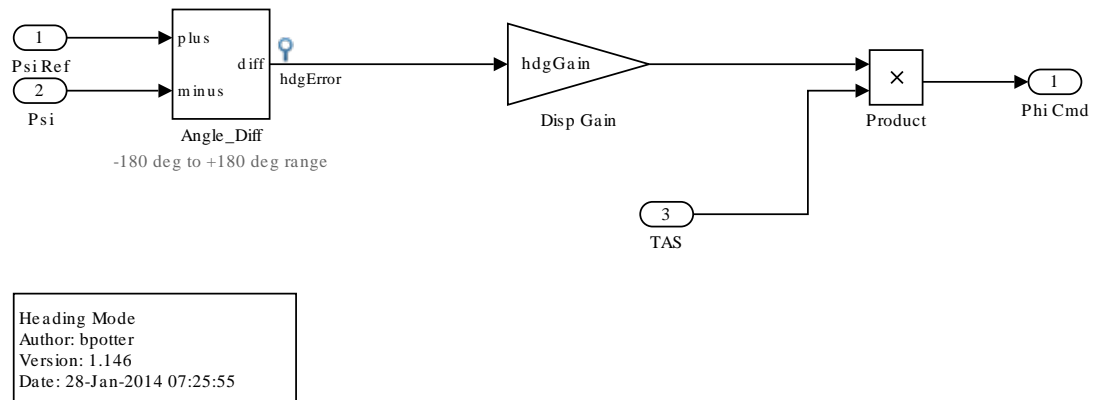
3.3.1.1.14. "sum2" (Sum)

Table 3.40. "sum2" Parameters

Parameter	Value
Icon shape	round
List of signs	++
Sum over	All dimensions
Dimension	1
Require all inputs to have the same data type	on
Accumulator data type	Inherit: Same as first input
Output minimum	[]
Output maximum	[]
Output data type	Inherit: Same as first input
Lock data type settings against changes by the fixed-point tools	off
Integer rounding mode	Zero
Saturate on integer overflow	off
Sample time (-1 for inherited)	-1

3.4. Heading_Mode

Checksum: 818383081 2669970868 4253932516 4253384806

Figure 3.4. Heading_Mode**ARP-4754/DO-178 Demonstration**

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3.4.1. Interface

3.4.1.1. Input Signals

The following tables describe external signals used to compute the subsystem's inputs. The name of the input signal is the name of the input port that accepts the signal. The number in angle brackets is the number of the input port. A dimension of [1 1] indicates a scalar signal.

Table 3.41.

Description:

Data Type: double

Width: 1

Dimensions: [1 1]

Table 3.42.

Description:

Data Type: double

Width: 1

Dimensions: [1 1]

Table 3.43.

Description:

Data Type: double

Width: 1

Dimensions: [1 1]

3.4.1.2. Output Signals

The following tables describe the signals output by this system. The name of the output signal is the name of the signal's parent block, i.e., the block that computes the signal. The number in angle brackets is the number of the port that emits the signal.

Table 3.44.

Description:

Data Type: double

Width: 1

Dimensions: [1 1]

3.4.2. Blocks

3.4.2.1. Parameters

3.4.2.1.1. "Disp Gain" (Gain)

Table 3.45. "Disp Gain" Parameters

Parameter	Value
Gain	hdgGain
Multiplication	Element-wise(K.*u)
Parameter minimum	[]
Parameter maximum	[]
Parameter data type	Inherit: Inherit via internal rule
Output minimum	[]
Output maximum	[]
Output data type	Inherit: Inherit via internal rule
Lock output data type setting against changes by the fixed-point tools	off
Integer rounding mode	Floor
Saturate on integer overflow	off
Sample time (-1 for inherited)	-1

3.4.2.1.2. "Phi Cmd" (Outport)

Table 3.46. "Phi Cmd" Parameters

Parameter	Value
Port number	1

Parameter	Value
Icon display	Port number
Minimum	[]
Maximum	[]
Data type	double
Lock output data type setting against changes by the fixed-point tools	off
Output as nonvirtual bus in parent model	off
Port dimensions (-1 for inherited)	1
Variable-size signal	Inherit
Sample time (-1 for inherited)	1/40
Signal type	real
Source of initial output value	Dialog
Output when disabled	held
Initial output	[]

3.4.2.1.3. "Product" (Product)

Table 3.47. "Product" Parameters

Parameter	Value
Number of inputs	2
Multiplication	Element-wise(.*)
Multiply over	All dimensions
Dimension	1
Require all inputs to have the same data type	off
Output minimum	[]
Output maximum	[]
Output data type	Inherit: Inherit via internal rule
Lock output data type setting against changes by the fixed-point tools	off
Integer rounding mode	Zero
Saturate on integer overflow	off
Sample time (-1 for inherited)	-1

3.4.2.1.4. "Psi" (Inport)**Table 3.48. "Psi" Parameters**

Parameter	Value
Port number	2
Port dimensions (-1 for inherited)	1
Sample time (-1 for inherited)	1/40
Minimum	[]
Maximum	[]
Data type	double

3.4.2.1.5. "Psi Ref" (Inport)**Table 3.49. "Psi Ref" Parameters**

Parameter	Value
Port number	1
Port dimensions (-1 for inherited)	1
Sample time (-1 for inherited)	1/40
Minimum	[]
Maximum	[]
Data type	double

3.4.2.1.6. "TAS" (Inport)**Table 3.50. "TAS" Parameters**

Parameter	Value
Port number	3
Port dimensions (-1 for inherited)	1
Sample time (-1 for inherited)	1/40
Minimum	[]
Maximum	[]
Data type	double

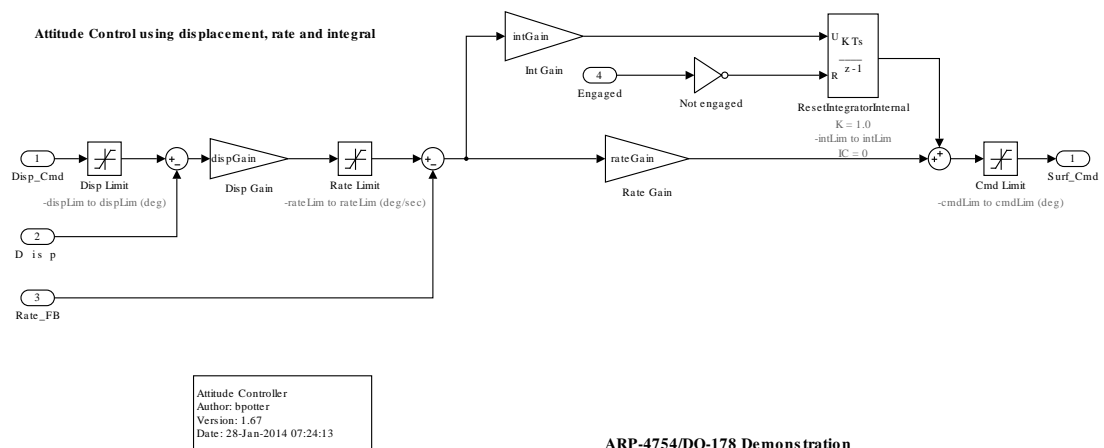
3.4.3. Block Execution Order

1. sum [28] (Sum)
2. abs [23] (Abs)
3. constant [23] (Constant)
4. constant1 [24] (Constant)
5. sum2 [29] (Sum)
6. product1 [26] (Product)
7. floor [25] (Rounding)
8. signum [27] (Signum)
9. product2 [27] (Product)
10. product [26] (Product)
11. sum1 [28] (Sum)
12. Disp Gain [31] (Gain)
13. Product [32] (Product)

3.5. attitude_controller

Checksum: 4155006210 2694985018 1491191922 2119500045

Figure 3.5. attitude_controller



3.5.1. Interface

3.5.1.1. Input Signals

The following tables describe external signals used to compute the subsystem's inputs. The name of the input signal is the name of the input port that accepts the signal. The number in angle brackets is the number of the input port. A dimension of [1 1] indicates a scalar signal.

Table 3.51.

Description:

Data Type: double

Width: 1

Dimensions: [1 1]

Table 3.52.

Description:

Data Type: double

Width: 1

Dimensions: [1 1]

Table 3.53.

Description:

Data Type: boolean

Width: 1

Dimensions: [1 1]

Table 3.54.

Description:

Data Type: double

Width: 1

Dimensions: [1 1]

3.5.1.2. Output Signals

The following tables describe the signals output by this system. The name of the output signal is the name of the signal's parent block, i.e., the block that computes the signal. The number in angle brackets is the number of the port that emits the signal.

Table 3.55.

Description:

Data Type: double

Width: 1

Dimensions: [1 1]

3.5.2. Blocks

3.5.2.1. Parameters

3.5.2.1.1. "Cmd Limit" (Saturate)

Table 3.56. "Cmd Limit" Parameters

Parameter	Value
Upper limit	cmdLim
Lower limit	-cmdLim

Parameter	Value
Treat as gain when linearizing	on
Enable zero-crossing detection	on
Sample time (-1 for inherited)	-1
Output minimum	[]
Output maximum	[]
Output data type	Inherit: Same as input
Lock output data type setting against changes by the fixed-point tools	off
Integer rounding mode	Floor

3.5.2.1.2. "Disp Gain" (Gain)

Table 3.57. "Disp Gain" Parameters

Parameter	Value
Gain	dispGain
Multiplication	Element-wise($K \cdot u$)
Parameter minimum	[]
Parameter maximum	[]
Parameter data type	Inherit: Inherit via internal rule
Output minimum	[]
Output maximum	[]
Output data type	Inherit: Inherit via internal rule
Lock output data type setting against changes by the fixed-point tools	off
Integer rounding mode	Floor
Saturate on integer overflow	off
Sample time (-1 for inherited)	-1

3.5.2.1.3. "Disp Limit" (Saturate)

Table 3.58. "Disp Limit" Parameters

Parameter	Value
Upper limit	dispLim

Parameter	Value
Lower limit	-dispLim
Treat as gain when linearizing	on
Enable zero-crossing detection	on
Sample time (-1 for inherited)	-1
Output minimum	[]
Output maximum	[]
Output data type	Inherit: Same as input
Lock output data type setting against changes by the fixed-point tools	off
Integer rounding mode	Floor

3.5.2.1.4. "Disp_Cmd" (Inport)

Table 3.59. "Disp_Cmd" Parameters

Parameter	Value
Port number	1
Port dimensions (-1 for inherited)	1
Sample time (-1 for inherited)	1/40
Minimum	[]
Maximum	[]
Data type	double

3.5.2.1.5. "Disp_FB " (Inport)

Table 3.60. "Disp_FB " Parameters

Parameter	Value
Port number	2
Port dimensions (-1 for inherited)	1
Sample time (-1 for inherited)	1/40
Minimum	[]
Maximum	[]
Data type	double

3.5.2.1.6. "Engaged" (Inport)

Table 3.61. "Engaged" Parameters

Parameter	Value
Port number	4
Port dimensions (-1 for inherited)	1
Sample time (-1 for inherited)	1/40
Minimum	[]
Maximum	[]
Data type	boolean

3.5.2.1.7. "Int Gain" (Gain)

Table 3.62. "Int Gain" Parameters

Parameter	Value
Gain	intGain
Multiplication	Element-wise(K.*u)
Parameter minimum	[]
Parameter maximum	[]
Parameter data type	Inherit: Inherit via internal rule
Output minimum	[]
Output maximum	[]
Output data type	Inherit: Inherit via internal rule
Lock output data type setting against changes by the fixed-point tools	off
Integer rounding mode	Floor
Saturate on integer overflow	off
Sample time (-1 for inherited)	-1

3.5.2.1.8. "Not engaged" (Logic)

Table 3.63. "Not engaged" Parameters

Parameter	Value
Operator	NOT

Parameter	Value
Number of input ports	2
Icon shape	distinctive
Require all inputs and output to have the same data type	off
Output data type	boolean
Sample time (-1 for inherited)	-1

3.5.2.1.9. "Rate Gain" (Gain)

Table 3.64. "Rate Gain" Parameters

Parameter	Value
Gain	rateGain
Multiplication	Element-wise($K \cdot u$)
Parameter minimum	[]
Parameter maximum	[]
Parameter data type	Inherit: Inherit via internal rule
Output minimum	[]
Output maximum	[]
Output data type	Inherit: Inherit via internal rule
Lock output data type setting against changes by the fixed-point tools	off
Integer rounding mode	Floor
Saturate on integer overflow	off
Sample time (-1 for inherited)	-1

3.5.2.1.10. "Rate Limit" (Saturate)

Table 3.65. "Rate Limit" Parameters

Parameter	Value
Upper limit	rateLim
Lower limit	-rateLim
Treat as gain when linearizing	on

Parameter	Value
Enable zero-crossing detection	on
Sample time (-1 for inherited)	-1
Output minimum	[]
Output maximum	[]
Output data type	Inherit: Same as input
Lock output data type setting against changes by the fixed-point tools	off
Integer rounding mode	Floor

3.5.2.1.11. "Rate_FB" (Inport)

Table 3.66. "Rate_FB" Parameters

Parameter	Value
Port number	3
Port dimensions (-1 for inherited)	1
Sample time (-1 for inherited)	1/40
Minimum	[]
Maximum	[]
Data type	double

3.5.2.1.12. "Sum" (Sum)

Table 3.67. "Sum" Parameters

Parameter	Value
Icon shape	round
List of signs	+-
Sum over	All dimensions
Dimension	1
Require all inputs to have the same data type	off
Accumulator data type	Inherit: Inherit via internal rule
Output minimum	[]
Output maximum	[]
Output data type	Inherit: Inherit via internal rule

Parameter	Value
Lock data type settings against changes by the fixed-point tools	off
Integer rounding mode	Floor
Saturate on integer overflow	off
Sample time (-1 for inherited)	-1

3.5.2.1.13. "Sum1" (Sum)

Table 3.68. "Sum1" Parameters

Parameter	Value
Icon shape	round
List of signs	+-
Sum over	All dimensions
Dimension	1
Require all inputs to have the same data type	off
Accumulator data type	Inherit: Inherit via internal rule
Output minimum	[]
Output maximum	[]
Output data type	Inherit: Inherit via internal rule
Lock data type settings against changes by the fixed-point tools	off
Integer rounding mode	Floor
Saturate on integer overflow	off
Sample time (-1 for inherited)	-1

3.5.2.1.14. "Sum2" (Sum)

Table 3.69. "Sum2" Parameters

Parameter	Value
Icon shape	round
List of signs	++
Sum over	All dimensions

Parameter	Value
Dimension	1
Require all inputs to have the same data type	off
Accumulator data type	Inherit: Inherit via internal rule
Output minimum	[]
Output maximum	[]
Output data type	Inherit: Inherit via internal rule
Lock data type settings against changes by the fixed-point tools	off
Integer rounding mode	Floor
Saturate on integer overflow	off
Sample time (-1 for inherited)	-1

3.5.2.1.15. "Surf_Cmd" (Outport)

Table 3.70. "Surf_Cmd" Parameters

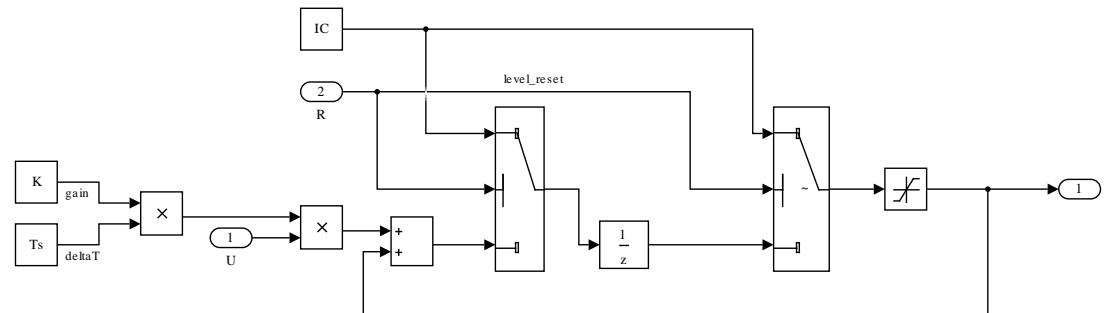
Parameter	Value
Port number	1
Icon display	Port number
Minimum	[]
Maximum	[]
Data type	double
Lock output data type setting against changes by the fixed-point tools	off
Output as nonvirtual bus in parent model	off
Port dimensions (-1 for inherited)	1
Variable-size signal	Inherit
Sample time (-1 for inherited)	1/40
Signal type	real
Source of initial output value	Dialog
Output when disabled	held
Initial output	[]

3.5.3. Block Execution Order

1. Constant2 [44] (Constant)
2. Not engaged [38] (Logic)
3. X [49] (UnitDelay)
4. Switch [47] (Switch)
5. Saturation [46] (Saturate)
6. Disp Limit [36] (Saturate)
7. Sum [40] (Sum)
8. Disp Gain [36] (Gain)
9. Rate Limit [39] (Saturate)
10. Sum1 [41] (Sum)
11. Rate Gain [39] (Gain)
12. Sum2 [41] (Sum)
13. Cmd Limit [35] (Saturate)
14. Constant [43] (Constant)
15. Constant1 [44] (Constant)
16. Product [45] (Product)
17. *TmpAtomicSubsysAtSwitch1Inport3*
18. Switch1 [48] (Switch)

3.6. ResetIntegratorInternal

Figure 3.6. attitude_controller/ResetIntegratorInternal



Level Reset Integration With Saturation
 $y(n) = y(n-1) + K \cdot Ts \cdot u(n-1)$

3.6.1. Blocks

3.6.1.1. Parameters

3.6.1.1.1. "Constant" (Constant)

Table 3.71. "Constant" Parameters

Parameter	Value
Constant value	K

Parameter	Value
Interpret vector parameters as 1-D	on
Sampling mode	Sample based
Output minimum	[]
Output maximum	[]
Output data type	Inherit: Inherit from 'Constant value'
Lock output data type setting against changes by the fixed-point tools	off
Sample time	inf
Frame period	inf

3.6.1.1.2. "Constant1" (Constant)

Table 3.72. "Constant1" Parameters

Parameter	Value
Constant value	Ts
Interpret vector parameters as 1-D	on
Sampling mode	Sample based
Output minimum	[]
Output maximum	[]
Output data type	Inherit: Inherit from 'Constant value'
Lock output data type setting against changes by the fixed-point tools	off
Sample time	inf
Frame period	inf

3.6.1.1.3. "Constant2" (Constant)

Table 3.73. "Constant2" Parameters

Parameter	Value
Constant value	IC
Interpret vector parameters as 1-D	on
Sampling mode	Sample based
Output minimum	[]
Output maximum	[]

Parameter	Value
Output data type	Inherit: Inherit from 'Constant value'
Lock output data type setting against changes by the fixed-point tools	off
Sample time	inf
Frame period	inf

3.6.1.1.4. "Product" (Product)

Table 3.74. "Product" Parameters

Parameter	Value
Number of inputs	2
Multiplication	Element-wise(.*)
Multiply over	All dimensions
Dimension	1
Require all inputs to have the same data type	off
Output minimum	[]
Output maximum	[]
Output data type	Inherit: Inherit via internal rule
Lock output data type setting against changes by the fixed-point tools	off
Integer rounding mode	Zero
Saturate on integer overflow	off
Sample time (-1 for inherited)	-1

3.6.1.1.5. "Product1" (Product)

Table 3.75. "Product1" Parameters

Parameter	Value
Number of inputs	2
Multiplication	Element-wise(.*)
Multiply over	All dimensions
Dimension	1
Require all inputs to have the same data type	off

Parameter	Value
Output minimum	[]
Output maximum	[]
Output data type	Inherit: Inherit via internal rule
Lock output data type setting against changes by the fixed-point tools	off
Integer rounding mode	Zero
Saturate on integer overflow	off
Sample time (-1 for inherited)	-1

3.6.1.1.6. "R" (Inport)

Table 3.76. "R" Parameters

Parameter	Value
Port number	2
Port dimensions (-1 for inherited)	-1
Sample time (-1 for inherited)	-1
Minimum	[]
Maximum	[]
Data type	Inherit: auto

3.6.1.1.7. "Saturation" (Saturate)

Table 3.77. "Saturation" Parameters

Parameter	Value
Upper limit	UL
Lower limit	-UL
Treat as gain when linearizing	on
Enable zero-crossing detection	on
Sample time (-1 for inherited)	-1
Output minimum	[]
Output maximum	[]

Parameter	Value
Output data type	Inherit: Same as input
Lock output data type setting against changes by the fixed-point tools	off
Integer rounding mode	Floor

3.6.1.1.8. "Sum" (Sum)

Table 3.78. "Sum" Parameters

Parameter	Value
Icon shape	rectangular
List of signs	++
Sum over	All dimensions
Dimension	1
Require all inputs to have the same data type	off
Accumulator data type	Inherit: Inherit via internal rule
Output minimum	[]
Output maximum	[]
Output data type	Inherit: Inherit via internal rule
Lock data type settings against changes by the fixed-point tools	off
Integer rounding mode	Floor
Saturate on integer overflow	off
Sample time (-1 for inherited)	-1

3.6.1.1.9. "Switch" (Switch)

Table 3.79. "Switch" Parameters

Parameter	Value
Criteria for passing first input	u2 ~= 0
Threshold	0
Require all data port inputs to have the same data type	off
Output minimum	[]

Parameter	Value
Output maximum	[]
Output data type	Inherit: Inherit via internal rule
Lock output data type setting against changes by the fixed-point tools	off
Integer rounding mode	Floor
Saturate on integer overflow	off
Enable zero-crossing detection	on
Sample time (-1 for inherited)	-1
Allow different data input sizes (Results in variable-size output signal)	off

3.6.1.1.10. "Switch1" (Switch)

Table 3.80. "Switch1" Parameters

Parameter	Value
Criteria for passing first input	u2 ~= 0
Threshold	0
Require all data port inputs to have the same data type	off
Output minimum	[]
Output maximum	[]
Output data type	Inherit: Inherit via internal rule
Lock output data type setting against changes by the fixed-point tools	off
Integer rounding mode	Floor
Saturate on integer overflow	off
Enable zero-crossing detection	on
Sample time (-1 for inherited)	-1
Allow different data input sizes (Results in variable-size output signal)	off

3.6.1.1.11. "U" (Inport)**Table 3.81. "U" Parameters**

Parameter	Value
Port number	1
Port dimensions (-1 for inherited)	-1
Sample time (-1 for inherited)	-1
Minimum	[]
Maximum	[]
Data type	Inherit: auto

3.6.1.1.12. "X" (UnitDelay)**Table 3.82. "X" Parameters**

Parameter	Value
Initial condition	IC
Input processing	Elements as channels (sample based)
Sample time (-1 for inherited)	Ts
State name must resolve to Simulink signal object	off

3.6.1.1.13. "Y" (Outport)**Table 3.83. "Y" Parameters**

Parameter	Value
Port number	1
Icon display	Port number
Minimum	[]
Maximum	[]
Data type	Inherit: auto
Lock output data type setting against changes by the fixed-point tools	off
Output as nonvirtual bus in parent model	off

Parameter	Value
Port dimensions (-1 for inherited)	-1
Variable-size signal	Inherit
Sample time (-1 for inherited)	-1
Source of initial output value	Dialog
Output when disabled	held
Initial output	[]

Chapter 4. System Design Variables

Table of Contents

4.1. Design Variable Details	51
------------------------------------	----

4.1. Design Variable Details

Table 4.1. dispGain

Property	Value
Value	1
CoderInfo	dispGain.CoderInfo [51]
Description	
DataType	auto
Min	
Max	
DocUnits	
Complexity	real
Dimensions	[1 1]

Table 4.2. dispGain [51].CoderInfo

Property	Value
StorageClass	Auto
Alias	
Alignment	-1
CustomStorageClass	Default
CustomAttributes	dispGain.CoderInfo.CustomAttributes [51]

dispGain.CoderInfo.CustomAttributes (SimulinkCSC.AttribClass_Simulink_Default,)

Note: this object has no unfiltered properties.

Used by Blocks:

- roll_ap/Basic Roll Mode [5]

Workspace: model (roll_ap)

Table 4.3. hdgGain

Property	Value
Value	0.0150
CoderInfo	hdgGain.CoderInfo [52]
Description	
DataType	auto
Min	0
Max	
DocUnits	
Complexity	real
Dimensions	[1 1]

Table 4.4. hdgGain [51].CoderInfo

Property	Value
StorageClass	Auto
Alias	
Alignment	-1
CustomStorageClass	Default
CustomAttributes	hdgGain.CoderInfo.CustomAttributes [52]

hdgGain.CoderInfo.CustomAttributes (SimulinkCSC.AttribClass_Simulink_Default,)

Note: this object has no unfiltered properties.

Used by Blocks:

- roll_ap/Heading Mode [6]

Workspace: model (roll_ap)

Table 4.5. intGain

Property	Value
Value	1
CoderInfo	intGain.CoderInfo [53]
Description	
DataType	auto
Min	
Max	

DocUnits	
Complexity	real
Dimensions	[1 1]

Table 4.6. intGain [52].CoderInfo

Property	Value
StorageClass	Auto
Alias	
Alignment	-1
CustomStorageClass	Default
CustomAttributes	intGain.CoderInfo.CustomAttributes [53]

intGain.CoderInfo.CustomAttributes (SimulinkCSC.AttribClass_Simulink_Default,)

Note: this object has no unfiltered properties.

Used by Blocks:

- roll_ap/Basic Roll Mode [5]

Workspace: model (roll_ap)

Table 4.7. rateGain

Property	Value
Value	3
CoderInfo	rateGain.CoderInfo [53]
Description	
DataType	auto
Min	
Max	
DocUnits	
Complexity	real
Dimensions	[1 1]

Table 4.8. rateGain [53].CoderInfo

Property	Value
StorageClass	Auto

Alias	
Alignment	-1
CustomStorageClass	Default
CustomAttributes	rateGain.CoderInfo.CustomAttributes [54]

rateGain.CoderInfo.CustomAttributes (SimulinkCSC.AttribClass_Simulink_Default,)

Note: this object has no unfiltered properties.

Used by Blocks:

- roll_ap/Basic Roll Mode [5]

Workspace: model (roll_ap)

Chapter 5. Requirements Traceability

Table of Contents

5.1. Model Information for "roll_ap"	55
5.2. Document Summary for "roll_ap"	55
5.3. System - roll_ap	56
5.4. System - Roll Reference	66
5.5. System - Latch Phi	83
5.6. Systems in "roll_ap" that have no links to requirements	83

5.1. Model Information for "roll_ap"

Table 5.1. roll_ap Version Information

<i>ModelVersion</i>	1.164	<i>ConfigurationManager</i>	Microsoft Visual SourceSafe
<i>Created</i>	Thu Apr 06 16:59:31 2006	<i>Creator</i>	bpotter
<i>LastModifiedDate</i>	Mon Feb 03 08:05:33 2014	<i>LastModifiedBy</i>	bpotter

5.2. Document Summary for "roll_ap"

Table 5.2. Requirements documents linked in model

ID	Artifact names stored by RMI	Last modified	# links
DO-C1	do178b_autopilot_requirements.docx [file:///C:/Users/bpotter/LocalWorkArea/demos/autopilot_R2013b_workarea/do17-8b_autopilot_requirements.docx]	18-May-2011 15:47:42	43

5.3. System - roll_ap

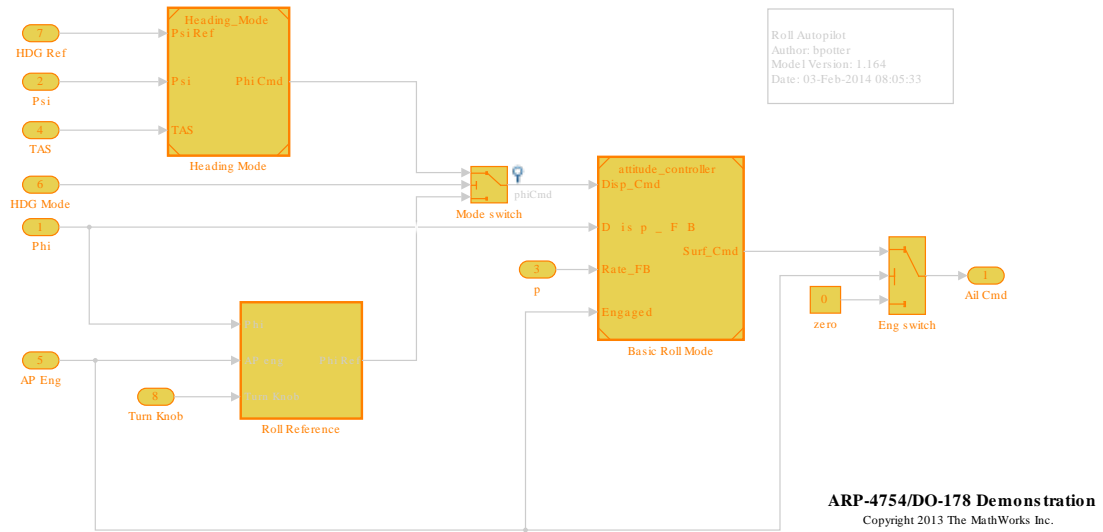


Table 5.3. Blocks in "roll_ap" that have requirements

Linked Object	Requirements Traceability Data
Ail Cmd	<ol style="list-style-type: none"> "1.1. Roll Autopilot Engage Control" do178b_autopilot_requirements.docx [file:///C:/Users/bpotter/LocalWorkArea/demos/autopilot_R2013b_workarea/do178b_autopilot_requirements.docx] Location ID not entered
AP Eng	<ol style="list-style-type: none"> "1.1. Roll Autopilot Engage Control" do178b_autopilot_requirements.docx, at 'Simulink_requirement_item_1' [file:///C:/Users/bpotter/LocalWorkArea/demos/autopilot_R2013b_workarea/do178b_autopilot_requirements.docx#Simulink_requirement_item_1] 1.1. Roll Autopilot Engage Control Requirement Roll Autopilot shall engage when the pilot selects the autopilot engage switch in the cockpit and disengage when the switch is deselected. When not engaged, the command to the roll actuator shall be zero. Rationale The autopilot should only be engaged when the pilot selects it. <hr/> <ol style="list-style-type: none"> "1.3. Roll Hold Reference" do178b_autopilot_requirements.docx, at 'Simulink_r-

Linked Object	Requirements Traceability Data
	<p>----- Details from do178b_autopilot_requirements- requirement_item_3' [file:/- .docx: ----- [file:///C:/Users/bpotter/LocalWorkAr- //C:/Users/bpotter/LocalW- ea/demos/autopilot_R2013b_workarea/do178b_aut- orkArea/demos/autopilot_- opilot_requirements.docx#Simulink_requirement_i- R2013b_workarea/do178b- tem_3] _autopilot_requirements.d- 1.3. Roll Hold Reference ocx#Simulink_requiremen- Requirement t_item_3]</p> <p>When roll hold mode bec- omes the active mode the roll hold reference shall be set to the actual roll at- titude of the aircraft, ex- cept under the following conditions: The roll hold reference shall be set to zero if the actual roll an- gle is less than 6 degrees, in either direction, at the time of roll hold engage- ment. The roll hold refer- ence shall be set to 30 de- grees in the same directi- on as the actual roll angle if the actual roll angle is greater than 30 degrees at the time of roll hold enga- gement. The roll referen- ce shall be set to the coc- kpit turn knob command, up to a 30 degree limit, if the turn knob is comman- ding 3 degrees or more in either direction.</p> <p>Rationale When engaging the mode at a small bank angle, it is assumed that the pilot wa- nts to maintain level flig- ht. When the mode is en- gaged above the autopil- ot roll limit, the autopilot should control to the lim- it. The turn knob will be considered to be in dent when it is less than 3 deg- rees.</p> <p>-- -----</p> <p>3. "1.4. Roll Performance" do178b_autopilot_require- ----- Details from do178b_autopilot_requirements.docx, at 'Simulink_r- .docx: ----- [file:///C:/Users/bpotter/LocalWorkAr- equirement_item_4' [file:/- ea/demos/autopilot_R2013b_workarea/do178b_aut- //C:/Users/bpotter/LocalW- opilot_requirements.docx#Simulink_requirement_i- orkArea/demos/autopilot_- tem_4] R2013b_workarea/do178b-</p>

Linked Object	Requirements Traceability Data
	<div> <div>1.4. Roll Performance Requirement</div> <div>Steady state roll commands shall be tracked within 1 degree in calm air. Response to roll step commands shall not exceed 10% overshoot in calm air. Small signal (<3 degree) roll bandwidth shall be at least 0.5 rad/sec.</div> <div>Rationale</div> <div>These tracking, overshoot and bandwidth requirements are necessary for good roll performance in lateral modes.</div> </div> <div> <div>_autopilot_requirements.docx#Simulink_requirement_item_4]</div> </div>
Basic Roll Mode	<div> <div>1. "1.4. Roll Performance"</div> <div>----- Details from do178b_autopilot_requirements.docx: ----- [file:///C:/Users/bpotter/LocalWorkArea/demos/autopilot_R2013b_workarea/do178b_autopilot_requirements.docx#Simulink_requirement_item_4]</div> <div>1.4. Roll Performance Requirement</div> <div>Steady state roll commands shall be tracked within 1 degree in calm air. Response to roll step commands shall not exceed 10% overshoot in calm air. Small signal (<3 degree) roll bandwidth shall be at least 0.5 rad/sec.</div> <div>Rationale</div> <div>These tracking, overshoot and bandwidth requirements are necessary for good roll performance in lateral modes.</div> </div> <div>-----</div> <div> <div>2. "1.5. Roll Rate Limit"</div> <div>----- Details from do178b_autopilot_requirements.docx: ----- [file:///C:/Users/bpotter/LocalWorkArea/demos/autopilot_R2013b_workarea/do178b_autopilot_requirements.docx#Simulink_requirement_item_5]</div> <div>1.5. Roll Rate Limit Requirement</div> <div>The maximum roll rate for large commands shall be 6 deg/sec +/-10% in calm air.</div> <div>Rationale</div> <div>This roll rate allows good performance while st-</div> </div> <div> <div>do178b_autopilot_requirements.docx, at 'Simulink_requirement_item_4' [file:///C:/Users/bpotter/LocalWorkArea/demos/autopilot_R2013b_workarea/do178b_autopilot_requirements.docx#Simulink_requirement_item_4]</div> <div>do178b_autopilot_requirements.docx, at 'Simulink_requirement_item_5' [file:///C:/Users/bpotter/LocalWorkArea/demos/autopilot_R2013b_workarea/do178b_autopilot_requirements.docx#Simulink_requirement_item_5]</div> </div>

Linked Object	Requirements Traceability Data
	<p>ill maintaining passenger comfort.</p> <p>-- -----</p> <p>3. "1.6. Roll Angle Limit" do178b_autopilot_requirements.docx, at 'Simulink_requirement_item_6' [file:///C:/Users/bpotter/LocalWorkArea/demos/autopilot_R2013b_workarea/do178b_autopilot_requirements.docx#Simulink_requirement_item_6]</p> <p>1.6. Roll Angle Limit Requirement The maximum roll angle allowed shall be 30 deg +/-10% in calm air.</p> <p>Rationale This roll angle allows good turn rate while still maintaining passenger comfort.</p> <p>-- -----</p> <p>4. "1.7. Aileron Angle Limit" do178b_autopilot_requirements.docx, at 'Simulink_requirement_item_7' [file:///C:/Users/bpotter/LocalWorkArea/demos/autopilot_R2013b_workarea/do178b_autopilot_requirements.docx#Simulink_requirement_item_7]</p> <p>1.7. Aileron Angle Limit Requirement The maximum aileron command allowed shall be 15 deg.</p> <p>Rationale This is the maximum deflection allowed by the mechanical control system.</p>
Eng switch	<p>1. "1.1. Roll Autopilot Engage Control" do178b_autopilot_requirements.docx [file:///C:/Users/bpotter/LocalWorkArea/demos/autopilot_R2013b_workarea/do178b_autopilot_requirements.docx]</p> <p>Location ID not entered</p>
HDG Mode	<p>1. "1.2. Roll Hold Mode" do178b_autopilot_requirements.docx, at 'Simulink_requirement_item_2' [file:///C:/Users/bpotter/LocalWorkArea/demos/autopilot_R2013b_workarea/do178b_autopilot_requirements.docx#Simulink_requirement_item_2]</p> <p>1.2. Roll Hold Mode Requirement Roll hold mode shall be the active mode whenever the autopilot is engaged</p>

Linked Object	Requirements Traceability Data
	<p>and no other lateral mode is active.</p> <p>Rationale Roll hold mode is the default mode in the roll axis for the autopilot when no other mode is active.</p> <p>-- -----</p> <p>2. "1.8. Heading Hold Mode" do178b_autopilot_requirements.docx, at 'Simulink_requirement_item_8' [file:///C:/Users/bpotter/LocalWorkArea/demos/autopilot_R2013b_workarea/do178b_autopilot_requirements.docx#Simulink_requirement_item_8]</p> <p>1.8. Heading Hold Mode Requirement Heading Hold shall become the active mode when the pilot selects the heading switch in the cockpit and deactivate when the switch is deselected.</p> <p>Rationale Heading hold mode will be the active mode when selected by the pilot.</p>
HDG Ref	<p>1. "1.9. Heading Hold Reference" do178b_autopilot_requirements.docx, at 'Simulink_requirement_item_9' [file:///C:/Users/bpotter/LocalWorkArea/demos/autopilot_R2013b_workarea/do178b_autopilot_requirements.docx#Simulink_requirement_item_9]</p> <p>1.9. Heading Hold Reference Requirement When heading hold mode becomes the active mode the heading hold reference shall be set by the pilot via a cockpit control.</p> <p>Rationale The pilot will select the desired heading to track via the cockpit control.</p> <p>-- -----</p> <p>2. "1.10. Heading Performance" do178b_autopilot_requirements.docx, at 'Simulink_requirement_item_10' [file:///C:/Users/bpotter/LocalWorkArea/demos/autopilot_R2013b_workarea/do178b_autopilot_requirements.docx#Simulink_requirement_item_10]</p> <p>1.10. Heading Performance Requirement Steady state heading commands shall be tracked within 1 degree in calm air. Response to heading</p>

Linked Object	Requirements Traceability Data
	<p>step commands shall not exceed 10% overshoot in calm air.</p> <p>Rationale: These tracking and overshoot requirements are necessary for good heading performance.</p>
Heading Mode	<p>1. "1.10. Heading Performance" do178b_autopilot_requirements.docx, at 'Simulink_requirement_item_10' [file:///C:/Users/bpotter/LocalWorkArea/demos/autopilot_R2013b_workarea/do178b_autopilot_requirements.docx#Simulink_requirement_item_10]</p> <p>1.10. Heading Performance Requirement: Steady state heading commands shall be tracked within 1 degree in calm air. Response to heading step commands shall not exceed 10% overshoot in calm air.</p> <p>Rationale: These tracking and overshoot requirements are necessary for good heading performance.</p>
Mode switch	<p>1. "1.2. Roll Hold Mode" do178b_autopilot_requirements.docx, at 'Simulink_requirement_item_2' [file:///C:/Users/bpotter/LocalWorkArea/demos/autopilot_R2013b_workarea/do178b_autopilot_requirements.docx#Simulink_requirement_item_2]</p> <p>1.2. Roll Hold Mode Requirement: Roll hold mode shall be the active mode whenever the autopilot is engaged and no other lateral mode is active.</p> <p>Rationale: Roll hold mode is the default mode in the roll axis for the autopilot when no other mode is active.</p> <p>-----</p> <p>2. "1.4. Roll Performance" do178b_autopilot_requirements.docx, at 'Simulink_requirement_item_4' [file:///C:/Users/bpotter/LocalWorkArea/demos/autopilot_R2013b_workarea/do178b_autopilot_requirements.docx#Simulink_requirement_item_4]</p> <p>1.4. Roll Performance</p>

Linked Object	Requirements Traceability Data		
	Requirement	Steady state roll commands shall be tracked within 1 degree in calm air. Response to roll step commands shall not exceed 10% overshoot in calm air. Small signal (<3 degree) roll bandwidth shall be at least 0.5 rad/sec.	ocx#Simulink_requirement_item_4]
	Rationale	These tracking, overshoot and bandwidth requirements are necessary for good roll performance in lateral modes.	
	<p>3. "1.8. Heading Hold Mode"</p> <p>----- Details from do178b_autopilot_requirements.docx: ----- [file:///C:/Users/bpotter/LocalWorkArea/demos/autopilot_R2013b_workarea/do178b_autopilot_requirements.docx#Simulink_requirement_item_8]</p> <p>1.8. Heading Hold Mode</p> <p>Requirement</p>	<p>Heading Hold shall become the active mode when the pilot selects the heading switch in the cockpit and deactivate when the switch is deselected.</p> <p>Rationale</p> <p>Heading hold mode will be the active mode when selected by the pilot.</p>	<p>do178b_autopilot_requirements.docx, at 'Simulink_requirement_item_8' [file:///C:/Users/bpotter/LocalWorkArea/demos/autopilot_R2013b_workarea/do178b_autopilot_requirements.docx#Simulink_requirement_item_8]</p>
	<p>4. "1.10. Heading Performance"</p> <p>----- Details from do178b_autopilot_requirements.docx: ----- [file:///C:/Users/bpotter/LocalWorkArea/demos/autopilot_R2013b_workarea/do178b_autopilot_requirements.docx#Simulink_requirement_item_10]</p> <p>1.10. Heading Performance</p> <p>Requirement</p> <p>Rationale</p>	<p>Steady state heading commands shall be tracked within 1 degree in calm air. Response to heading step commands shall not exceed 10% overshoot in calm air.</p> <p>These tracking and overshoot requirements are necessary for good heading performance.</p>	<p>do178b_autopilot_requirements.docx, at 'Simulink_requirement_item_10' [file:///C:/Users/bpotter/LocalWorkArea/demos/autopilot_R2013b_workarea/do178b_autopilot_requirements.docx#Simulink_requirement_item_10]</p>

Linked Object	Requirements Traceability Data
p	<p>1. "1.4. Roll Performance" do178b_autopilot_requirements.docx, at 'Simulink_requirement_item_4' [file:///C:/Users/bpotter/LocalWorkArea/demos/autopilot_R2013b_workarea/do178b_autopilot_requirements.docx#Simulink_requirement_item_4]</p> <p>1.4. Roll Performance Requirement</p> <p>Steady state roll commands shall be tracked within 1 degree in calm air. Response to roll step commands shall not exceed 10% overshoot in calm air. Small signal (<3 degree) roll bandwidth shall be at least 0.5 rad/sec.</p> <p>Rationale</p> <p>These tracking, overshoot and bandwidth requirements are necessary for good roll performance in lateral modes.</p>
Phi	<p>1. "1.3. Roll Hold Reference" do178b_autopilot_requirements.docx, at 'Simulink_requirement_item_3' [file:///C:/Users/bpotter/LocalWorkArea/demos/autopilot_R2013b_workarea/do178b_autopilot_requirements.docx#Simulink_requirement_item_3]</p> <p>1.3. Roll Hold Reference Requirement</p> <p>When roll hold mode becomes the active mode the roll hold reference shall be set to the actual roll attitude of the aircraft, except under the following conditions: The roll hold reference shall be set to zero if the actual roll angle is less than 6 degrees, in either direction, at the time of roll hold engagement. The roll hold reference shall be set to 30 degrees in the same direction as the actual roll angle if the actual roll angle is greater than 30 degrees at the time of roll hold engagement. The roll reference shall be set to the cockpit turn knob command, up to a 30 degree limit, if</p>

Linked Object	Requirements Traceability Data
	<p>the turn knob is commanding 3 degrees or more in either direction.</p> <p>Rationale When engaging the mode at a small bank angle, it is assumed that the pilot wants to maintain level flight. When the mode is engaged above the autopilot roll limit, the autopilot should control to the limit. The turn knob will be considered to be in dent when it is less than 3 degrees.</p> <p>-- -----</p> <p>2. "1.4. Roll Performance" do178b_autopilot_requirements.docx, at 'Simulink_requirement_item_4' [file:///C:/Users/bpotter/LocalWorkArea/demos/autopilot_R2013b_workarea/do178b_autopilot_requirements.docx#Simulink_requirement_item_4]</p> <p>1.4. Roll Performance Requirement Steady state roll commands shall be tracked within 1 degree in calm air. Response to roll step commands shall not exceed 10% overshoot in calm air. Small signal (<3 degree) roll bandwidth shall be at least 0.5 rad/sec.</p> <p>Rationale These tracking, overshoot and bandwidth requirements are necessary for good roll performance in lateral modes.</p>
Psi	<p>1. "1.10. Heading Performance" do178b_autopilot_requirements.docx, at 'Simulink_requirement_item_10' [file:///C:/Users/bpotter/LocalWorkArea/demos/autopilot_R2013b_workarea/do178b_autopilot_requirements.docx#Simulink_requirement_item_10]</p> <p>1.10. Heading Performance Requirement Steady state heading commands shall be tracked within 1 degree in calm air. Response to heading step commands shall not exceed 10% overshoot in calm air.</p>

Linked Object	Requirements Traceability Data
	<p>Rationale These tracking and overshoot requirements are necessary for good heading performance.</p>
TAS	<p>1. "1.10. Heading Performance" do178b_autopilot_requirements.docx, at 'Simulink_requirement_item_10' [file:///C:/Users/bpotter/LocalWorkArea/demos/autopilot_R2013b_workarea/do178b_autopilot_requirements.docx#Simulink_requirement_item_10]</p> <p>1.10. Heading Performance Requirement Steady state heading commands shall be tracked within 1 degree in calm air. Response to heading step commands shall not exceed 10% overshoot in calm air.</p> <p>Rationale These tracking and overshoot requirements are necessary for good heading performance.</p>
Turn Knob	<p>1. "1.3. Roll Hold Reference" do178b_autopilot_requirements.docx, at 'Simulink_requirement_item_3' [file:///C:/Users/bpotter/LocalWorkArea/demos/autopilot_R2013b_workarea/do178b_autopilot_requirements.docx#Simulink_requirement_item_3]</p> <p>1.3. Roll Hold Reference Requirement When roll hold mode becomes the active mode the roll hold reference shall be set to the actual roll attitude of the aircraft, except under the following conditions: The roll hold reference shall be set to zero if the actual roll angle is less than 6 degrees, in either direction, at the time of roll hold engagement. The roll hold reference shall be set to 30 degrees in the same direction as the actual roll angle if the actual roll angle is greater than 30 degrees at the time of roll hold engagement. The roll reference shall be set to the cockpit turn knob command,</p>

Linked Object	Requirements Traceability Data
	<p>up to a 30 degree limit, if the turn knob is commanding 3 degrees or more in either direction.</p> <p>When engaging the mode at a small bank angle, it is assumed that the pilot wants to maintain level flight. When the mode is engaged above the autopilot roll limit, the autopilot should control to the limit. The turn knob will be considered to be in dent when it is less than 3 degrees.</p>
zero	<p>1. "1.1. Roll Autopilot Engage Control"</p> <p>----- Details from do178b_autopilot_requirements.docx: ----- [file:///C:/Users/bpotter/LocalWorkArea/demos/autopilot_R2013b_workarea/do178b_autopilot_requirements.docx] Location ID not entered</p> <p>do178b_autopilot_requirements.docx [file:///C:/Users/bpotter/LocalWorkArea/demos/autopilot_R2013b_workarea/do178b_autopilot_requirements.docx]</p>

Table 5.4. Objects in "roll_ap" that are not linked to requirements

Name	Type
Model Info	SubSystem

5.4. System - Roll Reference

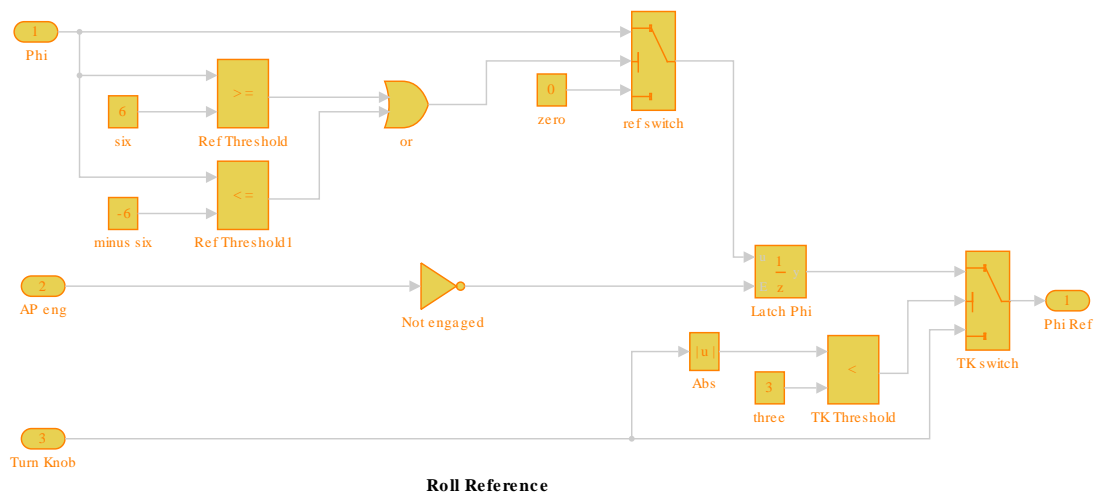


Table 5.5. roll_ap/Roll Reference Requirements

Link#	Link Description	Link Target (document name and location ID)
1.	<p>"1.3. Roll Hold Reference"</p> <p>----- Details from do178b_autopilot_requirements.docx: ----- [file:///C:/Users/bpotter/LocalWorkArea/demos/autopilot_R2013b_workarea/do178b_autopilot_requirements.docx#Simulink_requirement_item_3]</p> <p>1.3. Roll Hold Reference Requirement</p> <p>When roll hold mode becomes the active mode the roll hold reference shall be set to the actual roll attitude of the aircraft, except under the following conditions: The roll hold reference shall be set to zero if the actual roll angle is less than 6 degrees, in either direction, at the time of roll hold engagement. The roll hold reference shall be set to 30 degrees in the same direction as the actual roll angle if the actual roll angle is greater than 30 degrees at the time of roll hold engagement. The roll reference shall be set to the cockpit turn knob command, up to a 30 degree limit, if the turn knob is commanding 3 degrees or more in either direction.</p> <p>Rationale</p> <p>When engaging the mode at a small bank angle, it is assumed that the pilot wants to maintain level flight. When the mode is engaged above the autopilot roll limit, the autopilot should control to the limit. The turn knob will be considered to be in dent when it is less than 3 degrees.</p>	<p>do178b_autopilot_requirements.docx, at 'Simulink_requirement_item_3' [file:///C:/Users/bpotter/LocalWorkArea/demos/autopilot_R2013b_workarea/do178b_autopilot_requirements.docx#Simulink_requirement_item_3]</p>

Table 5.6. Blocks in "Roll Reference" that have requirements

Linked Object	Requirements Traceability Data
Abs	<p>1. "1.3. Roll Hold Reference"</p> <p>----- Details from do178b_autopilot_requirements.docx: ----- [file:///C:/Users/bpotter/LocalWorkArea/demos/autopilot_R2013b_workarea/do178b_autopilot_requirements.docx#Simulink_requirement_item_3]</p> <p>1.3. Roll Hold Reference Requirement</p> <p>When roll hold mode becomes the active mode the roll hold reference shall be set to the actual roll at-</p> <p>do178b_autopilot_requirements.docx, at 'Simulink_requirement_item_3' [file:///C:/Users/bpotter/LocalWorkArea/demos/autopilot_R2013b_workarea/do178b_autopilot_requirements.docx#Simulink_requirement_item_3]</p>

Linked Object	Requirements Traceability Data
	<p> titude of the aircraft, except under the following conditions: The roll hold reference shall be set to zero if the actual roll angle is less than 6 degrees, in either direction, at the time of roll hold engagement. The roll hold reference shall be set to 30 degrees in the same direction as the actual roll angle if the actual roll angle is greater than 30 degrees at the time of roll hold engagement. The roll reference shall be set to the cockpit turn knob command, up to a 30 degree limit, if the turn knob is commanding 3 degrees or more in either direction. </p> <p> Rationale </p> <p> When engaging the mode at a small bank angle, it is assumed that the pilot wants to maintain level flight. When the mode is engaged above the autopilot roll limit, the autopilot should control to the limit. The turn knob will be considered to be in dent when it is less than 3 degrees. </p>
AP eng	<p> 1. "1.3. Roll Hold Reference" </p> <p> ----- Details from do178b_autopilot_requirements.docx: ----- [file:///C:/Users/bpotter/LocalWorkArea/demos/autopilot_R2013b_workarea/do178b_autopilot_requirements.docx#Simulink_requirement_item_3] </p> <p> 1.3. Roll Hold Reference Requirement </p> <p> When roll hold mode becomes the active mode the roll hold reference shall be set to the actual roll attitude of the aircraft, except under the following conditions: The roll hold reference shall be set to zero if the actual roll angle is less than 6 degrees, </p> <p> do178b_autopilot_requirements.docx, at 'Simulink_requirement_item_3' [file:///C:/Users/bpotter/LocalWorkArea/demos/autopilot_R2013b_workarea/do178b_autopilot_requirements.docx#Simulink_requirement_item_3] </p>

Linked Object	Requirements Traceability Data
	<p>in either direction, at the time of roll hold engagement. The roll hold reference shall be set to 30 degrees in the same direction as the actual roll angle if the actual roll angle is greater than 30 degrees at the time of roll hold engagement. The roll reference shall be set to the cockpit turn knob command, up to a 30 degree limit, if the turn knob is commanding 3 degrees or more in either direction.</p> <p>Rationale</p> <p>When engaging the mode at a small bank angle, it is assumed that the pilot wants to maintain level flight. When the mode is engaged above the autopilot roll limit, the autopilot should control to the limit. The turn knob will be considered to be in dent when it is less than 3 degrees.</p>
Latch Phi	<p>1. "1.3. Roll Hold Reference" do178b_autopilot_requirements.docx, at 'Simulink_requirement_item_3' [file:///C:/Users/bpotter/LocalWorkArea/demos/autopilot_R2013b_workarea/do178b_autopilot_requirements.docx#Simulink_requirement_item_3]</p> <p>1.3. Roll Hold Reference Requirement</p> <p>When roll hold mode becomes the active mode the roll hold reference shall be set to the actual roll attitude of the aircraft, except under the following conditions: The roll hold reference shall be set to zero if the actual roll angle is less than 6 degrees, in either direction, at the time of roll hold engagement. The roll hold reference shall be set to 30 degrees in the same direction as the actual roll angle</p>

Linked Object	Requirements Traceability Data
	<p data-bbox="553 558 659 583">Rationale</p> <p data-bbox="833 243 1114 548">if the actual roll angle is greater than 30 degrees at the time of roll hold engagement. The roll reference shall be set to the cockpit turn knob command, up to a 30 degree limit, if the turn knob is commanding 3 degrees or more in either direction.</p> <p data-bbox="833 558 1114 936">When engaging the mode at a small bank angle, it is assumed that the pilot wants to maintain level flight. When the mode is engaged above the autopilot roll limit, the autopilot should control to the limit. The turn knob will be considered to be in dent when it is less than 3 degrees.</p>
minus six	<p data-bbox="516 957 846 989">1. "1.3. Roll Hold Reference"</p> <p data-bbox="553 999 1114 1146">----- Details from do178b_autopilot_requirements.docx: ----- [file:///C:/Users/bpotter/LocalWorkArea/demos/autopilot_R2013b_workarea/do178b_autopilot_requirements.docx#Simulink_requirement_item_3]</p> <p data-bbox="553 1157 821 1209">1.3. Roll Hold Reference Requirement</p> <p data-bbox="833 1188 1114 1875">When roll hold mode becomes the active mode the roll hold reference shall be set to the actual roll attitude of the aircraft, except under the following conditions: The roll hold reference shall be set to zero if the actual roll angle is less than 6 degrees, in either direction, at the time of roll hold engagement. The roll hold reference shall be set to 30 degrees in the same direction as the actual roll angle if the actual roll angle is greater than 30 degrees at the time of roll hold engagement. The roll reference shall be set to the cockpit turn knob command,</p> <p data-bbox="1122 957 1422 1241">do178b_autopilot_requirements.docx, at 'Simulink_requirement_item_3' [file:///C:/Users/bpotter/LocalWorkArea/demos/autopilot_R2013b_workarea/do178b_autopilot_requirements.docx#Simulink_requirement_item_3]</p>

Linked Object	Requirements Traceability Data
	<p data-bbox="553 365 657 390">Rationale</p> <p data-bbox="833 243 1109 737">up to a 30 degree limit, if the turn knob is commanding 3 degrees or more in either direction. When engaging the mode at a small bank angle, it is assumed that the pilot wants to maintain level flight. When the mode is engaged above the autopilot roll limit, the autopilot should control to the limit. The turn knob will be considered to be in dent when it is less than 3 degrees.</p>
Not engaged	<p data-bbox="513 768 1417 953">1. "1.3. Roll Hold Reference" do178b_autopilot_requirements.docx, at 'Simulink_requirement_item_3' [file:///C:/Users/bpotter/LocalWorkArea/demos/autopilot_R2013b_workarea/do178b_autopilot_requirements.docx#Simulink_requirement_item_3]</p> <p data-bbox="553 961 695 1020">1.3. Roll Hold Reference Requirement</p> <p data-bbox="833 993 1109 1812">When roll hold mode becomes the active mode the roll hold reference shall be set to the actual roll attitude of the aircraft, except under the following conditions: The roll hold reference shall be set to zero if the actual roll angle is less than 6 degrees, in either direction, at the time of roll hold engagement. The roll hold reference shall be set to 30 degrees in the same direction as the actual roll angle if the actual roll angle is greater than 30 degrees at the time of roll hold engagement. The roll reference shall be set to the cockpit turn knob command, up to a 30 degree limit, if the turn knob is commanding 3 degrees or more in either direction.</p> <p data-bbox="553 1820 657 1845">Rationale</p> <p data-bbox="833 1820 1109 1875">When engaging the mode at a small bank angle, it is</p>

Linked Object	Requirements Traceability Data
	<p>assumed that the pilot wants to maintain level flight. When the mode is engaged above the autopilot roll limit, the autopilot should control to the limit. The turn knob will be considered to be in dent when it is less than 3 degrees.</p>
or	<p>1. "1.3. Roll Hold Reference" do178b_autopilot_requirements.docx, at 'Simulink_requirement_item_3' [file:///C:/Users/bpotter/LocalWorkArea/demos/autopilot_R2013b_workarea/do178b_autopilot_requirements.docx#Simulink_requirement_item_3]</p> <p>1.3. Roll Hold Reference Requirement</p> <p>When roll hold mode becomes the active mode the roll hold reference shall be set to the actual roll attitude of the aircraft, except under the following conditions: The roll hold reference shall be set to zero if the actual roll angle is less than 6 degrees, in either direction, at the time of roll hold engagement. The roll hold reference shall be set to 30 degrees in the same direction as the actual roll angle if the actual roll angle is greater than 30 degrees at the time of roll hold engagement. The roll reference shall be set to the cockpit turn knob command, up to a 30 degree limit, if the turn knob is commanding 3 degrees or more in either direction.</p> <p>Rationale</p> <p>When engaging the mode at a small bank angle, it is assumed that the pilot wants to maintain level flight. When the mode is engaged above the autopilot roll limit, the autopilot should control to the limit.</p>

Linked Object	Requirements Traceability Data
	<p>it. The turn knob will be considered to be in dent when it is less than 3 degrees.</p>
Phi	<p>1. "1.3. Roll Hold Reference" do178b_autopilot_requirements.docx, at 'Simulink_requirement_item_3' [file:///C:/Users/bpotter/LocalWorkArea/demos/autopilot_R2013b_workarea/do178b_autopilot_requirements.docx#Simulink_requirement_item_3]</p> <p>1.3. Roll Hold Reference Requirement</p> <p>When roll hold mode becomes the active mode the roll hold reference shall be set to the actual roll attitude of the aircraft, except under the following conditions: The roll hold reference shall be set to zero if the actual roll angle is less than 6 degrees, in either direction, at the time of roll hold engagement. The roll hold reference shall be set to 30 degrees in the same direction as the actual roll angle if the actual roll angle is greater than 30 degrees at the time of roll hold engagement. The roll reference shall be set to the cockpit turn knob command, up to a 30 degree limit, if the turn knob is commanding 3 degrees or more in either direction.</p> <p>Rationale</p> <p>When engaging the mode at a small bank angle, it is assumed that the pilot wants to maintain level flight. When the mode is engaged above the autopilot roll limit, the autopilot should control to the limit. The turn knob will be considered to be in dent when it is less than 3 degrees.</p>
Phi Ref	<p>1. "1.3. Roll Hold Reference" do178b_autopilot_requirements.docx, at 'Simulink_r-</p>

Linked Object	Requirements Traceability Data
	<p>----- Details from do178b_autopilot_requirements.docx: ----- [file:///C:/Users/bpotter/LocalWorkArea/demos/autopilot_R2013b_workarea/do178b_autopilot_requirements.docx#Simulink_requirement_item_3]</p> <p>1.3. Roll Hold Reference Requirement</p> <p>When roll hold mode becomes the active mode the roll hold reference shall be set to the actual roll attitude of the aircraft, except under the following conditions: The roll hold reference shall be set to zero if the actual roll angle is less than 6 degrees, in either direction, at the time of roll hold engagement. The roll hold reference shall be set to 30 degrees in the same direction as the actual roll angle if the actual roll angle is greater than 30 degrees at the time of roll hold engagement. The roll reference shall be set to the cockpit turn knob command, up to a 30 degree limit, if the turn knob is commanding 3 degrees or more in either direction.</p> <p>Rationale</p> <p>When engaging the mode at a small bank angle, it is assumed that the pilot wants to maintain level flight. When the mode is engaged above the autopilot roll limit, the autopilot should control to the limit. The turn knob will be considered to be in dent when it is less than 3 degrees.</p>
ref switch	<p>1. "1.3. Roll Hold Reference"</p> <p>----- Details from do178b_autopilot_requirements.docx: ----- [file:///C:/Users/bpotter/LocalWorkArea/demos/autopilot_R2013b_workarea/do178b_autopilot_requirements.docx#Simulink_requirement_item_3]</p> <p>1.3. Roll Hold Reference</p> <p>do178b_autopilot_requirements.docx, at 'Simulink_requirement_item_3' [file:///C:/Users/bpotter/LocalWorkArea/demos/autopilot_R2013b_workarea/do178b_autopilot_requirements.d</p>

Linked Object	Requirements Traceability Data		
	Requirement	When roll hold mode becomes the active mode the roll hold reference shall be set to the actual roll attitude of the aircraft, except under the following conditions: The roll hold reference shall be set to zero if the actual roll angle is less than 6 degrees, in either direction, at the time of roll hold engagement. The roll hold reference shall be set to 30 degrees in the same direction as the actual roll angle if the actual roll angle is greater than 30 degrees at the time of roll hold engagement. The roll reference shall be set to the cockpit turn knob command, up to a 30 degree limit, if the turn knob is commanding 3 degrees or more in either direction.	ocx#Simulink_requirement_item_3]
	Rationale	When engaging the mode at a small bank angle, it is assumed that the pilot wants to maintain level flight. When the mode is engaged above the autopilot roll limit, the autopilot should control to the limit. The turn knob will be considered to be in dent when it is less than 3 degrees.	
Ref Threshold	1. "1.3. Roll Hold Reference" ----- Details from do178b_autopilot_requirements.docx: ----- [file:///C:/Users/bpotter/LocalWorkArea/demos/autopilot_R2013b_workarea/do178b_autopilot_requirements.docx#Simulink_requirement_item_3] 1.3. Roll Hold Reference Requirement When roll hold mode becomes the active mode the roll hold reference shall be set to the actual roll attitude of the aircraft, except under the following do178b_autopilot_requirements.docx, at 'Simulink_requirement_item_3' [file:///C:/Users/bpotter/LocalWorkArea/demos/autopilot_R2013b_workarea/do178b_autopilot_requirements.docx#Simulink_requirement_item_3]		

Linked Object	Requirements Traceability Data
	<p>conditions: The roll hold reference shall be set to zero if the actual roll angle is less than 6 degrees, in either direction, at the time of roll hold engagement. The roll hold reference shall be set to 30 degrees in the same direction as the actual roll angle if the actual roll angle is greater than 30 degrees at the time of roll hold engagement. The roll reference shall be set to the cockpit turn knob command, up to a 30 degree limit, if the turn knob is commanding 3 degrees or more in either direction.</p> <p>Rationale</p> <p>When engaging the mode at a small bank angle, it is assumed that the pilot wants to maintain level flight. When the mode is engaged above the autopilot roll limit, the autopilot should control to the limit. The turn knob will be considered to be in dent when it is less than 3 degrees.</p>
Ref Threshold1	<p>1. "1.3. Roll Hold Reference" do178b_autopilot_requirements.docx, at 'Simulink_requirement_item_3' [file:///C:/Users/bpotter/LocalWorkArea/demos/autopilot_R2013b_workarea/do178b_autopilot_requirements.docx#Simulink_requirement_item_3]</p> <p>1.3. Roll Hold Reference Requirement</p> <p>When roll hold mode becomes the active mode the roll hold reference shall be set to the actual roll attitude of the aircraft, except under the following conditions: The roll hold reference shall be set to zero if the actual roll angle is less than 6 degrees, in either direction, at the time of roll hold engage-</p>

Linked Object	Requirements Traceability Data
	<p>ment. The roll hold reference shall be set to 30 degrees in the same direction as the actual roll angle if the actual roll angle is greater than 30 degrees at the time of roll hold engagement. The roll reference shall be set to the cockpit turn knob command, up to a 30 degree limit, if the turn knob is commanding 3 degrees or more in either direction.</p> <p>Rationale</p> <p>When engaging the mode at a small bank angle, it is assumed that the pilot wants to maintain level flight. When the mode is engaged above the autopilot roll limit, the autopilot should control to the limit. The turn knob will be considered to be in dent when it is less than 3 degrees.</p>
six	<p>1. "1.3. Roll Hold Reference" do178b_autopilot_requirements.docx, at 'Simulink_requirement_item_3' [file:///C:/Users/bpotter/LocalWorkArea/demos/autopilot_R2013b_workarea/do178b_autopilot_requirements.docx#Simulink_requirement_item_3]</p> <p>1.3. Roll Hold Reference Requirement</p> <p>When roll hold mode becomes the active mode the roll hold reference shall be set to the actual roll attitude of the aircraft, except under the following conditions: The roll hold reference shall be set to zero if the actual roll angle is less than 6 degrees, in either direction, at the time of roll hold engagement. The roll hold reference shall be set to 30 degrees in the same direction as the actual roll angle if the actual roll angle is greater than 30 degrees at</p>

Linked Object	Requirements Traceability Data
	<p>the time of roll hold engagement. The roll reference shall be set to the cockpit turn knob command, up to a 30 degree limit, if the turn knob is commanding 3 degrees or more in either direction.</p> <p>Rationale</p> <p>When engaging the mode at a small bank angle, it is assumed that the pilot wants to maintain level flight. When the mode is engaged above the autopilot roll limit, the autopilot should control to the limit. The turn knob will be considered to be in dent when it is less than 3 degrees.</p>
three	<p>1. "1.3. Roll Hold Reference" do178b_autopilot_requirements.docx, at 'Simulink_requirement_item_3' [file:///C:/Users/bpotter/LocalWorkArea/demos/autopilot_R2013b_workarea/do178b_autopilot_requirements.docx#Simulink_requirement_item_3]</p> <p>----- Details from do178b_autopilot_requirements.docx: ----- [file:///C:/Users/bpotter/LocalWorkArea/demos/autopilot_R2013b_workarea/do178b_autopilot_requirements.docx#Simulink_requirement_item_3]</p> <p>1.3. Roll Hold Reference Requirement</p> <p>When roll hold mode becomes the active mode the roll hold reference shall be set to the actual roll attitude of the aircraft, except under the following conditions: The roll hold reference shall be set to zero if the actual roll angle is less than 6 degrees, in either direction, at the time of roll hold engagement. The roll hold reference shall be set to 30 degrees in the same direction as the actual roll angle if the actual roll angle is greater than 30 degrees at the time of roll hold engagement. The roll reference shall be set to the cockpit turn knob command, up to a 30 degree limit, if the turn knob is commanding 3 degrees or more in either direction.</p>

Linked Object	Requirements Traceability Data
	<p>Rationale</p> <p>ding 3 degrees or more in either direction. When engaging the mode at a small bank angle, it is assumed that the pilot wants to maintain level flight. When the mode is engaged above the autopilot roll limit, the autopilot should control to the limit. The turn knob will be considered to be in dent when it is less than 3 degrees.</p>
TK switch	<p>1. "1.3. Roll Hold Reference" do178b_autopilot_requirements.docx, at 'Simulink_requirement_item_3' [file:///C:/Users/bpotter/LocalWorkArea/demos/autopilot_R2013b_workarea/do178b_autopilot_requirements.docx#Simulink_requirement_item_3]</p> <p>1.3. Roll Hold Reference Requirement</p> <p>When roll hold mode becomes the active mode the roll hold reference shall be set to the actual roll attitude of the aircraft, except under the following conditions: The roll hold reference shall be set to zero if the actual roll angle is less than 6 degrees, in either direction, at the time of roll hold engagement. The roll hold reference shall be set to 30 degrees in the same direction as the actual roll angle if the actual roll angle is greater than 30 degrees at the time of roll hold engagement. The roll reference shall be set to the cockpit turn knob command, up to a 30 degree limit, if the turn knob is commanding 3 degrees or more in either direction.</p> <p>Rationale</p> <p>When engaging the mode at a small bank angle, it is assumed that the pilot wants to maintain level flight.</p>

Linked Object	Requirements Traceability Data
	<p>ht. When the mode is engaged above the autopilot roll limit, the autopilot should control to the limit. The turn knob will be considered to be in dent when it is less than 3 degrees.</p>
TK Threshold	<p>1. "1.3. Roll Hold Reference" do178b_autopilot_requirements.docx, at 'Simulink_requirement_item_3' [file:///C:/Users/bpotter/LocalWorkArea/demos/autopilot_R2013b_workarea/do178b_autopilot_requirements.docx#Simulink_requirement_item_3]</p> <p>1.3. Roll Hold Reference Requirement</p> <p>When roll hold mode becomes the active mode the roll hold reference shall be set to the actual roll attitude of the aircraft, except under the following conditions: The roll hold reference shall be set to zero if the actual roll angle is less than 6 degrees, in either direction, at the time of roll hold engagement. The roll hold reference shall be set to 30 degrees in the same direction as the actual roll angle if the actual roll angle is greater than 30 degrees at the time of roll hold engagement. The roll reference shall be set to the cockpit turn knob command, up to a 30 degree limit, if the turn knob is commanding 3 degrees or more in either direction.</p> <p>Rationale</p> <p>When engaging the mode at a small bank angle, it is assumed that the pilot wants to maintain level flight. When the mode is engaged above the autopilot roll limit, the autopilot should control to the limit. The turn knob will be considered to be in dent</p>

Linked Object	Requirements Traceability Data
	when it is less than 3 degrees.
Turn Knob	<p>1. "1.3. Roll Hold Reference" do178b_autopilot_requirements.docx, at 'Simulink_requirement_item_3' [file:///C:/Users/bpotter/LocalWorkArea/demos/autopilot_R2013b_workarea/do178b_autopilot_requirements.docx#Simulink_requirement_item_3]</p> <p>1.3. Roll Hold Reference Requirement</p> <p>When roll hold mode becomes the active mode the roll hold reference shall be set to the actual roll attitude of the aircraft, except under the following conditions: The roll hold reference shall be set to zero if the actual roll angle is less than 6 degrees, in either direction, at the time of roll hold engagement. The roll hold reference shall be set to 30 degrees in the same direction as the actual roll angle if the actual roll angle is greater than 30 degrees at the time of roll hold engagement. The roll reference shall be set to the cockpit turn knob command, up to a 30 degree limit, if the turn knob is commanding 3 degrees or more in either direction.</p> <p>Rationale</p> <p>When engaging the mode at a small bank angle, it is assumed that the pilot wants to maintain level flight. When the mode is engaged above the autopilot roll limit, the autopilot should control to the limit. The turn knob will be considered to be in dent when it is less than 3 degrees.</p>
zero	<p>1. "1.3. Roll Hold Reference" do178b_autopilot_requirements.docx, at 'Simulink_requirement_item_3' [file:///C:/Users/bpotter/LocalWorkArea/demos/autopilot_R2013b_workarea/do178b_autopilot_requirements.docx#Simulink_requirement_item_3]</p>

Linked Object	Requirements Traceability Data
	<div data-bbox="553 241 1424 296"> <p>opilot_requirements.docx#Simulink_requirement_item_3]</p> </div> <div data-bbox="553 304 1424 1150"> <p>1.3. Roll Hold Reference Requirement</p> <p>When roll hold mode becomes the active mode the roll hold reference shall be set to the actual roll attitude of the aircraft, except under the following conditions: The roll hold reference shall be set to zero if the actual roll angle is less than 6 degrees, in either direction, at the time of roll hold engagement. The roll hold reference shall be set to 30 degrees in the same direction as the actual roll angle if the actual roll angle is greater than 30 degrees at the time of roll hold engagement. The roll reference shall be set to the cockpit turn knob command, up to a 30 degree limit, if the turn knob is commanding 3 degrees or more in either direction.</p> </div> <div data-bbox="553 1159 1424 1539"> <p>Rationale</p> <p>When engaging the mode at a small bank angle, it is assumed that the pilot wants to maintain level flight. When the mode is engaged above the autopilot roll limit, the autopilot should control to the limit. The turn knob will be considered to be in dent when it is less than 3 degrees.</p> </div> <div data-bbox="1122 241 1424 394"> <p>orkArea/demos/autopilot_R2013b_workarea/do178b-_autopilot_requirements.docx#Simulink_requirement_item_3]</p> </div>

5.5. System - Latch Phi

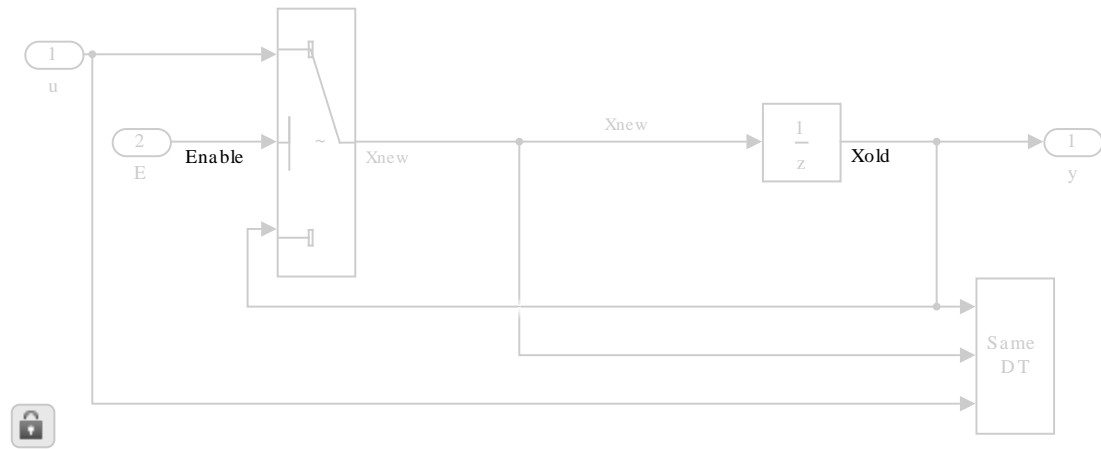


Table 5.7. Objects in "Latch Phi" that are not linked to requirements

Name	Type
E	Inport
Enable	Switch
FixPt Data Type Duplicate1	DataTypeDuplicate
FixPt Unit Delay1	UnitDelay
u	Inport
y	Outport

5.6. Systems in "roll_ap" that have no links to requirements

Table 5.8. Systems and subsystem blocks in "roll_ap" that have no links to requirements

Model or subsystem block	Children with links
roll_ap	15 out of 16
roll_ap/Model Info/EmptySubsystem	None

Chapter 6. System Model Configuration

Table 6.1. roll_ap Configuration Set

Property	Value
Description	
Components	[roll_ap Configuration Set.Components(1) [-84], roll_ap Configuration Set.Components(2) [-85], roll_ap Configuration Set.Components(-3) [86], roll_ap Configuration Set.Components(4) [87], roll_ap Configuration Set.Components(5) [89], roll_ap Configuration Set.Components(6) [91], roll_ap Configuration Set.Components(7) [91], roll_ap Configuration Set.Components(8) [92], roll_ap Configuration Set.Components(9) [94], roll_ap Configuration Set.Components(10) [94]]
Name	DO-178B Config Set
SimulationMode	normal

Table 6.2. roll_ap Configuration Set.Components [84](1)

Property	Value
Name	Solver
Description	
Components	
StartTime	0.0
StopTime	25
AbsTol	auto
FixedStep	1/40
InitialStep	auto
MaxNumMinSteps	-1
MaxOrder	5
ZcThreshold	auto
ConsecutiveZCsStepRelTol	10*128*eps
MaxConsecutiveZCs	1000
ExtrapolationOrder	4
NumberNewtonIterations	1
MaxStep	auto
MinStep	auto
MaxConsecutiveMinStep	1
RelTol	1e-3
SolverMode	SingleTasking

EnableConcurrentExecution	off
ConcurrentTasks	off
Solver	FixedStepDiscrete
SolverName	FixedStepDiscrete
SolverType	Fixed-step
SolverJacobianMethodControl	auto
ShapePreserveControl	DisableAll
ZeroCrossControl	UseLocalSettings
ZeroCrossAlgorithm	Nonadaptive
SolverResetMethod	Fast
PositivePriorityOrder	off
AutoInsertRateTranBlk	off
SampleTimeConstraint	Unconstrained
InsertRTBMode	Whenever possible
SampleTimeProperty	roll_ap Configuration Set.Components(1).Sample-TimeProperty [95]

Table 6.3. roll_ap Configuration Set.Components [84](2)

Property	Value
Name	Data Import/Export
Description	
Components	
Decimation	1
ExternalInput	rollIn
FinalStateName	xFinal
InitialState	xInitial
LimitDataPoints	off
MaxDataPoints	1000
LoadExternalInput	off
LoadInitialState	off
SaveFinalState	off
SaveCompleteFinalSimState	off
SaveFormat	StructureWithTime
SignalLoggingSaveFormat	Dataset
SaveOutput	off
SaveState	off
SignalLogging	on
DSMLogging	off
InspectSignalLogs	off

SaveTime	off
ReturnWorkspaceOutputs	off
StateSaveName	xout
TimeSaveName	tout
OutputSaveName	Ail_Cmd
SignalLoggingName	roll_ap_logsout
DSMLoggingName	dsmout
OutputOption	RefineOutputTimes
OutputTimes	[]
ReturnWorkspaceOutputsName	out
Refine	1

Table 6.4. roll_ap Configuration Set.Components [84](3)

Property	Value
Name	Optimization
Description	
Components	
BlockReduction	off
BooleanDataType	on
ConditionallyExecuteInputs	on
InlineParams	on
UseIntDivNetSlope	off
UseFloatMulNetSlope	off
DefaultUnderspecifiedDataType	double
UseSpecifiedMinMax	off
InlineInvariantSignals	on
OptimizeBlockIOStorage	on
BufferReuse	on
EnhancedBackFolding	off
StrengthReduction	off
AdvancedOptControl	-SLCI
EnforceIntegerDowncast	on
ExpressionFolding	on
BooleansAsBitfields	off
BitfieldContainerType	uint_T
EnableMemcpy	on
MemcpyThreshold	64
PassReuseOutputArgsAs	Structure reference
PassReuseOutputArgsThreshold	12

FoldNonRolledExpr	on
LocalBlockOutputs	on
RollThreshold	5
SystemCodeInlineAuto	off
StateBitsets	off
DataBitsets	off
ActiveStateOutputEnumStorageType	Native Integer
UseTempVars	off
ZeroExternalMemoryAtStartup	on
ZeroInternalMemoryAtStartup	on
InitFltsAndDblsToZero	off
NoFixptDivByZeroProtection	off
EfficientFloat2IntCast	on
EfficientMapNaN2IntZero	off
OptimizeModelRefInitCode	on
LifeSpan	inf
EvaledLifeSpan	Inf
MaxStackSize	inf
BufferReusableBoundary	on
SimCompilerOptimization	Off
AccelVerboseBuild	off
ParallelExecutionInRapidAccelerator	on

Table 6.5. roll_ap Configuration Set.Components [84](4)

Property	Value
Name	Diagnostics
Description	
Components	
RTPrefix	error
ConsistencyChecking	none
ArrayBoundsChecking	none
SignalInfNanChecking	error
SignalRangeChecking	error
ReadBeforeWriteMsg	EnableAllAsError
WriteAfterWriteMsg	EnableAllAsError
WriteAfterReadMsg	EnableAllAsError
AlgebraicLoopMsg	error
ArtificialAlgebraicLoopMsg	error
SaveWithDisabledLinksMsg	error

SaveWithParameterizedLinksMsg	error
CheckSSInitialOutputMsg	on
UnderspecifiedInitializationDetection	Simplified
MergeDetectMultiDrivingBlocksExec	none
CheckExecutionContextPreStartOutputMsg	on
CheckExecutionContextRuntimeOutputMsg	on
SignalResolutionControl	UseLocalSettings
BlockPriorityViolationMsg	error
MinStepSizeMsg	warning
TimeAdjustmentMsg	none
MaxConsecutiveZCsMsg	warning
MaskedZcDiagnostic	warning
IgnoredZcDiagnostic	warning
SolverPrmCheckMsg	error
InheritedTsInSrcMsg	error
DiscreteInheritContinuousMsg	error
MultiTaskDSMMsg	error
MultiTaskCondExecSysMsg	error
MultiTaskRateTransMsg	error
SingleTaskRateTransMsg	error
TasksWithSamePriorityMsg	error
SigSpecEnsureSampleTimeMsg	error
CheckMatrixSingularityMsg	error
IntegerOverflowMsg	error
Int32ToFloatConvMsg	warning
ParameterDowncastMsg	error
ParameterOverflowMsg	error
ParameterUnderflowMsg	error
ParameterPrecisionLossMsg	error
ParameterTunabilityLossMsg	error
FixptConstUnderflowMsg	none
FixptConstOverflowMsg	none
FixptConstPrecisionLossMsg	none
UnderSpecifiedDataTypeMsg	error
UnnecessaryDatatypeConvMsg	warning
VectorMatrixConversionMsg	error
InvalidFcnCallConnMsg	error
FcnCallInpInsideContextMsg	EnableAllAsError
SignalLabelMismatchMsg	error

UnconnectedInputMsg	error
UnconnectedOutputMsg	error
UnconnectedLineMsg	error
SFCnCompatibilityMsg	error
FrameProcessingCompatibilityMsg	warning
UniqueDataStoreMsg	error
BusObjectLabelMismatch	error
RootOutputRequireBusObject	error
AssertControl	DisableAll
Echo	
EnableOverflowDetection	off
ModelReferenceIOMsg	error
ModelReferenceVersionMismatchMessage	none
ModelReferenceIOMismatchMessage	error
ModelReferenceCSMismatchMessage	warning
ModelReferenceSimTargetVerbose	off
UnknownTsInhSupMsg	error
ModelReferenceDataLoggingMessage	error
ModelReferenceSymbolNameMessage	warning
ModelReferenceExtraNoncontSigs	none
StateNameClashWarn	warning
SimStateInterfaceChecksumMismatchMsg	warning
SimStateOlderReleaseMsg	error
InitInArrayFormatMsg	warning
StrictBusMsg	ErrorOnBusTreatedAsVector
BusNameAdapt	WarnAndRepair
NonBusSignalsTreatedAsBus	error
LoggingUnavailableSignals	error
SFUnusedDataAndEventsDiag	warning
SFUnexpectedBacktrackingDiag	warning
SFInvalidInputDataAccessInChartInitDiag	warning
SFNoUnconditionalDefaultTransitionDiag	warning
SFTransitionOutsideNaturalParentDiag	warning
SFUnconditionalTransitionShadowingDiag	warning
SFUndirectedBroadcastEventsDiag	warning
SFTransitionActionBeforeConditionDiag	warning

Table 6.6. roll_ap Configuration Set.Components [84](5)

Property	Value
----------	-------

Name	Hardware Implementation
Description	
Components	
ProdBitPerChar	8
ProdBitPerShort	16
ProdBitPerInt	32
ProdBitPerLong	32
ProdBitPerLongLong	64
ProdBitPerFloat	32
ProdBitPerDouble	64
ProdBitPerPointer	32
ProdLargestAtomicInteger	Char
ProdLargestAtomicFloat	None
ProdIntDivRoundTo	Zero
ProdEndianess	BigEndian
ProdWordSize	32
ProdShiftRightIntArith	on
ProdLongLongMode	off
ProdHWDeviceType	32-bit Embedded Processor
TargetBitPerChar	8
TargetBitPerShort	16
TargetBitPerInt	32
TargetBitPerLong	32
TargetBitPerLongLong	64
TargetBitPerFloat	32
TargetBitPerDouble	64
TargetBitPerPointer	32
TargetLargestAtomicInteger	Char
TargetLargestAtomicFloat	None
TargetShiftRightIntArith	on
TargetLongLongMode	off
TargetIntDivRoundTo	Undefined
TargetEndianess	Unspecified
TargetWordSize	32
TargetTypeEmulationWarnSuppressLevel	0
TargetPreprocMaxBitsSint	32
TargetPreprocMaxBitsUint	32
TargetHWDeviceType	32-bit Generic
TargetUnknown	off

ProdEqTarget	on
--------------	----

Table 6.7. roll_ap Configuration Set.Components [84](6)

Property	Value
Name	Model Referencing
Description	
Components	
UpdateModelReferenceTargets	IfOutOfDateOrStructuralChange
CheckModelReferenceTargetMessage	error
EnableParallelModelReferenceBuilds	off
ParallelModelReferenceErrorOnInvalidPool	on
ParallelModelReferenceMATLABWorkerInit	None
ModelReferenceNumInstancesAllowed	Multi
PropagateVarSize	Infer from blocks in model
ModelDependencies	
ModelReferencePassRootInputsByReference	on
ModelReferenceMinAlgLoopOccurrences	off
PropagateSignalLabelsOutOfModel	off
SupportModelReferenceSimTargetCustomCode	off

Table 6.8. roll_ap Configuration Set.Components [84](7)

Property	Value
Name	Simulation Target
Description	
Components	
SimCustomSourceCode	
SimCustomHeaderCode	
SimCustomInitializer	
SimCustomTerminator	
SimReservedNameArray	
SimUserSources	
SimUserIncludeDirs	
SimUserLibraries	
SFSimEnableDebug	on
SFSimOverflowDetection	on
SFSimEcho	on
SimBlas	on
SimCtrlC	on
SimExtrinsic	on

SimIntegrity	on
SimUseLocalCustomCode	off
SimParseCustomCode	on
SimBuildMode	sf_incremental_build
SimDataInitializer	
SimGenImportedTypeDefs	off

Table 6.9. roll_ap Configuration Set.Components [84](8)

Property	Value
Name	Code Generation
SystemTargetFile	ert.tlc
TLCOptions	
CodeGenDirectory	
GenCodeOnly	off
MakeCommand	make_rtw
GenerateMakefile	on
PackageGeneratedCodeAndArtifacts	off
PackageName	
TemplateMakefile	ert_default_tmf
PostCodeGenCommand	
Description	Embedded Coder
GenerateReport	on
SaveLog	off
RTWVerbose	off
RetainRTWFile	off
ProfileTLC	off
TLCDebug	off
TLCCoverage	off
TLCAssert	off
ProcessScriptMode	Default
ConfigurationMode	Optimized
ProcessScript	ert_make_rtw_hook
ConfigurationScript	
ConfigAtBuild	off
RTWUseLocalCustomCode	off
RTWUseSimCustomCode	off
CustomSourceCode	
CustomHeaderCode	
CustomInclude	

CustomSource	
CustomLibrary	
CustomInitializer	
CustomTerminator	
Toolchain	Automatically locate an installed toolchain
BuildConfiguration	Faster Builds
CustomToolchainOptions	
IncludeHyperlinkInReport	on
LaunchReport	on
PortableWordSizes	on
GenerateErtSFunction	off
CreateSILPILBlock	None
CodeExecutionProfiling	off
CodeExecutionProfileVariable	executionProfile
CodeProfilingSaveOptions	SummaryOnly
CodeProfilingInstrumentation	off
SILDebugging	off
TargetLang	C
IncludeRootSignalInRTWFile	off
IncludeVirtualBlocksInRTWFileBlockHierarchy-Map	off
IncludeRegionsInRTWFileBlockHierarchyMap	off
IncludeERTFirstTime	off
GenerateTraceInfo	on
GenerateTraceReport	on
GenerateTraceReportSl	on
GenerateTraceReportSf	on
GenerateTraceReportEml	on
GenerateCodeInfo	off
GenerateWebview	off
GenerateCodeMetricsReport	off
GenerateCodeReplacementReport	off
RTWCompilerOptimization	Off
ObjectivePriorities	
RTWCustomCompilerOptimizations	
CheckMdlBeforeBuild	Off
CustomRebuildMode	OnUpdate
DataInitializer	

Components	[roll_ap Configuration Set.Components(8).Components(1) [96], roll_ap Configuration Set.Components(8).Components(2) [97]]
------------	--

Table 6.10. roll_ap Configuration Set.Components [84](9)

Property	Value
Description	Polyspace Model Link Custom Configuration Component
Components	
Name	Polyspace
PSVerificationMode	CodeProver
PSVerificationSettings	PrjConfig
PSCxxVerificationSettings	PrjConfig
PSOpenProjectManager	on
PSResultDir	results_{\$ModelName\$}
PSAddSuffixToResultDir	off
PSEnableAdditionalFileList	off
PSAdditionalFileList	
PSModelRefVerifDepth	All
PSModelRefByModelRefVerif	off
PSInputRangeMode	DesignMinMax
PSParamRangeMode	None
PSOutputRangeMode	None
PSAutoStubLUT	off

Table 6.11. roll_ap Configuration Set.Components [84](10)

Property	Value
Description	Design Verifier Custom Configuration Component
Components	
Name	Design Verifier
DVMode	TestGeneration
DVMaxProcessTime	300
DVDisplayUnsatisfiableObjectives	off
DVAutomaticStubbing	on
DVDesignMinMaxConstraints	on
DVOutputDir	sldv_output/{\$ModelName\$}
DVMakeOutputFilesUnique	off
DVBlockReplacement	off
DVBlockReplacementRulesList	<FactoryDefaultRules>

DVBlockReplacementModelFileName	\$ModelName\$_replacement
DVParameters	off
DVParametersConfigFileName	sldv_params_template.m
DVModelCoverageObjectives	ConditionDecision
DVTestConditions	UseLocalSettings
DVTestObjectives	UseLocalSettings
DVMaxTestCaseSteps	500
DVTestSuiteOptimization	CombinedObjectives (Nonlinear Extended)
DVAssertions	UseLocalSettings
DVProofAssumptions	UseLocalSettings
DVExtendExistingTests	off
DVExistingTestFile	
DVIgnoreExistTestSatisfied	on
DVIgnoreCovSatisfied	off
DVCoverageDataFile	
DVCovFilter	off
DVCovFilterFileName	
DVDetectIntegerOverflow	on
DVDetectDivisionByZero	on
DVDesignMinMaxCheck	off
DVDetectDeadLogic	off
DVDetectOutOfBounds	off
DVProvingStrategy	Prove
DVMaxViolationSteps	20
DVSaveDataFile	off
DVDataFileName	\$ModelName\$_sldvdata
DVSaveExpectedOutput	off
DVRandomizeNoEffectData	off
DVSaveHarnessModel	on
DVHarnessModelFileName	\$ModelName\$_harness
DVModelReferenceHarness	on
DVSaveSystemTestHarness	off
DVSystemTestFileName	\$ModelName\$_harness
DVSaveReport	on
DVReportFileName	\$ModelName\$_report
DVReportIncludeGraphics	off
DVDisplayReport	on
DVDisplayResultsOnModel	off

Table 6.12. roll_ap Configuration Set.Components(1) [84].SampleTimeProperty

Field	Value
SampleTime	1/40
Offset	0
Priority	1

Table 6.13. roll_ap Configuration Set.Components(8).Components [94](1)

Property	Value
Name	Code Appearance
Description	
Components	
Comment	
ForceParamTrailComments	on
GenerateComments	on
IgnoreCustomStorageClasses	off
IgnoreTestpoints	off
IncHierarchyInIds	off
MaxIdLength	63
PreserveName	off
PreserveNameWithParent	off
ShowEliminatedStatement	on
OperatorAnnotations	off
IncAutoGenComments	off
SimulinkDataObjDesc	off
SFDDataObjDesc	off
MATLABFcnDesc	off
IncDataTypeInIds	off
PrefixModelToSubsysFcnNames	on
MangleLength	4
CustomSymbolStr	\$R\$N\$M
CustomSymbolStrGlobalVar	\$R\$N\$M
CustomSymbolStrType	\$N\$R\$M
CustomSymbolStrField	\$N\$M
CustomSymbolStrFcn	\$R\$N\$M\$F
CustomSymbolStrFcnArg	rt\$I\$N\$M
CustomSymbolStrBlkIO	rtb_\$N\$M
CustomSymbolStrTmpVar	\$N\$M
CustomSymbolStrMacro	\$R\$N\$M

CustomSymbolStrUtil	\$N\$C
CustomCommentsFcn	
DefineNamingRule	None
DefineNamingFcn	
ParamNamingRule	None
ParamNamingFcn	
SignalNamingRule	None
SignalNamingFcn	
InsertBlockDesc	off
InsertPolySpaceComments	off
SimulinkBlockComments	on
MATLABSourceComments	off
EnableCustomComments	off
InternalIdentifier	Classic
InlinedPrmAccess	Literals
ReqsInCode	on
UseSimReservedNames	off
ReservedNameArray	

Table 6.14. roll_ap Configuration Set.Components(8).Components [94](2)

Property	Value
Name	Target
Description	
Components	
IsERTTarget	on
TargetFcnLib	ansi_tfl_table_tmw.mat
TargetLibSuffix	
TargetPreCompLibLocation	
GenFloatMathFcnCalls	ANSI_C
TargetFunctionLibrary	ANSI_C
CodeReplacementLibrary	ANSI_C
UtilityFuncGeneration	Shared location
ERTMultiwordTypeDef	System defined
ERTMultiwordLength	256
MultiwordLength	2048
GenerateFullHeader	on
GenerateSampleERTMain	off
GenerateTestInterfaces	off
IsPILTarget	off

ModelReferenceCompliant	on
ParMdlRefBuildCompliant	on
CompOptLevelCompliant	on
ConcurrentExecutionCompliant	on
IncludeMdlTerminateFcn	off
GeneratePreprocessorConditionals	Disable all
CombineOutputUpdateFcns	on
CombineSignalStateStructs	off
SuppressErrorStatus	on
ERTFirstTimeCompliant	on
IncludeFileDelimiter	Auto
ERTCustomFileBanners	on
SupportAbsoluteTime	off
LogVarNameModifier	rt_
MatFileLogging	off
MultiInstanceERTCode	off
SupportNonFinite	off
SupportComplex	off
PurelyIntegerCode	off
SupportContinuousTime	off
SupportNonInlinedSFcns	off
SupportVariableSizeSignals	off
ParenthesesLevel	Maximum
GenerateClassInterface	off
ModelStepFunctionPrototypeControlCompliant	on
CPPClassGenCompliant	on
AutosarCompliant	off
GRTInterface	off
GenerateAllocFcn	off
UseToolchainInfoCompliant	on
GenerateASAP2	off
ExtMode	off
ExtModeTransport	0
ExtModeStaticAlloc	off
ExtModeStaticAllocSize	1000000
ExtModeTesting	off
ExtModeMexFile	ext_comm
ExtModeMexArgs	
ExtModeIntrfLevel	Level1

InlinedParameterPlacement	Hierarchical
TargetOS	BareBoardExample
MultiInstanceErrorCode	None
RateGroupingCode	on
RootIOFormat	Individual arguments
RTWCAPISignals	off
RTWCAPIParams	off
RTWCAPISates	off
RTWCAPIRootIO	off
ERTSrcFileBannerTemplate	ert_code_template.cgt
ERTHdrFileBannerTemplate	ert_code_template.cgt
ERTDataSrcFileTemplate	ert_code_template.cgt
ERTDataHdrFileTemplate	ert_code_template.cgt
ERTCustomFileTemplate	example_file_process.tlc
InitialValueSource	Model
ModuleNamingRule	Unspecified
ModuleName	
EnableDataOwnership	off
SignalDisplayLevel	10
ParamTuneLevel	10
GlobalDataDefinition	Auto
DataDefinitionFile	global.c
GlobalDataReference	Auto
ERTFilePackagingFormat	Modular
DataReferenceFile	global.h
PreserveExpressionOrder	on
PreserveIfCondition	on
ConvertIfToSwitch	off
PreserveExternInFcnDecls	on
SuppressUnreachableDefaultCases	off
IndentStyle	K&R
IndentSize	2
EnableUserReplacementTypes	off
ReplacementTypes	roll_ap Configuration Set.Components(8).Components(2).ReplacementTypes [100]
MemSecPackage	--- None ---
MemSecDataConstants	Default
MemSecDataIO	Default
MemSecDataInternal	Default

MemSecDataParameters	Default
MemSecFuncInitTerm	Default
MemSecFuncExecute	Default
MemSecFuncSharedUtil	Default

Table 6.15. roll_ap Configuration
Set.Components(8).Components(2) [97].ReplacementTypes

Field	Value
double	
single	
int32	
int16	
int8	
uint32	
uint16	
uint8	
boolean	
int	
uint	
char	

Chapter 7. Glossary

Atomic Subsystem. A subsystem treated as a unit by an implementation of the design documented in this report. The implementation computes the outputs of all the blocks in the atomic subsystem before computing the next block in the parent system's block execution order (sorted list).

Block Diagram. A Simulink block diagram represents a set of simultaneous equations that relate a system or subsystem's inputs to its outputs as a function of time. Each block in the diagram represents an equation of the form $y = f(t, x, u)$ where t is the current time, u is a block input, y is a block output, and x is a system state (see the Simulink documentation for information on the functions represented by the various types of blocks that make up the diagram). Lines connecting the blocks represent dependencies among the blocks, i.e., inputs whose current values are the outputs of other blocks. An implementation of a design described in this document computes a root or atomic system's outputs at each time step by computing the outputs of the blocks in an order determined by block input/output dependencies.

Block Parameter. A variable that determines the output of a block along with its inputs, for example, the gain parameter of a Gain block.

Block Execution Order. The order in which Simulink evaluates blocks during simulation of a model. The block execution order determined by Simulink ensures that a block executes only after all blocks on whose outputs it depends are executed.

Checksum. A number that indicates whether different versions of a model or atomic subsystem differ functionally or only cosmetically. Different checksums for different versions of the same model or subsystem indicate that the versions differ functionally.

Design Variable. A symbolic (MATLAB) variable or expression used as the value of a block parameter. Design variables allow the behavior of the model to be altered by altering the value of the design variable.

Signal. A block output, so-called because block outputs typically vary with time.

Virtual Subsystem. A subsystem that is purely graphical, i.e., is intended to reduce the visual complexity of the block diagram of which it is a subsystem. An implementation of the design treats the blocks in the subsystem as part of the first nonvirtual ancestor of the virtual subsystem (see Atomic Subsystem).

Chapter 8. About this Report

Table of Contents

8.1. Report Overview	102
8.2. Root System Description	102
8.3. Subsystem Descriptions	103
8.4. State Chart Descriptions	103

8.1. Report Overview

This report describes the design of the roll_ap system. The report was generated automatically from a Simulink model used to validate the design. It contains the following sections:

Model Version. Specifies information about the version of the model from which this design description was generated. Includes the model checksum, a number that indicates whether different versions of the model differ functionally or only cosmetically. Different checksums for different versions indicate that the versions differ functionally.

Root System. Describes the design's root system.

Subsystems. Describes each of the design's subsystems.

Design Variables. Describes system design variables, i.e., MATLAB variables and expressions used as block parameter values.

System Model Configuration. Lists the configuration parameters, e.g., start and stop time, of the model used to simulate the system described by this report.

Requirements Traceability. Shows design requirements associated with elements of the design model. This section appears only if the design model contains requirements links.

Glossary. Defines Simulink terms used in this report.

8.2. Root System Description

This section describes a design's root system. It contains the following sections:

Diagram. Simulink block diagram that represents the algorithm used to compute the root system's outputs.

Description. Description of the root system. This section appears only if the model's root system has a Documentation property or a Doc block.

Interface. Name, data type, width, and other properties of the root system's input and output signals. The number of the block port that outputs the signal appears in angle brackets appended to the signal name. This section appears only if the root system has input or output ports.

Blocks. This section has two subsections:

- **Parameters.** Describes key parameters of blocks in the root system. This section also includes graphical and/or tabular representations of lookup table data used by lookup table blocks, i.e., blocks that use lookup tables to compute their outputs.

- **Block Execution Order.** Order in which blocks must be executed at each time step in order to ensure that each block's inputs are available when it executes.

State Charts. Describes state charts used in the root system. This section appears only if the root system contains Stateflow blocks.

8.3. Subsystem Descriptions

This section describes a design's subsystems. Each subsystem description contains the following sections:

Checksum. This section appears only if the subsystem is an atomic subsystem. The checksum indicates whether the version of the model subsystem used to generate this report differs functionally from other versions of the model subsystem. If two model checksums differ, the corresponding versions of the model differ functionally.

Diagram. Simulink block diagram that graphically represents the algorithm used to compute the subsystem's outputs.

Description. Description of the subsystem. This section appears only if the subsystem has a Documentation property or contains a Doc block.

Interface. Name, data type, width, and other properties of the subsystem's input and output signals. The number of the block port that outputs the signal appears in angle brackets appended to the signal name. This section appears only if the subsystem is atomic and has input or output ports.

Blocks. Blocks that this subsystem contains. This section has two subsections:

- **Parameters.** Key parameters of blocks in the subsystem. This section also includes graphical and/or tabular representations of lookup table data used by lookup table blocks, blocks that use lookup tables to compute their outputs.
- **Block Execution Order.** Order in which the subsystem's blocks must be executed at each time step in order to ensure that each block's inputs are available when the block executes. This section appears only if the subsystem is atomic.

State Charts. Describes state charts used in the subsystem. This section appears only if the root system contains Stateflow blocks.

8.4. State Chart Descriptions

This section describes the state machines used by Stateflow blocks to compute their outputs, i.e., Stateflow blocks. Each state machine description contains the following sections:

Chart. Diagram representing the state machine.

States. Describes the state machine's states. Each state description includes the state's diagram and diagrams and/or descriptions of graphical functions, Simulink functions, truth tables, and MATLAB functions parented by the state.

Transitions. Transitions between the state machine's states. Each transition description specifies the values of key transition properties. Appears only if a transition has properties that do not appear on the chart.

Junctions. Transition junctions. Each junction description specifies the values of key junction properties. Appears only if a junction has properties that do not appear on the chart.

Events. Events that trigger state transitions. Each event description specifies the values of key event properties.

Data. Data types and other properties of the Stateflow block's inputs, outputs, and other state machine data.

Targets. Executable implementations of the state machine used to compute the outputs of the corresponding Stateflow block.

MATLAB Supporting Functions. List of functions invoked by MATLAB functions defined in the chart.